Social approval and facilitation in predicting modeling effects in alcohol consumption

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Abstract

Purpose: An important question for alcohol abuse prevention and treatment is whether individuals with high needs for social approval, or those who drink heavily in social contexts, are particularly vulnerable to modeling effects in alcohol consumption. Methods: Male and female heavy social drinkers (N=202), as distinguished by these cognitive and situational variables, participated in a multisession dyadic modeling effects study along with a same-sex confederate model who exhibited alternating patterns of heavy and light consumption in an experimental barroom. Results: Subjects with high needs for social approval, and those who tend to drink heavily in social contexts, were particularly vulnerable to imitating directional changes in modeled drinking levels across heavy and light consumption experimental sessions. Additionally, modeling effects were revealed, including reductions in drinking levels, regardless of individual characteristics such as demographics or levels of intoxication achieved on “usual drinking occasions.” Implications: Findings suggest that individuals exhibiting high needs for social approval, and those who tend to drink heavily in social contexts, may benefit from (1) befriending lower risk models and (2) prevention and/or intervention efforts to reduce risk for substance use by reducing excessive needs for social approval and/or reducing exposure to social contexts where heavy drinking and related risk behavior is normative. © 2001 Elsevier Science Inc. All rights reserved.

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1. Introduction

Since the advent of behavioral psychology (Bandura, 1969) and the latter development of cognitive–behavioral and social learning theory (Bandura, 1977, 1986), modeling effects, or what has often been described as observational learning, have been referred to as the central mechanism through which individuals learn personal and social behaviors. Observational learning, or modeling effects, have also been deemed to play a major role in the development and maintenance of addictive behaviors. Additionally, since the consumption of alcohol in Western societies most often occurs in social contexts, the potential for reinforcing social consequences from alcohol consumption to contribute towards the development of problem drinking behavior has been an integral part of behavioral theory (Bandura, 1986; Cox, 1990; Galizio & Maisto, 1985).

A social learning approach towards understanding the problem of alcoholism or chemically dependent behavior has encouraged experimental studies to identify reinforcers surrounding the use of alcohol. This approach has included studying events that occurred concurrently with the consumption of alcohol, how the immediate consequences of consumption might serve some reinforcing function, and what the situational determinants of drinking may include. If the parameters of reinforcement for the normal use of alcohol could be experimentally isolated and observed, steps could then be taken to prevent the development of dependencies, or to substitute other forms of reinforcement for addicted individuals.

With this evolving theory in mind, an early empirical study was conducted in an experimental “alcohol research laboratory” to examine modeling effects in social drinking that might directly impact the drinking behavior of heavy social drinkers (Caudill & Marlatt, 1975). At that time, since peer influence effects had just been identified as a leading cause of relapse to alcohol use in recovering alcoholics (Marlatt & Gordon, 1980), the study was intended to document a direct effect of modeling influences on alcohol consumption in a controlled laboratory setting. The demonstration of such influences could potentially offer information to be used in the development of strategies for relapse prevention based on a social skills training approach (Marlatt & Gordon, 1985). This modeling study (Caudill & Marlatt, 1975) demonstrated a robust modeling effect. Over the next several decades, additional modeling studies demonstrated that this effect was replicable across a wide range of individuals and differing demographic subgroups (Caudill & Goldberg, 1992; Collins & Marlatt, 1981; Collins, Parks, & Marlatt, 1985; Quigley & Collins, 1999). A recent meta-analysis of modeling effects research (Quigley & Collins, 1999) indicated consistent and robust modeling effects with large effect sizes. The results of the meta-analysis also suggested that the modeling effects paradigm may be a useful context to test various mediator or moderator models of modeling effects in high-risk drinkers. We suggest that identifying individuals with heightened susceptibilities to modeling effects in alcohol consumption is particularly important. According to predictions derived from social learning theory (Bandura, 1986), susceptible individuals may imitate the drinking of low- as well as high-consumption models (Caudill & Lipscomb, 1980). Robust modeling effects demonstrated in studies that compared heavy versus light consumption modeling with at-risk drinkers support this suggestion (Quigley & Collins, 1999). The current study was designed
to further test this theory with a repeated measurement (heavy and light consumption) within-subjects modeling effects design.

In 1988, Chipperfield and Vogel-Sprott extended the modeling effects paradigm by examining the potential for an individual difference variable, namely one’s family history of alcoholism, to mediate the modeling effect. In this study, male drinkers with a family history of alcoholism responded more to modeling effects in alcohol consumption than did those with no such history. Surprisingly, no studies since then have pursued this issue further, or examined other potential mediators of modeling effects.

The current study was designed to test whether several individual difference variables mediate the modeling effect in drinking. These variables were derived from the general modeling literature, which suggests that individuals vary in their susceptibility to modeling effects (Bandura, 1969, 1986). Perhaps one of the most widely described mediators of modeling is a strong need for social approval. Another social-cognitive and/or social-situational variable linked to increased risk behavior in higher risk drinkers is drinking for social facilitation. Social facilitation has been defined as drinking to improve one’s communication with others (Goldman, Del Boca, & Darkes, 1999), or as the extent that individuals drink, or drink heavily, in social contexts (Beck, Thombs, Mahoney, & Fingar, 1995). This belief in alcohol as a social facilitator has been linked with an array of substance abuse problems, including later development of alcohol problems in adolescents, heightened levels of alcohol use and related risk behaviors in high school and college students, more adverse consequences from drinking in current drinkers, and a heightened risk for relapse in treated alcohol abusers (Beck et al., 1995; Beck, Thombs, & Summons, 1993; Christiansen, Smith, Roehling, & Goldman, 1989; Goldman et al., 1999; Kilbey, Downey, & Breslau, 1998; Thombs, Beck, & Pleace, 1993). For these reasons, the current study was designed to determine if at-risk heavy social drinkers who are high in their need for social approval or who report drinking for social facilitation are particularly susceptible to modeling effects in alcohol consumption.

The current study included four innovations in its experimental design. First, subjects were exposed to alternating heavy and light consumption levels across four modeling effects sessions. Second, we used a community-based sample of heavy drinkers instead of college students. Third, the current study defined the high-risk population using information on blood alcohol concentration (BAC) levels typically achieved when drinking instead of quantity by frequency measures, since these latter indices often ignore the amount of time taken to consume the number of drinks reported per typical occasion. Fourth, drinkers completed taste comparisons after each drinking session instead of during the sessions to enhance the naturalistic nature of the dyadic coaction social drinking context examined.

2. Method

2.1. Experimental design

Subjects for the original study included 96 male and 96 female heavy social drinkers, aged 21–40 years. These subjects were randomly assigned to participate in one of four conditions.
in a 2 (High or Low in Risk Status) × 2 (Heavy or Light Consumption Confederate Modeling in Their First Drinking Session) randomized block design (24 males and 24 females per cell, see Fig. 1). To ensure that our final sample size attained 24 cases per cell once the data were cleaned, we added 10 subjects, yielding a final sample of 202 subjects.

2.2. Defining at-risk heavy social drinkers by usual BAC levels

Heavy drinkers were defined as those whose usual estimated BAC levels when drinking were greater than or equal to 0.06 (with a range from 0.06 to 0.295 and a mean of 0.105). This estimated measure of BAC was derived from a formula by Widmark (1932), and was recently implemented in a computerized form by the National Highway Traffic Safety Administration (1994). The measure is based upon information provided by respondents, including gender, number of alcoholic beverages consumed on typical drinking occasions, the amount of time they typically take to consume the designated number of drinks consumed on these typical occasions, and their body weights. This measure has been used in several investigations of high-risk drinkers (Caudill, Crosse, et al., 2001; Caudill, Harding, & Moore, 2000a, 2000b; Caudill, Harding, & Moore, 2001; Caudill, Luckey, & Kong, 2001; Harding, Caudill, & Moore, in press; Harding, Caudill, Moore, & Frissell, 2001). Its correspondence with in vivo breath testing and its predictive utility in other studies have been excellent. It should also be noted here that this measure of estimated BACs on “typical drinking occasions” was predictive of higher BACs achieved overall in the current “modeling effects” study ($P < .05$), even though our study sample was restricted to heavier drinkers.

2.3. Subject recruitment and screening

Subjects were recruited via local newspaper advertisements and in several local college student newspapers. Respondents who called, were 21–40 years of age, and were potentially interested in participating in a “taste comparison” experiment with different alcoholic beverages, were screened for potential participation. Interviewers from Westat’s Telephone Research Center (TRC) completed subject screenings. Subjects were screened about usual drinking to ensure that they fulfilled the study criteria. These criteria included typically achieving at least a 0.06 BAC level when drinking, having achieved this BAC level at least

<table>
<thead>
<tr>
<th>High in Psychometric Risk</th>
<th>Light Consumption Model</th>
<th>Heavy Consumption Model</th>
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<tr>
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<tr>
<td>Low in Psychometric Risk</td>
<td>Group 3</td>
<td>Group 4</td>
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Fig. 1. Experimental paradigm for male and female heavy social drinkers.
once in the past 30 days, and having consumed beer at least once in the past 30 days. After screening, potential subjects were also required to pass medical and psychiatric screenings to ensure they could safely participate in the study. Potential subjects were excluded if they were taking medication for medical or psychiatric disorders for which alcohol consumption may prove hazardous. Potential subjects were also excluded if they had ever received any form of treatment for a drinking problem or drug abuse, had ever exhibited alcohol abuse symptoms such as blackouts, or had reported illicit drug use within 30 days prior to their session. Of those screened, 21% were eligible to participate in the study. The predominant reason for ineligibility was that callers did not meet our drinking habits criteria for heavy social drinkers.

The same formula used to calculate BACs from the screening interview was also used to calculate subjects’ BACs between drinking sessions instead of using a Breathalyzer. This was done to assist us in monitoring BACs unobtrusively, since subjects’ levels of alcohol consumption was our central covertly assessed dependent variable. We wished to minimize the chance that participants might guess we were examining the amount they drank.

2.4. Experimental instructions and scheduling protocols

Once a caller was determined to be eligible for the study, they were called back and told that their participation would include attending an 80-min experimental session where they would be asked to make various taste comparisons and ratings after consuming several different types of beers. It was explained that some postexperimental waiting time had been programmed into the scheduling and that they would receive US$80.00 for their participation in the study. Since subjects would be consuming alcohol over an 80-min period, it was anticipated that they would need to wait for several additional hours after the session was completed before they would be able to leave. Their BACs had to be at a 0.02% BAC or below before they could legally be released, and then they would be provided with a complimentary cab ride home. It was also noted that we needed to schedule a time for their participation when they had no planned activities prior to 10 a.m. the next morning and that weekend sessions were available for those who preferred them. Finally, it was stated that they must agree in a written consent form not to operate any dangerous machinery for a period of 4 h after the experiment, that they would be tested on a Breathalyzer upon their arrival and they must not present any positive readings if they wish to participate.

Sessions were scheduled every evening of the week, except Monday, and sessions were never scheduled prior to 4 p.m. This time frame was used in order to allow for more normal drinking times to be examined in this study, and to reduce the within-group variance in drinking behaviors that may have occurred if daytime hours had been included. Subjects generally reached moderate BACs (approximately 0.07%) and required an additional 3 h of waiting time or longer prior to being allowed to leave the laboratory.

2.5. Seminaturalistic barroom setting

For all scheduled experimental sessions, subjects and confederates were seated across from each other at a small table in an alcoholic beverage tasting area. This area was in a large office
space at Westat’s headquarters that was transformed into an experimental barroom laboratory. On one side of this alcohol research laboratory, a bar served as the central location from which the experimenter instructed and observed. There were two barroom tables with chairs on either side of the bar. The subject and confederate were requested to complete their taste comparison sessions at a table, which had its seats turned at a 90° angle to the bar and hidden video cameras to facilitate recordings. Hidden video cameras were used to unobtrusively videotape experimental sessions for later ratings of subjects’ and confederates’ drinking behaviors (sip frequencies and amounts). Beverages that were removed from the subject and confederate after each 20-min session were taken to an adjoining kitchen where they were measured to determine how much of their beverages the subject and confederate model had consumed in each session.

2.6. Experimental procedure

As in other laboratory studies of modeling effects in alcohol consumption (e.g., Caudill & Lipscomb, 1980; Caudill & Marlatt, 1975), all experimental procedures were strictly scripted to allow for an easy replication of our procedures.

2.7. Arrival procedures and introductory scripts

Once the subject had entered the laboratory, the experimenter had him/her sit in the waiting area and then excused him/herself to wait for the next subject. The confederate arrived a few minutes later. The subject and same-sex confederate model were then told by a same-sex experimenter that we were having participants complete the taste comparison sessions together in pairs to save time. The cover story and following protocols are identical to those used in all of the aforementioned studies of this nature. After subjects and confederates were questioned to determine that they had followed experimental restrictions prior to their participation (no alcohol consumption, drug use, or intake of food for 4 h prior to the experimental session) and informed consent had been obtained, they were then both tested on a Breathalyzer to ensure that neither participant presented a positive BAC prior to the study. Each participant was then taken into a separate office area to be weighed, and female subjects were given a pregnancy test. No female participants were found to be pregnant.

2.8. Demographic and risk factor questionnaire administration

Prior to the implementation of the initial experimental alcohol consumption session, the subject and confederate were told that we would first ask them to complete several brief questionnaires. This assessment battery included questionnaires that were used to identify potential high- and low-risk groups for the study, including the Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1960; Robinette, 1991) and Beck et al.’s (1995) Social Context of Drinking measure. Subjects were told that in order to make it more comfortable and private for them, we would request that they complete this task in two different rooms. The experimenter then asked the confederate to follow him/her into the other
room and informed both participants that the taste comparison sessions would be done together in the barroom once they had completed the questionnaires. Once the subject had completed his/her questionnaires, the experimenter brought the confederate back into the room and requested that both drop their sealed psychometric batteries into a locked box for data entry.

The Social Context of Drinking measure was originally created for students (Beck et al., 1993, 1995; Thombs et al., 1993). Therefore, to make it more applicable to a general and slightly older population, Beck et al.’s (1995) most recent college student version of the SCD was modified. Of 30 items in the Beck et al.’s (1995) SCD measure, one question was dropped and seven additional items were slightly edited. Drinking “to forget about academic problems,” for example, read “to forget about problems at work or school” and “at home with your parents” was changed to say “at home with your family.” Additionally, Beck et al.’s zero- to three-point Likert scale of the frequency with which respondents drink for various reasons, or in different contexts, was expanded to a zero- to ten-point scale to allow for a greater sensitivity in measuring the utility of these concepts as potential predictors of modeling effects.

2.9. Experimental social context

Since previous studies had shown that friendly models were the ones who successfully generated a receptive response and an induced modeling effect in drinking (Caudill & Marlatt, 1975; Collins et al., 1985; Reid, 1978), the confederates related in a friendly manner to subjects throughout the 2-h period of experimentation. This included smiling, cordial discussions about topics that were not related to their present experience in the lab, eye contact, leaning forward, etc.

2.10. Experimental instructions and assessment protocol

It was then noted that we were ready to begin the taste comparison sessions. The script for the taste comparison sessions, which was virtually identical to that used in previous taste comparison studies, read as follows:

The primary purpose of this study is to examine the abilities of various types of drinkers with differing backgrounds to make fine taste comparisons based on their memory of drinking different brands of alcoholic beverages. During each session, please be sure to try each of the three beverages served to you. After every tasting session we will have you make some judgments about each of the beverages you’ve consumed based on your memory of drinking them. There will be up to four such taste comparison sessions this evening, each lasting about 20 minutes. After each taste comparison session we will stop for a bathroom (and cigarette) break and have you both come back and rate each of the three beverages on a series of scales. The rating scales ask questions such as which beer seemed, for example, the most or least “rich”. After you have completed your taste comparison ratings of the beverages, we will then bring you another selection of beers and ask you to complete this process again. You are free to visit with each other at any time, but there are several restrictions: We ask that you do
not discuss with each other the qualities or characteristics of the beverages you are consuming as part of this experiment. We also ask that you do not talk about your experiences here today while the study is underway. I also ask for you not to share beverages, because you partner’s beer may not always be the same brands as those which you will be asked to make taste comparisons about. I would also like to encourage you to get comfortable and feel free to drink as you normally would. I, as a bartender, will be here for serving drinks, but have been instructed not to engage in discussions with either of you beyond responding to your requests for additional drinks or using the bathroom during breaks. Do either of you have any questions about today’s session before we get started?

During the breaks between sessions, the experimenter took the remaining beer from the previous session into the kitchen area to measure the amounts consumed, recorded them, and entered the subject’s amounts into a computer program, which kept track of his/her BAC. Measuring of amounts did not occur in front of subjects so the measure of amount consumed, as a dependent variable, was not readily apparent. When the subject and confederate returned from their break, they completed taste comparison rating forms for the previous session. These taste comparison forms were just like those used in previous modeling studies and asked subjects to rate each of the three beverages on a series of adjectives such as “strong,” “sweet,” or “bitter.” For each adjective, subjects were asked to rate which beverage (from memory in this case) was, for example, “most or least sweet.” The decanters from which subjects and confederates poured from during the drinking sessions were marked A, B, and C, and which participants were told they would use for their ratings after each drinking session. Each 20-min tasting-task session was videotaped, and later coded for sip rates and amounts, for subjects and confederates.

2.11. Confederates’ modeling effects consumption protocols

Subjects’ and confederates’ cups and decanters were identical. A similar protocol was used for each 20-min drinking session as that which had been implemented in a number of earlier modeling studies (Caudill & Lipscomb, 1980; Collins et al., 1985; DeRicco, 1978; DeRicco & Garlington, 1977; DeRicco & Neimann, 1980; Reid, 1978). A more naturalistic setting than the tasting task was used, allowing subjects to drink in an ad lib fashion in a barroom setting. In addition, with the design of this study, the extent of subjects’ tracking of the alternating coaction modeling consumption variations was assessed in a longer and more naturalistic drinking session and open-ended social context than is typical (Caudill & Lipscomb, 1980).

As is typical, heavy and light consumption modeling conditions were distinguished by differences in the size of confederate sips and volume consumed, but not by any overall differences in their number of sips. In Session 1, the confederate either exhibited heavy or light consumption rates, as defined below, and as randomly determined (by random blocking to ensure that an equivalent number of both were included in the first session, and for males and females). In Sessions 2, 3, and 4, the confederate model exhibited an alternating pattern of heavy and light alcohol consumption from one session to the next, based on his/her randomly selected heavy or light consumption pattern for Session 1.
In the heavy consumption modeling condition, the confederate was trained to consume a total of nine plastic cups, each of which contained approximately 83.3 ml or 2.932 oz, of nonalcoholic near beer, during this 20-min session. A wall clock was visible to confederates, and they learned to consume nearly three cups of “beer” every 6 min. The confederates took a sip from any one of three cups every 20 s, as determined by a clock with a second hand they could see on the wall. Once all three cups were empty, the confederate poured the same amount into each of the three cups at 6 min 40 s and at 13 min 20 s to continue sipping every 20 s until the session ended. Experimenters helped confederates with their timing by covertly signaling them when they were 2 min away from needing to finish each set of drinks. In total, confederates in the heavy consumption modeling condition consumed 750 ml (26.4 oz) of near beer.

In the light consumption modeling condition, the confederate took smaller sips, sipped at the same rate, but consumed nine cups containing approximately 27.8 ml (0.978 oz) per cup of nonalcoholic near beer over the same 20 min of time. Thus, confederates consumed a total of 250 ml (8.8 oz) of near beer in the light consumption session (or approximately three-fourths of a beer). The heavy and light consumption modeling conditions therefore varied based on the size of confederates’ sips (larger sips in the heavy consumption condition).

2.12. BAC assessments and protocols

After each 20-min session was completed, and subject’s and confederate’s beverages had been removed, the experimenter measured the amount of beer the subject drank and then entered this information into a computer program that calculated his/her BAC. The subject was not told about this procedure to avoid affecting his or her normal drinking behavior. At any point, if a subject attained a BAC of 0.13% alcohol, the session was immediately discontinued and subjects were debriefed.

2.13. Postexperimental questionnaire

Once the taste comparison sessions were completed, the subject and confederate were asked to complete a postexperimental questionnaire in private. This questionnaire, like those used in other modeling effects studies (e.g., Caudill & Lipscomb, 1980; Caudill & Marlatt, 1975; Collins & Marlatt, 1981; Collins et al., 1985), included filler questions about the taste comparisons and their experiences in the study, then asked them about the true purposes of the experiment and whether they believed any deception was involved (and if so, to describe). No participants expressed any awareness of the true purposes of the experiment, guessed that a confederate was involved, nor suggested that we were examining the amount of alcohol they had consumed as a dependent variable.

2.14. Experimental debriefing

As in similar studies (Caudill & Lipscomb, 1980; Caudill & Marlatt, 1975), subjects were then interviewed by the experimenter. They were first asked to describe what they saw as the
experimental purpose for the project they had just participated in. They were further queried in order to ascertain how much they may have known or suspected about experimental hypotheses and procedures. These interviews confirmed that subjects were not aware of experimental hypotheses or deception in the experimental procedures.

After the subject completed the postexperimental questionnaire and interview, was debriefed, and further questions were answered, the experimenter conducted a Breathalyzer test. The experimenter then informed him/her what the actual reading was, and reminded the subject that if his/her BAC was above 0.02% alcohol at that time, he/she needed to remain in the laboratory until his/her BAC reached a point that was at or below 0.02%. They were also reminded that they would be provided with a complementary ride home.

2.15. Behavioral ratings of videotapes

Videotapes were rated by trained behavioral raters, who systematically counted subjects’ and confederate models’ number of sips of their drinks in each 20-min session. Numbers of sips were covertly rated by two raters in 20% of the sessions. Interrater reliabilities ranged from 95% to 100%.

2.16. Measuring modeling effects—the Shift in Directional Change (SDC) scores

Modeling effects for the current study were defined as the extent (or amount in milliliters) to which subjects shifted their drinking levels in the same direction as confederate models across the four study drinking sessions examined. This index of directional change is herein referred to as a SDC score. As noted earlier, the confederate models, as randomly determined, either exhibited heavy or light consumption modeling in their first drinking sessions. They then alternated between heavy and light consumption levels across the three remaining sessions, as determined by their random assignments to heavy or light consumption levels in their first sessions. Because there were four drinking sessions overall, this study design allowed for the assessment of three directional shifts in drinking levels (or amounts) across the four respective study sessions. Each of these three directional shifts in drinking levels received a score for the amount that subjects shifted their drinking levels in the same direction as the confederate models, or in the opposite direction. If they shifted their drinking levels in the same direction as confederate models, they received a positive SDC score, and if they shifted their drinking levels in the opposite direction, they received a negative SDC score. These scores were based on the number of ml of beer consumed in a direction that was consistent with the drinking of the confederates, or the amount in milliliters of beer consumed in a direction that was opposite to the shifts in drinking levels across sessions exhibited by confederate models. Using this “SDC” scoring system, the greater the score that subjects received, the more they were seen as having responded to the modeling effect. Three SDC scores were given to subjects who completed all sessions of the experiment. Two examples of SDC scoring system are as follows. For each example, let us first assume that the confederate model began with heavy consumption modeling, then shifted in subsequent sessions to light, heavy, and then light consumption (hence, H/L/H/L shifts between the four
respective sessions). If a subject in this example consumed 200 ml of beer in Session 1, 100 ml in Session 2, 300 ml in Session 3, and 200 ml in Session 4, the SDC scores that this subject would receive for these three shifts in drinking levels across sessions would be 100, 200, and 100. In another example using the same modeling conditions, if the subject consumed 300 ml in Session 1, 200 ml in Session 2, 300 ml in Session 3, and 350 ml in Session 4, then the three SDC scores this individual would receive would be 100, 100, and −50. These three scores were then used as outcomes in a repeated-measures multiple regression model to determine the amount to which subjects exhibited directional shifts that mirrored those exhibited by confederate models and the extent to which these were modified by subjects’ risk factors status.

3. Results

3.1. Modeling effects manipulation check

To assess whether confederates followed experimental protocols to consume approximately 750 ml of nonalcoholic near beer in the heavy consumption modeling condition and 250 ml in the light consumption modeling condition and to take an equivalent number of sips across both conditions, our analysis began with a validity check on these confederate behaviors. Findings showed that confederates successfully followed all of these experimental protocols. In the heavy consumption modeling condition, confederates consumed an average of 740 ml of their beverages (S.D. = 56.2), and in the light consumption modeling condition, they, on average, consumed 299 ml (S.D. = 47.6). This difference, as intended, was highly significant ($\chi^2 = 7216.5, P < .0001$). Additionally, confederates in the heavy consumption modeling condition, on average, took 56 sips of their beverages (S.D. = 5.6), and similarly, in the light consumption modeling condition, on average, they also took 56 sips (S.D. = 6.2). Sipping behavior was thus consistent across the two modeling effects conditions.

3.2. Overall analytic approach

As noted above, modeling effects were defined as the extent to which subjects shifted their drinking levels, or the amount (ml) they consumed, in the same direction across drinking sessions as that exhibited by confederate models. Individual predictor variables were then examined to determine the extent to which they predicted SDC scores in this population. Since there were multiple observations for subjects who completed more than two drinking sessions, we applied a repeated measures multiple regression procedure as our central analytic technique, using the SAS MIXED procedure to identify predictor variables associated with social drinkers’ heightened susceptibilities to modeling effects in alcohol consumption. This technique takes into account the correlation among repeated measurements of the same subject in the analysis, and also makes use of the partial information for subjects who did not complete all four of their drinking sessions due to heavier consumption levels in their first three sessions. Of 202 subjects in the current study, 2 (<1%) only completed one drinking
session and were excluded from the analysis. Of the rest, 13 (6.4%) completed two sessions; 
45 (22.3%) completed three; and 142 (70.3%) completed all four. Partial between-sessions 
modeling effects data was therefore used from 58 of the 60 subjects who did not complete all 
four drinking sessions.

3.3. Examining demographic and drinking history variables, condition assignments, and 
session effects as potential predictors of modeling effects

First, we examined the potential predictive value of demographic variables and several 
drinking-related variables to predict modeling effects (Table 1). These included typical 
BACs achieved when drinking, initial drinking condition assignments, a measure of 
perceived similarity of the confederate (from the postexperimental questionnaire), and a 
time effect variable, which indicates the extent to which the modeling effect itself may have 
varied in strength between the different sessions. We began by running a preliminary 
analytic model that included all of the respective predictor variables included in the model. 
The $P$ values for these initial predictors for this preliminary model are listed in the second 
column of Table 1. To derive a parsimonious model, we then reran the repeated-measures 
multiple regression procedure after dropping the least significant variable from the predictor 
variables listed on Table 1 (with the largest $P$ value). By repeatedly dropping nonsignificant

<table>
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<th>Predictor variables</th>
<th>Initial model—adjusted by all covariates ($P$ value)</th>
<th>Final model</th>
<th>Effect of covariate</th>
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Marital status: single/married/other; Race: White/Black/other; Education: ≤12/some college/college graduate; 
Income: less than 15K/15–25K/25–45K/45K+; Sex: female/male; Initial condition assignment: heavy or 
light consumption.
predictors, we derived a final model with only the significant predictors remaining. As can be seen in examining the final model in Table 1, none of the demographic variables were statistically significant predictors of modeling effects in alcohol consumption with this population of heavy social drinkers. Results for the final model show that the modeling effect itself, as based on an examination of the predictor variables from Table 1, is only predicted by the variable of time, as the modeling effect was most robust between Sessions 3 and 4, and weakest between Sessions 2 and 3. This latter finding indicated that subjects were more likely to respond to modeling effects in alcohol consumption in the latter drinking session.

3.4. Need for social approval and social facilitation as potential predictors of modeling effects

In order to test the potential predictive utility of the Marlowe–Crowne Social Desirability Scale and the Social Context of Drinking factors in predicting modeling effects, we adjusted for any demographic variables from Table 1, which had \( P \) values below .4 in examining these indices (see Table 2 for this model). Demographic and drinking-related variables that qualified according to this criteria for inclusion in the initial model in Table 2 were “marital status,” “weight,” and the measure of time effect. Combining these three predictors, and the social desirability and social context of drinking scales, we have an initial model with the \( P \) values depicted in the second column of Table 2. After dropping nonsignificant predictors in the development of a final model, only the Marlowe–Crowne Social Desirability Scale and the social facilitation factor from the Social Context of

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Initial model—adjusted by all covariates</th>
<th>Final model</th>
<th>Effect of covariate</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marital status</td>
<td>.211</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>.262</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modeling effects by session</td>
<td>.061</td>
<td>20.8</td>
<td>.11</td>
<td></td>
</tr>
<tr>
<td>Modeling in 1–2 versus 2–3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modeling in 1–2 versus 3–4</td>
<td></td>
<td>-6.6</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Modeling in 2–3 versus 3–4</td>
<td></td>
<td>-27.4</td>
<td>.023</td>
<td></td>
</tr>
<tr>
<td>Marlowe–Crowne Social Desirability Scale</td>
<td>.013</td>
<td>3.0</td>
<td>.011</td>
<td></td>
</tr>
<tr>
<td>Social Context of Drinking Scale Factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social facilitation</td>
<td>.056</td>
<td>0.64</td>
<td>.032</td>
<td></td>
</tr>
<tr>
<td>Peer acceptance</td>
<td>.147</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional pain</td>
<td>.733</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family drinking</td>
<td>.667</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex seeking</td>
<td>.194</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>.534</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Drinking measures were predictors of the modeling effect (P values of .011 and .032, respectively, after adjusting for the time effect and for one another, in our final model). Subjects who had a high need for social approval, and those with higher scores on drinking for social facilitation, were each more likely to respond to modeling effects in alcohol consumption in the current study.

3.5. Comparing partial completers and dropouts with completers

We wished to determine if the 60 subjects who were partial completers or dropouts differed from the remaining 142 subjects on any central study variables that may have affected our findings and/or limited our generalizability to other “at-risk” drinkers or samples. We therefore compared completers to dropouts on demographic, drinking habits, and risk factor variables. The partial completers and dropouts reported higher BACs on “typical drinking occasions” (P < .01), more drinking and driving (on the Motor Vehicle factor from the SCD—P < .005), and slightly lower incomes (P < .05), than completers. It is important to note here that none of these variables were shown to be related to modeling effects in the current study. Partial completers and dropouts also did not differ from completers on Marlowe–Crowne scores or drinking for social facilitation. Therefore, inclusion of partial data for some subjects is not likely to have affected the findings regarding predictors of heightened subject susceptibilities to modeling effects in alcohol consumption.

4. Discussion

Consistent with previous modeling effects studies, the modeling effect was not restricted to any particular demographic subgroup, or any set of drinkers. This suggests that modeling influences in alcohol consumption are consistent and robust enough that they are not bound by individual differences at this level. Additionally, the modeling effect influenced drinkers regardless of their usual BAC levels when drinking, or their perceptions of the perceived similarity between themselves and the model they imitated. These results suggest that heavy social drinkers are not only susceptible to the modeling of riskier levels of alcohol consumption, but can also be influenced by the “moderating effects” of lighter consumption modeling as they were in the current study. These findings also suggest that substance abuse prevention programs may benefit from attempting to provide heavy social drinkers with “less risky” alcohol-consumption models and/or social systems in general, and that such interventions are applicable to a wide range of at-risk drinkers.

The current study also showed that heavy social drinkers with a particularly high need for social approval, as measured by the Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1960; Robinette, 1991), were significantly more susceptible to modeling effects in alcohol consumption than were those who were lower on this perceived need. Drinkers examined who exhibited the highest need for social approval were more likely to track modeled directional changes in drinking levels across sessions than those who exhibited lower levels of this perceived need. These findings have significant implications for prevention and/or
intervention efforts with individuals who, due to their high need for social approval, may be at risk for developing substance abuse problems, or for individuals who exhibit such needs and may be seeking treatment for substance abuse. First, these findings suggest that risk reduction programs can be designed to target individuals in early adolescence identified as having a heightened need for social approval. Second, these programs could encourage these individuals to foster friendships with other individuals exhibiting low risk behaviors (e.g., not drinking). A cognitive intervention, for example, may specifically attempt to encourage at-risk adolescents to reduce their heightened needs for social approval. Similarly, relapse prevention programs with clients who exhibit such “heightened perceived needs” may also benefit from the inclusion of similar cognitive and/or skills training interventions. Relapse prevention programs typically include some form of social skills training and cognitive interventions to bolster one’s ability to successfully cope with potential precipitants of relapse (Marlatt & Gordon, 1985; Wilson, 1992), however, these specific interventions may prove to be particularly important inclusions for such at-risk clientele as those identified here.

The social facilitation factor from the Social Context of Drinking scale was also a strong predictor of modeling effects with this population. This finding is consistent with prior studies showing that the social facilitation factor from Beck et al.’s high school and college student SCD scales successfully predicts heavier levels of alcohol use in these populations (Beck et al., 1993, 1995; Thombs et al., 1993). Interestingly, although measures of alcohol expectancies have traditionally been seen as some of the more meaningful predictors of heavier levels of alcohol use and related risk behavior in numerous populations (see Goldman et al., 1999 for a recent review of this literature), Thombs et al. (1993) reported that a similar SCD to that used here (their earlier version of the college student SCD) was superior in predicting alcohol-related risk behavior when compared with a commonly used measure of alcohol expectancies, the Alcohol Outcome Expectancy (AOE) questionnaire (Leigh & Stacy, 1993). Specifically, Thombs et al. reported that SCD social context indices successfully accounted for 70% of the variance in an index of alcohol use intensity in 18–22-year-olds examined compared to 48% for the AOE. They also noted that the SCD social facilitation factor was the best predictor variable examined.

In summary, this study has identified a number of factors that appear to affect drinking in specific drinking contexts. This information can potentially be used in the design of prevention and intervention programs. This area of research is one that promises fruitful results from further investigation, which should be pursued.

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References


