Old Dominion University
ODU Digital Commons

Winter 2012

When Cognitive Bias Masquerades as Intervention Efficacy: Drinking Norms as Anchors and Norm Interventions as Anchoring Effects

Matthew R. Pearson
Old Dominion University

Follow this and additional works at: https://digitalcommons.odu.edu/psychology_etds

Part of the Cognitive Psychology Commons, and the Experimental Analysis of Behavior Commons

WHEN COGNITIVE BIAS MASQUERADES AS INTERVENTION EFFICACY:

DRINKING NORMS AS ANCHORS AND NORM INTERVENTIONS AS

ANCHORING EFFECTS

by

Matthew R. Pearson
B.S., May 2005, Virginia Polytechnic Institute and State University
M.S., December 2009, Old Dominion University

A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

APPLIED EXPERIMENTAL PSYCHOLOGY

OLD DOMINION UNIVERSITY
December 2012

Approved by:

James M. Henson (Director)

Valerian J. Derlega (Member)

Michelle L. Kelley (Member)

James A. Neff (Member)

ABSTRACT

WHEN COGNITIVE BIAS MASQUERADES AS INTERVENTION EFFICACY: DRINKING NORMS AS ANCHORS AND NORM INTERVENTIONS AS ANCHORING EFFECTS

Matthew R. Pearson
Old Dominion University, 2012
Director: Dr. James M. Henson

Problematic drinking is a serious public health concern on college campuses in the United States. College students most frequently report drinking for social reasons, and perceptions of peers' drinking, or perceived drinking norms, are among the most consistent, robust predictors of college student drinking. Therefore, norm-based interventions have risen to prominence in the attempt to reduce the harm caused by college student alcohol use. However, the efficacy of these interventions may be obscured by cognitive bias. Specifically, providing information regarding the drinking norm may "anchor" individuals' *estimates* of their own behavior. Using samples of college student drinkers, two studies were conducted to examine whether normative feedback serves as an anchor and biases one's report of their behavior (*norms as anchor hypothesis*). In addition, the boundary conditions of this effect were examined. Specifically, it was examined whether the anchoring effect is attenuated or eliminated when participants are forewarned about the anchoring effect or when controlling for social desirability bias. Contrary to hypotheses, a robust anchoring effect was not found in Study 1 or Study 2. Given the lack of clarity provided by null results, these findings are interpreted cautiously. Methodological limitations are discussed in terms of how improvements can be made for future research and what the results signify for norm-based interventions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Problematic alcohol consumption among college students is a significant public health concern. In a large representative sample of college students, 31.6% of students could be classified as alcohol abusers, and 6.3% met criteria for alcohol dependence (Knight et al., 2002); nearly half of the sample (44.1%) reported at least one symptom of alcohol abuse or dependence. With such a large percentage of college students evincing problematic drinking behaviors, it is no surprise that much effort has focused on developing effective interventions for college students. One of the most studied interventions among college students are social norms interventions (Larimer & Cronce, 2007).

Social norm theory posits that individuals tend to conform to the perceived social norms, and excessive alcohol use can be perpetuated by misperceptions regarding drinking norms (Perkins & Berkowitz, 1986). Specifically, heavy drinkers tend to believe that others drink as heavily as they do, and when they are informed that they drink more than others, their drive to conform to the social norm will lead them to moderate their drinking. The present studies explore whether the effects of social norms interventions partially rely on a cognitive bias, namely, the anchoring effect (Tversky & Kahneman, 1974). Before reviewing the present studies, evidence that suggests drinking norms to be an antecedent to drinking behavior is reviewed, followed by an explanation of the anchoring effect and its importance in reviewing the effects of normative interventions.

This dissertation adheres to APA format.

Drinking Norms and Alcohol Use

According to the research, there appears to be strong evidence that perceived drinking norms are related to one's drinking. In the present discussion, "drinking norms" refers to what is often called descriptive norms, or the *perceived quantity and/or frequency of drinking* by important others (e.g., how much one's peers drink). Considerable cross-sectional research shows that drinking norms is a robust predictor of alcohol use (for a review, see Borsari & Carey, 2001). In one study that examined several proximal antecedents to alcohol use (i.e., drinking motives, alcohol expectancies), Neighbors, Lee, Lewis, Fossos and Larimer (2007) found that perceived drinking norms was the strongest unique predictor of alcohol use when controlling for all variables in the model. Similarly, among student athletes, Hummer, LaBrie, and Lac (2009) found perceived drinking norms to be one of the strongest predictors of alcohol consumption when controlling for drinking motives.

In general, research has found that the more proximal the reference group, the larger the association between drinking norms and alcohol consumption. For example, perceived drinking norms of close friends are more strongly related to alcohol use than perceived drinking norms of "typical" college students (Baer, Stacy, & Larimer, 1991). In addition, perceived drinking norms of same gender peers are also more related to alcohol use than drinking norms of opposite gender peers (Lewis & Neighbors, 2004). In fact, Neighbors, Lee et al. (2010) recently demonstrated that group identification with the reference group moderated the strength of the drinking norm-alcohol use relationship, such that individuals who more strongly identified with three different reference groups (same sex students, same race students, same Greek status students) had a stronger

relationship between perceived drinking norms of that specific reference group and personal alcohol use. From a social norms theory perspective, this finding reflects the fact that similar peers exert a stronger social influence on behavior than dissimilar peers. Despite the robust relationships identified using cross-sectional designs, strong causal conclusions cannot be made from these studies alone. In order to support the causal hypothesis that perceived drinking norms causes one's own drinking, it is important to determine whether manipulation of perceived drinking norms results in subsequent changes to personal drinking behaviors.

Normative Feedback Interventions

The strongest support for a relationship between drinking norms and alcohol use comes from intervention studies that ostensibly show that reductions in drinking norms are associated with reductions in drinking behaviors. This experimental evidence is better suited for making causal attributions (Fisher, 1935). Even a brief review of preventative interventions shows that personalized normative feedback is one of the most common treatment components in individual-level interventions directed at reducing college student drinking (Carey, Scott-Sheldon, Carey, & Demartini, 2007). Normative feedback interventions developed for college students have been specifically tailored toward high-risk groups including freshmen (Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007), athletes (Doumas, Haustveit, & Coll, 2010), university-sanctioned students (i.e., mandated; Doumas, McKinley, & Book, 2009), students turning 21 years old (Lewis, Neighbors, Lee, & Oster-Aaland, 2008), and fraternity/sorority members (LaBrie, Hummer, Grant, & Lac, 2010). Although some of these interventions involve mailed feedback (Lewis, Neighbors, Lee, & Oster-Aaland, 2008) or *in vivo* personalized

feedback (LaBrie, Hummer, Grant, & Lac, 2010), the current trend favors the development of successful web-based interventions (Neighbors et al., 2010).

As discussed by Lewis and Neighbors (2006), one of the difficulties in evaluating the efficacy of personalized normative feedback in reducing alcohol consumption is that it is often provided in combination with other treatment components. For example, Brief Motivational Interventions (BMIs) typically include personalized normative feedback in addition to decisional balance exercises and/or skill building exercises (Larimer & Cronce, 2007; Murphy, Dennhardt, Skidmore, Martens, & McDevitt-Murphy, 2010; Vasilaki, Hosier, & Cox, 2006). Carey et al. (2007) reviewed 62 randomized controlled trials of individual level interventions targeted at college student drinkers. Although dozens of studies included a normative feedback component, they typically included motivational interviewing and/or other treatment components as well (see their Table 1). With a sample of 18-24 year old patients from a trauma center, Monti et al. (2007) found that motivational interviewing with personalized normative feedback was more successful at reducing alcohol use than personalized normative feedback alone. With college student drinkers, Walters, Vader, Harris, Field, and Jouriles (2009) found that neither personalized normative feedback nor motivational interviewing alone resulted in reductions in alcohol use when compared to the assessment only condition; however, motivational interviewing combined with personalized normative feedback resulted in significant reductions in drinks per week, peak blood alcohol concentration, and alcohol-related problems. Therefore, it is important to focus on studies in which personalized normative feedback is given in the absence of other significant treatment components.

Personalized normative feedback interventions rely on the assumption that the majority of college students overestimate their peers' level of alcohol consumption, and that correcting this misperception results in meaningful change in an individual's own drinking behavior. A meta-analysis of 23 studies with 102 separate tests of the discrepancy between perceived and actual drinking norms reveal a robust "self-other discrepancy" such that the majority of college students do in fact overestimate their peers' drinking behaviors (Borsari & Carey, 2003). More recently, a meta-analysis of 34 randomized controlled trials revealed that individual-level alcohol interventions designed to decrease college student drinking are generally effective at reducing perceived drinking norms (Scott-Sheldon, DeMartini, Carey, & Carey, 2009). Thus, there is convincing evidence that personalized normative feedback interventions are effective at reducing perceived drinking norms. In the next section, some of the most compelling evidence that personalized normative feedback interventions reduce alcohol consumption is reviewed.

Neighbors, Lewis et al. (2010, p. 902) succinctly described that personalized normative feedback interventions have three required components: "information regarding (a) one's own drinking behavior, (b) one's perceptions of other students' drinking behavior on the participating campus, and (c) other students' self-reported drinking behavior in text and bar graph formats." Although there is slight variability in how the feedback is presented, all of the studies reviewed below at least included these three required components of a personalized normative feedback intervention.

Neighbors, Lewis et al. (2010) performed a randomized controlled trial examining the efficacy of a web-based personalized normative feedback intervention. With the

longest follow-up period for such an intervention to date, they assessed participants every six months for 2 years following baseline assessment. They used a 2 (type of feedback: gender-specific vs. gender-neutral) x 2 (frequency of normative feedback: baseline only vs. biannually) + 1 (assessment only control condition) design, and they found that significant changes in "typical" weekly drinking over time were observed with gender-specific personalized normative feedback delivered biannually. When the feedback was gender-nonspecific and/or provided only once at baseline, no significant differences were found. None of the conditions evinced significant reductions in alcohol-related problems. Although only one of the intervention conditions had any effect on alcohol consumption, the strength of this study was that the participants completed a two-year follow-up period. which suggests that personalized normative feedback may have the potential to result in enduring change in drinking behavior.

Doumas and colleagues have found that web-based personalized normative feedback resulted in significant reductions in alcohol use at 3-month follow-up among "high-risk" NCAA Division I student athletes (Doumas, Haustveit, & Coll, 2010), and reduced alcohol use and alcohol-related problems at 3-month follow-up among "high-risk" first-year college students (Doumas & Anderson, 2009). In these studies, students were classified as "high-risk" if they endorsed engaging in heavy episodic drinking in the previous 2 weeks (Doumas & Anderson, 2009) or 3 months (Doumas et al., 2010). Finally, Doumas and colleagues found that personalized normative feedback reduced alcohol use, but not alcohol-related problems at one-month follow-up among mandated students (Doumas, McKinley, & Book, 2009). Neighbors, Lewis, Bergstrom, and Larimer (2006) found an intervention effect for personalized normative feedback on

weekly alcohol consumption at 2-month follow-up, but no such effect on alcohol-related problems. Lewis, Neighbors, Oster-Aaland, Kirkeby, and Larimer (2007) found that a personalized normative feedback intervention directed specifically at freshman college students reduced weekly alcohol consumption and drinking frequency at 5-month follow-up. In many of these studies, the observed intervention effects were mediated by changes in perceived drinking norms (Doumas et al., 2009, 2010; Lewis et al., 2007; Neighbors et al., 2006), providing stronger support that personalized normative feedback interventions reduce alcohol consumption through the theoretically-based mediator. It is important to note that only one study reviewed above found an intervention effect on alcohol-related problems, and this effect was only observed in a subset of the sample that was classified as high-risk based on endorsing engagement in heavy episodic drinking in the past 2 weeks (Doumas & Anderson, 2009).

It must be noted that of all the studies to date that support norm-based alcohol interventions fail to collect veridical measures of alcohol use, and usually rely on aggregated retrospective assessments of drinking (e.g., number of drinks consumed during a typical drinking week in the past 30 days). This fact is key, because these forms of assessment are vulnerable to reconstructive memory biases. In a sample of Swiss patients from an emergency room, Gmel and Daeppen (2007) used a retrospective 7-day diary to assess alcohol consumption. They found a systematic recall bias, such that self-reported alcohol consumption decreased with the length of the recall period. For example, average daily alcohol consumption was nearly 1 drink lower when using a 7-day recall period than using a 1-day recall period. Further, this bias was stronger among

more sporadic drinkers as compared to regular drinkers, which is particularly relevant considering that even heavy drinking college students tend to drink sporadically.

One way to minimize reconstructive memory biases is to narrow the assessment window, namely, to a single occasion. In the first personalized normative feedback intervention designed to reduce college students' 21st birthday celebratory drinking, Lewis, Neighbors, Lee, and Oster-Aaland (2008) found that a mailed birthday card intervention was successful at reducing normative misperceptions, but was unrelated to alcohol use or alcohol consequences. More recently, Neighbors, Less, Lewis, Fossos, and Walter (2009) completed a web-based personalized normative feedback intervention for 21st birthday celebratory drinking that showed a significant intervention effect on alcohol use, but not alcohol-related problems. This study provides perhaps some of the most convincing evidence that personalized normative feedback can result in reductions in alcohol use (at least on a single occasion) in that retrospective memory biases are minimized with recall of single events, especially notable events like a birthday celebration. For the purpose of determining the effect of personalized normative feedback on drinking behaviors, one limitation of this study was that participants also received information regarding their intended BAC and the effect of alcohol at varying BACs. In addition, they received information encouraging the use of protective behavioral strategies (i.e., strategies that can moderate drinking). However, they found that post-intervention drinking norms mediated the intervention effect, whereas use of protective behavioral strategies did not, suggesting that the intervention effect could be accounted for by changes to the theoretically-based mediator. In sum, the preponderance of evidence suggests that personalized normative feedback interventions are successful at

correcting misperceptions of peer drinking norms, and that they result in reductions in reported alcohol use in the absence of a corresponding reduction in alcohol-related problems.

Anchoring Effects

Much research has focused on the retrospective memory biases that limit the validity of self-reports of drinking behaviors (e.g., Takarangi, Garry, & Loftus, 2006). For the purpose of the present study, one cognitive bias that may be particularly relevant in terms of norm-based intervention is considered: the anchoring effect. Tversky and Kahneman (1974) were the first to demonstrate the adjustment and anchoring heuristic, or the anchoring effect, which they defined as the phenomenon where "people make estimates by starting from an initial value that is adjusted to yield the final answer" and "different starting points yield different estimates, which are biased toward the initial values" (p. 1128). In their classic study, a number wheel was spun in the presence of participants, showing that the number obtained was arbitrary. Then, participants were asked, for example, whether the percentage of African countries in the United Nations was greater or less than the obtained number (comparative judgment). Finally, participants were asked to estimate the actual percentage (absolute judgment). They found that participants' quantitative estimates were strongly biased toward the arbitrary anchor, such that participants made insufficient adjustment when given even an arbitrary starting value.

Decades of subsequent research has demonstrated the robustness of the anchoring effect and have explored the cognitive mechanisms behind the anchoring effect (e.g., insufficient adjustment, Jacowitz & Kahneman, 1995; Tversky & Kahneman, 1974;

semantic priming: Strack & Mussweiler, 1997). Although the standard anchoring study requires that an individual makes a quantitative judgment only after making a comparative judgment, subsequent studies have shown anchoring effects can occur in the absence of a comparative judgment when it is ensured that participants attend to the anchor value (Study 2: Wilson, Houston, Etline, & Brekke, 1996; Study 2: Wu, Cheng, & Lin, 2008). The anchoring effect occurs when given plausible or implausible anchor values (Strack & Mussweiler, 1997), and it even occurs when individuals are forewarned about the effects of anchoring (see Study 5: Wilson et al., 1996).

Anchoring Effects and Personalized Normative Feedback

Lombardi and Choplin (2010) conducted three experiments that examined the anchoring effect in reference to estimates of personal alcohol consumption. In Experiments 1 and 2, college students were either given bogus information regarding the drinking norm at their college campus (i.e., 19 or 16 drinks per week [high anchor] vs. 1 or 4 drinks per week [low anchor]) or no normative information (control group). Then, participants were asked whether they drank more, less, or about the same as the average student (comparative judgment). Finally, they were asked to estimate their own personal alcohol consumption using an open-ended question in Experiment 1 and a scaled-answer format in Experiment 2 (absolute judgment). Across both studies, Lombardi and Choplin found significant anchoring effects, such that estimates of personal alcohol use were significantly lower in the low anchor condition compared to both the control group and the high anchor condition. In Experiment 3, they used a poster adopted from a social norms intervention focused on decreasing heavy episodic drinking. The poster stated that most students of the campus community consume "4 or fewer drinks when they party."

Compared to the control group, the participants exposed to the poster were less likely to endorse heavy episodic drinking (i.e., drinking 5 or more drinks per occasion). Overall, Lombardi and Choplin provide convincing evidence that providing normative feedback may change *estimates* of personal alcohol consumption even in the absence of actual behavior change.

As mentioned above, it is clear that systematic discrepancies between perceived and actual drinking norms exist such that individuals overestimate peer drinking norms (for a meta-analysis, see Borsari & Carey, 2003), and that norm-based alcohol interventions are successful at reducing these misperceptions (Scott-Sheldon et al., 2009). However, the present study calls into question whether changing misperceptions of drinking norms effectively changes actual drinking behavior.

One of the strongest limitations to personalized normative feedback research is that alcohol use is not assessed in a veridical manner. For example, as a representative sample of the "successful" personalized normative feedback interventions, almost all of these studies reviewed above use a variant of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) to assess alcohol consumption and the Drinking Norms Rating Scale (DNRS; Baer, Stacy, & Larimer, 1991) to assess perceived drinking norms. Participants estimate how many standard drinks they consumed in a typical drinking week during a predefined assessment window (i.e., 30 days) and estimate their peers' drinking behavior using a comparable scale. Normative feedback is given in terms of how many standard drinks a "typical college student" consumes in a week. Then, participants' alcohol use and perceived drinking norms are re-assessed using the DDQ and DNRS.

Because participants are likely unable to use a "recall-and-count" strategy to report drinking behaviors such that they can recall and sum each incidence of alcohol consumption during a "typical" drinking week in the past 30 days, they must instead rely on estimation strategies (Schwarz, 2007). When provided with normative feedback, the "average alcohol consumption" of the "typical college student" may serve as a point of reference when estimating one's own drinking behaviors. In other words, the normative feedback may act as an anchor from which the participant adjusts their estimates of their own drinking. As decades of research on the anchoring effect attests, individuals are likely to make insufficient adjustment, such that their quantitative estimates are heavily weighted by the anchor.

The hypothesis that providing normative feedback essentially provides individuals with an anchor from which to make their estimates of drinking behavior provides an explanation for some inconsistent findings in the literature. For example, despite the strong relationship between alcohol use and alcohol-related problems, personalized normative feedback interventions have consistently been found to reduce reported alcohol use, but not alcohol-related problems. The anchoring effect explanation asserts that personalized feedback interventions alters one's *estimates* of alcohol consumption in the absence of actual behavioral change; therefore, it should not result in a significant reduction in problems experienced as a consequence of one's drinking.

Another peculiar finding was that Neighbors et al. (2010) found no intervention effect of personalized normative feedback at 6 months post-intervention; however, they found a significant intervention effect over the 2-year follow-up in the condition where gender-specific normative feedback was presented biannually. Given the relatively long ·

time between assessments (i.e., 6 months), a single exposure to the normative feedback may have been insufficient to produce an anchoring effect because participants may have forgotten the normative information. In fact, it appears that repeated exposure to an anchor is required to achieve an anchoring effect under some circumstances (Wu et al., 2008). Therefore, the biannual presentation of the normative feedback is perhaps tantamount to multiple exposures to an anchor.

A number of findings from the literature that are consistent with predictions from the social norms approach are also consistent with the anchoring effect explanation. For example, the social norms approach assumes that more proximal (i.e., important) peer groups have more of an influence on individuals' behaviors, and thus providing more specific normative feedback (i.e., gender-specific vs. gender-neutral) should result in improved efficacy (Neighbors et al., 2010). An anchoring explanation would also predict that the more relevant an anchor, the stronger the anchoring effect. For example, Strack and Mussweiler (1997) found that if participants were asked to judge whether a structure was taller or shorter than an arbitrary anchor value (comparative judgment), there was an anchoring effect if the subsequent question asked for the actual *height* of the structure (absolute judgment), but not if it asked for the actual *length* of the structure. Strack and Mussweiler (1997) conclude that "the strength of the anchoring effect depends on how applicable the activated information is perceived to be" (p. 440). Although theoretically-consistent mediation of interventions are typically viewed as strong support for behavioral change theories, the anchoring explanation would also predict that changes to perceived drinking norms would mediate the "intervention effect" (i.e., anchoring effect).

In sum, the anchoring effect provides a compelling alternative explanation of personalized normative feedback intervention effects that warrant further investigation.

Purpose

The present studies aimed to extend previous research by examining the boundary conditions of the anchoring effect in the context of estimating personal alcohol consumption. I hypothesized that when one is given normative information regarding similar peers, this information is likely to bias one's estimation of their own behavior. Because self-reports of one's behavior do not reflect veridical assessments of their behavior, individuals likely use any information that they have to make an estimate of their behavior. The strong argument states that norm-based alcohol interventions are ineffective at changing actual behavior, but they solely introduce a cognitive bias that unconsciously influences one's *estimates* of behavior. The weaker argument states that the magnitude of change (or the effect size) of norm-based alcohol interventions is exaggerated by the anchoring effect. In either case, it is important to determine whether providing normative feedback introduces a cognitive bias that may masquerade as intervention efficacy.

In study 1, a cross-sectional design is used to rule out the potential for actual behavior change, and the *norms as anchor hypothesis* states that estimates of alcohol use would be affected by normative feedback, such that self-reported drinking would be higher when presented with a high anchor and lower when presented with a low anchor. Because alcohol use and the presentation of normative feedback occurs contemporaneously (i.e., no time is allowed for behavioral change to occur), only the *norms as anchor hypothesis* could explain any group differences in reported alcohol use.

Hypothesis 1: Providing normative information to participants would produce an anchoring effect, that is, affect self-reported alcohol use in the absence of behavioral change.

If norm-based interventions typically produce anchoring effects, it would be important to determine how to reduce the effect of this cognitive bias when examining norm-based interventions. It would follow that perhaps warning participants of the anchoring effect would ameliorate or eliminate the effect. However, Wilson et al. (1997) demonstrated that anchoring effects occur even when participants are forewarned of their effects. Therefore, the anchoring effect appears to occur in the absence of conscious cognitive processing. Two predictions stem from the *nonconscious anchoring hypothesis*:

Hypothesis 2a: Anchoring effects would be present even when participants were forewarned of their effects.

Hypothesis 2b: Anchoring effects would be present even after controlling for social desirability bias.

Cross-sectional evidence shows that the perceived drinking norms of same gender peers more strongly predicts personal alcohol consumption than the perceived drinking norms of opposite gender peers (Lewis & Neighbors, 2004). Also, gender-specific normative feedback is more effective at reducing self-reported alcohol consumption (Neighbors, Lewis et al., 2010). In addition, group identification with referent groups moderated the relationship between perceived drinking norms and alcohol use, such that the relationship was strongest among individuals who strongly identified with the referent group (Neighbors, LaBrie et al., 2010). Previously, all of these findings have been

interpreted as supporting social norms theory because it is assumed that more similar peers exert a stronger social influence on behavior. However, in terms of anchoring effects, the *relevancy* of the anchor has an effect on the strength of the anchoring effect (Strack & Mussweiler, 1997). Thus, same gender normative information or information from a group with which one strongly identifies may act as a more relevant anchor, and thus increase the effect of the anchor on one's estimation of their own alcohol consumption. Two predictions stem from the *anchor applicability hypothesis*:

Hypothesis 3a: The anchoring effect would be strongest among individuals who identify strongly with the referent group.

Hypothesis 3b: The anchoring effect would be stronger when provided with gender-specific normative information as opposed to gender-neutral normative information.

The strength of the cross-sectional design in Study 1 is that it does not allow time for actual behavioral change, and any group differences must be attributed to cognitive bias. However, this cross-sectional design also fails to allow for social norms predictions to be pitted against anchoring effect predictions, and does not allow for a longitudinal test of mediation. To overcome these limitations, Study 2 was conducted using a longitudinal design with a one month follow-up.

Participants were assigned to one of five groups that differed in terms of when or whether they received normative feedback. It is important to note that the anchoring effect prediction is that normative feedback would reduce estimates of alcohol use immediately following presentation of normative feedback, whereas the social norms approach predicts reduced estimates of alcohol use only when time has elapsed between

the presentation of normative feedback and the assessment of alcohol use. In other words, the anchoring effect predicts immediate decreases in self-reported alcohol use, and the social norms approach predicts a delayed decrease in self-reported alcohol use. Figure 1 depicts the predicted pattern of means for Study 2.

Hypothesis 4: Anchoring effect predictions would better account for longitudinal changes in reported alcohol use than social norms theory predictions.

Previous studies have found that perceived drinking norms mediates the effect of normative feedback interventions on self-reported alcohol use (Doumas et al., 2009, 2010; Lewis et al., 2007; Neighbors et al., 2006). Although these studies have interpreted this finding to mean that change in perceived drinking norms is related to subsequent changes in actual drinking behaviors, the *norms as anchor hypothesis* predicts the same mediation of the anchoring effect. In other words, the strength of the anchoring effect will be explained by the degree to which one remembers the anchor.

Hypothesis 5: Anchoring effects would be mediated by changes in perceived drinking norms.
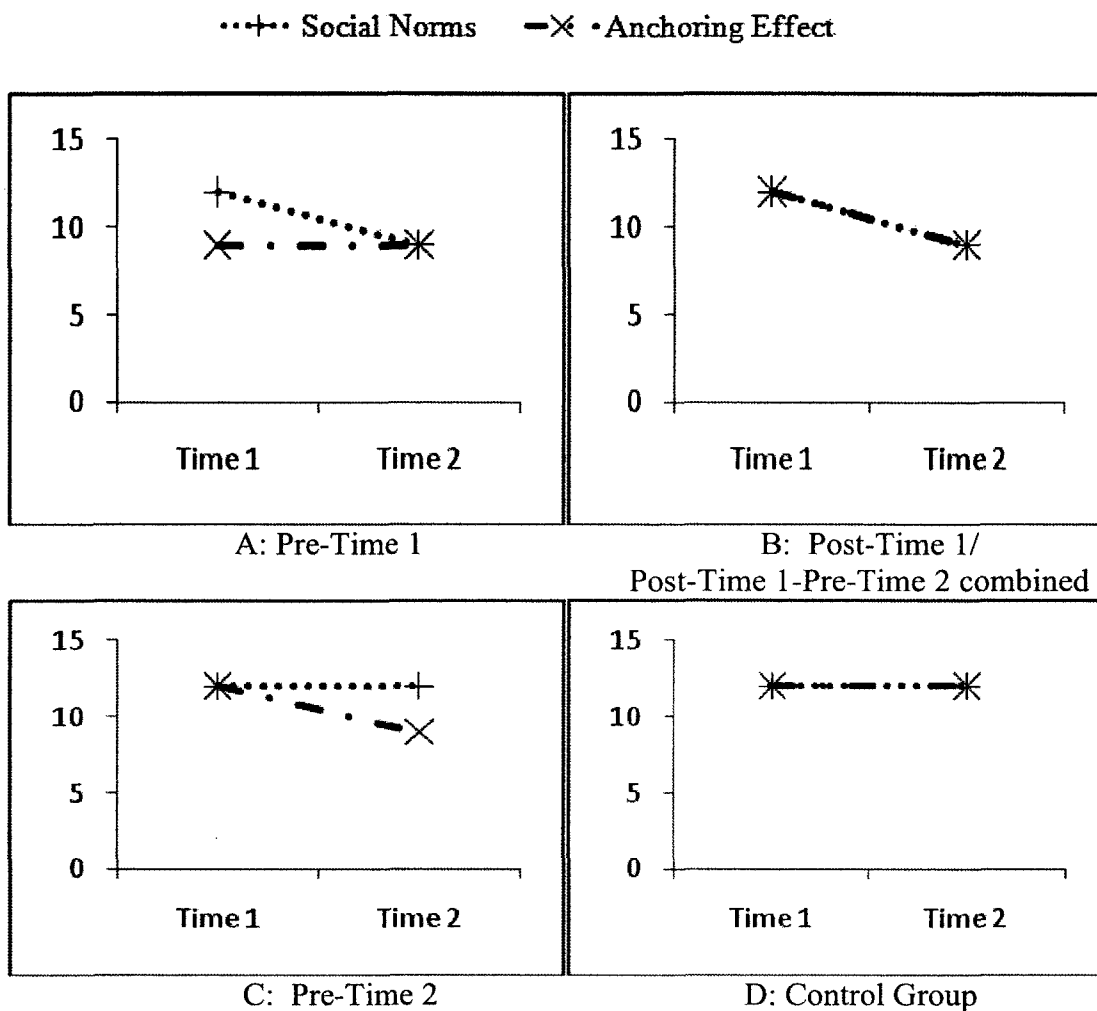
Figure 1. Depicts the Expected Pattern of Means Predicted by Social Norms Theory Versus the Anchoring Effect. In the pre-time 1 condition (quadrant A), an immediate decrease in self-reported consumption is expected only based on anchoring effect predictions, whereas a delayed decrease in self-reported consumption is expected based on social norms predictions. In the pre-Time 2 condition (quadrant C), an immediate decrease in self-reported consumption at Time 2 is expected based on anchoring effect predictions, but not according to social norms predictions.

CHAPTER II

METHOD

Participants

For study 1, participants were recruited from one of several locations at the student union at Old Dominion University. Participants were asked to complete an anonymous survey ("less than five minutes") to be eligible to win one of three $50 cash prizes. All power analyses were conducted to obtain .8 power and a Type I error rate of .05 using G*Power 3.1.2 (Faul, Erdfelder, Lang, & Buchner, 2007). For Study 1, a 2 x 2 x 2 + 1 between-subjects design was used, and power analyses revealed that approximately 51 participants per group ensures sufficient power to detect effects of interest ($d = .5$), even in the face of heterogeneity of variance (i.e., conducting a series of t-tests). Thus, 636 participants were recruited for Study 1. Given that the hypotheses concerned the effect of reported norms on drinkers' self-reports, all participants who reported not drinking in a "typical drinking week" were excluded (31.45%, $n = 200$). Data from five women and two men were dropped as they were misallocated into a gender-incongruent feedback condition (i.e., a woman received gender-specific feedback for a male). Therefore, our final sample consisted of 429 college student drinkers (221 men, 200 women, 8 missing). Drinker status was unrelated to gender, $\chi^2(1) = .21, p = .644$, and age, $t(615) = .65, p = .517$. However, drinkers were more likely to be White and less likely to be Asian/Pacific Islanders than non-drinkers, $\chi^2(5) = 14.60, p = .012$. In the overall sample, 31.4% were non-drinkers; however, 54.1% of Asian/Pacific Islanders were non-drinkers and only 26.3% of Whites were non-drinkers. Demographic characteristics of both samples are reported in Table 1.

Table 1

Sample Demographics for Drinkers and Non-Drinkers in Study 1

| | Drinkers | | Non-Drinkers | |
	N	%	N	%
Gender				
Male	221	51.5	98	49.0
Female	200	46.6	100	50.0
Missing	8	1.9	2	1.0
Racial/ethnic group				
African-American or Black	154	35.9	77	38.5
Asian or Pacific Islander	17	4.0	20	10.0
Caucasian or White	202	47.1	72	36.0
Latino or Latina	24	5.6	11	5.5
Native American	2	0.5	0	0.0
Other	9	2.1	7	3.5
Missing	21	4.9	13	6.5
Age				
M	20.59		20.40	
SD	3.28		3.65	

For study 2, college student drinkers were recruited through the psychology department's research participation pool (see Appendix A). Participants enrolled in the study online, and they received two confidential emails one month apart with the Time 1 and Time 2 assessments. Participants received one hour of research participation credit for their participation in this study. Credit was applied using a confidential identification number that the participant provided to the researcher. All participants electronically volunteered their participation after reading an informed consent that explained what the study involved and emphasized the confidentiality and anonymity of their responses (see Appendix B). Consistent with the characteristics of the participant pool, the majority of participants were women (see Table 2 for sample demographics).

Study 2 used a repeated-measures design with five groups. Power analyses revealed that approximately 115 participants would be needed to detect medium between-subject effects ($\eta^2_p = .09$). Two participants were identified as outliers on self-reported drinking and deleted based on the fact that they were greater than three standard deviations from the mean at both Time 1 and Time 2 (participant 82582: $zs = 5.54$ and 4.20; participant 84064: $zs = 3.42$ and 3.97). After deleting these outliers, 181 participants who completed baseline surveys remained (i.e., Time 1), and 132 of these participants completed follow-up data (i.e., Time 2). Thus, the data retention rate was reasonably high (72.9%) considering the low-stakes assessment. The retained sample did not differ from the full sample in terms of gender, $\chi^2(1) = 0.09$, $p = .762$, race, $\chi^2(5) = 3.46$, $p = .629$, or age, $t(311) = 0.53$, $p = .594$.

Table 2

Sample Demographics in Study 2

	Full Sample Sample[a]		Retained Sample[b]	
	N	%	N	%
Gender				
Male	41	22.7	28	21.2
Female	140	77.3	104	78.8
Racial/ethnic group				
African-American or Black	53	29.3	36	27.3
Asian or Pacific Islander	7	3.9	7	5.3
Caucasian or White	101	55.8	77	58.3
Latino or Latina	9	5.0	7	5.3
Native American	0	0.0	1	0.8
Other	11	6.1	4	3.0
Age				
M		22.18		22.59
SD		6.48		7.03

[a] Contains all participants who completed the baseline assessment ($n = 181$). [b] Contains only participants who completed both baseline and follow-up and reported drinking at baseline ($n = 132$).

Measures

Alcohol use. For both studies, alcohol use was measured using a modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985; see Appendix C). Using two seven-item grids (Monday-Sunday), participants report the number of standard drinks they consumed during both a typical and the heaviest drinking week in the past 30 days. For both studies, number of drinks consumed per typical drinking week was the primary dependent variable. To further quantify the alcohol use of the samples, additional measures of alcohol use were also reported including 1) frequency of alcohol use in a typical drinking week, 2) frequency of alcohol use in the heaviest drinking week in the past 30 days, and 3) quantity of alcohol use in the heaviest drinking week in the past 30 days. In the Study 2 sample only, some additional measures were also collected: 1) frequency of binge-episodes in the past 30 days (defined as 4 or more drinks per occasion for women or 5 or more drinks per occasion for men, and 2) number of drinks during the heaviest drinking episode in the past 30 days.

Perceived drinking norms. For both studies, the Drinking Norms Rating Scale (DNRS; Baer, Stacy, & Larimer, 1991; see Appendix D) was used to assess perceived drinking norms. The DNRS uses the same format as the DDQ such that individuals estimate the number of drinks consumed by the "typical college student" during both a typical and the heaviest drinking week in the past 30 days. For the present studies, perceived number of drinks consumed per typical drinking week was the primary measure of perceived drinking norms.

Group identification. Identification with the "typical college student" was assessed with three items adapted from Ellemers, Kortekaas, and Ouwerkerk (1999; see

Appendix E): "I identify with the typical college student," "I am like the typical college student," and "Being the typical college student is an important reflection of who I am." Participants will indicate agreement with the three statements on a 7-point Likert-type scale ranging from "Not at all" to "Very much."

Social desirability. Social desirability bias was assessed with a 10-item version (Strahan & Gerbesi, 1972) of the Marlowe Crowne Social Desirability Scale (Crowne & Marlowe, 1960; see Appendix F). Items are presented in a true/false format and were summed to create a composite of social desirability bias. Internal consistency and test-retest reliability have been shown to be high among college students.

Demographics. A standard demographics questionnaire (see Appendix G) was used to assess gender, race/ethnicity, and age.

Procedure: Study 1

A 2 (anchor: high vs. low) x 2 (warning: forewarned vs. not) x 2 (type of feedback: gender-specific vs. gender-neutral) + 1 between-subjects design was utilized. Participants were assigned to one of the 9 conditions.

Prior to receiving normative feedback, some participants were warned that such feedback could unduly affect their estimation of their own behavior, and thus were encouraged to report their behavior accurately. This forewarning was modeled after Wilson et al.'s (1996) most successful forewarning condition where it was explicitly stated that this "contamination effect" can result in both overestimation and underestimation depending on the relative size of the anchor. The forewarning instructions read as follows:

"Sometimes, a number in someone's head can influence their answers to subsequent questions. For example, when someone has a large number in their head, it can cause them to increase their estimates when answering subsequent questions. When someone has a small number in their head, it can cause them to decrease their estimates when answering subsequent questions.

When you answer the questions on the following pages regarding alcohol use, please be careful not to have this contamination effect happen to you. We would like the most accurate estimates that you can come up with."

Then, participants in the experimental groups were given normative feedback in terms of typical weekly consumption:

"Based on data collected at Old Dominion University, the typical college student at ODU consumes X drinks per week."

To produce the anticipated anchoring effect, some participants received a high anchor, and some participants received a low anchor. Both anchors were based on actual alcohol use data collected from Old Dominion University. For the high anchor, the mean number of drinks consumed by college student drinkers (i.e., excluding non-drinkers) "during the heaviest drinking week in the past 30 days" was used, which was 19 drinks. For the low anchor, the median number of drinks consumed by college students (i.e., including non-drinkers) "during a typical drinking week in the past 30 days" was used, which was 6 drinks. In the gender-specific feedback condition, "typical college student" was replaced with either "typical male college student" or "typical female college student," depending on the perceived gender of the participant. After completing

all measures, participants gave their information to be entered into a raffle, and they were debriefed regarding the true nature of the study.

Procedure: Study 2

Participants completed a baseline survey and a follow-up survey 1 month after baseline assessment. Participants were randomly assigned to receive normative feedback immediately prior to Time 1 alcohol use assessment (pre-Time 1 condition), following Time 1 alcohol use assessment (post-Time 1 condition), immediately prior to Time 2 alcohol use assessment (pre-Time 2 condition), following Time 1 alcohol use assessment and prior to Time 2 alcohol use assessment (post-Time 1/pre-Time 2 condition), or not at all (control group). In this study, the normative information reflected the actual drinking norms at ODU based on a recently conducted study. Thus, the experimental participants received the following information: "Based on data collected at Old Dominion University, on average, the typical college student at ODU consumes _8_ standard drinks per week."

CHAPTER 3

RESULTS

Descriptives: Study 1

On average, participants reported drinking 2 to 3 days during both the typical and heaviest drinking weeks in the past 30 days (typical: $M = 2.59$, $SD = 1.42$; heaviest: $M = 2.55$, $SD = 1.44$). During the typical drinking week, they reporting consuming nearly 11 standard drinks ($M = 10.93$, $SD = 11.79$), and during the heaviest drinking week, they reported consuming over 16 standard drinks on average ($M = 16.13$, $SD = 18.29$).

Planned Analyses: Study 1

Given that standard analysis of variance (ANOVA) methods can only be used with the experimental conditions that are fully crossed (i.e., the control group would be excluded from analyses), the data were analyzed using a number of planned pairwise comparisons. Unless otherwise noted, Tukey corrections were applied to control for the risk of Type I error inflation based on multiple comparisons.

<u>Hypothesis 1</u>: *Providing normative information to participants would produce an anchoring effect, that is, affect self-reported alcohol use in the absence of behavioral change.*

Hypothesis 1 was tested with pairwise comparisons between the low anchor, high anchor, and control conditions, collapsing across other conditions. It was expected that participants in the high anchor condition would report more alcohol use than participants in the control condition, whereas participants in the low anchor condition would report less alcohol consumption than the control condition. However, individuals in the high anchor condition ($M = 10.85$, $SD = 12.56$, $n = 184$) did not self-report drinking more than

the low anchor condition ($M = 10.94$, $SD = 10.70$, $n = 207$) or the control group ($M = 11.26$, $SD = 13.82$, $n = 38$).

<u>Hypothesis 2a</u>: *Anchoring effects would be present even when participants are forewarned of their effects.*

Hypothesis 2a was predicated on the idea that there would be an overall effect of anchor condition. This hypothesis would be supported if in the forewarning condition, the high anchor and/or low anchor condition were significantly different from each other. As could be expected from the lack of a "main effect" of anchor condition, there was not a significant difference in self-reported alcohol use between the high anchor ($M = 10.16$, $SD = 12.94$) and low anchor ($M = 11.16$, $SD = 11.27$) in the forewarning condition.

<u>Hypothesis 2b</u>: *Anchoring effects would be present even after controlling for social desirability bias.*

As with Hypothesis 2a, Hypothesis 2b was predicated on the idea that an overall anchoring effect would be present. As planned, typical alcohol use was regressed onto the participants' social desirability scores (Marlowe & Crowne, 1960), and the residuals were used to test the expected mean differences. The lack of differences between anchoring conditions and the control group remained even after controlling for social desirability.

<u>Hypothesis 3a</u>: *The anchoring effect would be strongest among individuals who identify strongly with the referent group.*

Hypothesis 3a was tested using moderated regression. Dummy-coded variables were used to examine the effect of anchoring condition on the outcomes. Interaction terms were created from a mean-centered group identification score (Ellemers et al.,

1999), and each dummy-coded variable used to indicate one's normative feedback

condition (i.e., high anchor vs. control and low anchor vs. control). Hypothesis 3a

would be supported by a significant interaction term. As shown in Table 3, there was no

significant interaction between identification with the typical college student and the

effect of anchoring condition.

Table 3

Results from multiple regression analysis predicting self-reported alcohol use from identification with the typical college student (ID) and anchoring conditions

Outcome: Typical Alcohol Use	b	β	p	pr
Identification (ID)	3.87	.23	.130	.074
Anchor Dummy-Code 1 (1 = low anchor)	-.14	-.01	.946	-.003
Anchor Dummy-Code 2 (1 = high anchor)	-.09	-.00	.965	-.002
ID x Anchor Dummy-Code 1	1.23	.05	.663	.021
ID x Anchor Dummy-Code 2	-.70	-.03	.803	-012

$N = 421$.

Hypothesis 3b: *The anchoring effect would be stronger when provided with gender-specific normative information than gender-neutral normative information.*

Hypothesis 3b would be supported to the extent that the anchoring effect (i.e., the

magnitude of the differences between the low anchor, high anchor, and control

conditions) is larger in the gender-specific normative information compared to the

gender-neutral normative information condition. However, there was no anchoring

effect in either the gender-specific normative feedback condition (low anchor: $M = 12.58$,

$SD = 12.68$; high anchor: $M = 11.36$, $SD = 14.50$) or gender-neutral normative feedback

condition (low anchor: $M = 9.47$, $SD = 8.33$; high anchor: $M = 10.29$, $SD = 10.15$).

Post Hoc Analyses: Study 1

The planned analyses revealed that there was no overall anchoring effect with or without controlling for social desirability, and a non-existent anchoring effect could not be minimized by forewarning or enhanced by gender-specific feedback. Given that the anchoring effect did not occur, pairwise comparisons between the low anchor, high anchor, and control conditions were examined to determine if normative feedback had an effect on perceived drinking norms. One participant in the control condition reported a drinking norm of 246 standard drinks in a typical drinking week, which was over 13 standard deviations above the mean ($z = 13.61$), so this outlier was deleted. As expected, perceived drinking norms were significantly lower in the low anchor condition ($M = 19.35$, $SD = 9.98$) compared to the high anchor condition ($M = 22.96$, $SD = 14.26$), $p = .011$, $d = .298$, although neither of these were significantly different from the control condition ($M = 21.59$, $SD = 13.80$), $ps > .65$. Dropping the control group, the difference between the high and low anchor group remained significant in a 2 (anchor: high vs. low) x 2 (warning: forewarned vs. not) x 2 (type of feedback: gender-specific vs. gender-neutral) x 2 (gender: male vs. female) ANOVA, indicated by a main effect of anchor, $F(1, 368) = 9.40$, $p = .002$. No other main or interactive effects were significant, $ps > .23$. Thus, to summarize Study 1's results, the normative feedback had a significant impact on perceived drinking norms, but had not discernible effect on self-reported alcohol use.

Descriptives: Study 2

One hundred thirty-two participants were retained in the analytic sample (i.e., completed both baseline and follow-up surveys and were not extreme outliers). On average, participants reported drinking between 2-3 days during both the typical and heaviest drinking weeks in the past 30 days at time 1 (typical: $M = 2.20$, $SD = 1.41$; heaviest: $M = 2.54$, $SD = 1.85$) and time 2 (typical: $M = 2.19$, $SD = 1.71$; heaviest: $M = 2.58$, $SD = 1.84$). During the typical drinking week, they reporting consuming around 8 standard drinks at time 1 ($M = 8.10$, $SD = 7.44$) and a little less at time 2 ($M = 7.36$, $SD = 7.50$). During the heaviest drinking week, they reported consuming around 12 standard drinks at time 1 ($M = 12.25$, $SD = 11.95$) and time 2 ($M = 12.03$, $SD = 11.46$) and during the heaviest drinking week.

Planned Analyses: Study 2

Hypothesis 4: *Anchoring effect predictions would better account for longitudinal changes in reported alcohol use than social norms theory predictions.*

Prior to examining Hypothesis 4, a repeated-measures analysis of variance was conducted to examine if there were any group, time, or group X time differences. There was not a significant main effect of group [$F(4, 127) = .86$, $p = .490$, $\eta^2_p = .026$] or time [$F(1, 127) = 2.57$, $p = .111$, $\eta^2_p = .020$], nor a significant interaction effect [$F(4, 127) = 1.79$, $p = .135$, $\eta^2_p = .053$].

Ignoring statistical tests which are highly dependent on sample size, the pattern of means do not clearly support the predictions based on the anchoring effect or social norms theory. For example, only the anchoring effect predicted a decrease in self-reported alcohol use in the pre-Time 2 feedback condition, and a small decrease in

Table 4

Descriptives for Typical Quantity of Alcohol Use: Study 2

Condition	Time 1		Time 2		
	M	*SD*	*M*	*SD*	*n*
No Feedback (control group)	8.18	7.44	8.25	8.90	52
Pre-Time 1 Feedback	8.40	7.53	6.10	3.78	25
Post-Time 1 Feedback	5.89	5.07	4.94	4.52	18
Post-Time 1/Pre-Time 2 Feedback	8.88	10.76	10.19	10.51	16
Pre-Time 2 Feedback	8.86	6.23	6.57	5.72	21
Overall	8.10	7.44	7.36	7.50	132

alcohol use was reported. However, only social norms theory predicted a decrease in alcohol use in the Pre-Time 1 feedback condition, and a similar decrease in alcohol use was reported in this condition. Further, both social norms theory and the anchoring effect predicted a decrease in self-reported alcohol use in the post-time 1/pre-time 2 feedback condition, and a small increase in reported alcohol use was observed in this condition. Overall, there was little support for either an anchoring effect or an effect driven by normative influence.

Hypothesis 5: *Anchoring effects would be mediated by changes in perceived drinking norms.*

As there was not a significant anchoring effect, it is not possible for there to be a "mediated effect". As neither the predictions from social norms theory nor the predictions based on the anchoring effect could account for variability in self-reported alcohol use, the effect of normative feedback on perceived drinking norms was examined. A repeated-measures analysis of variance was conducted to examine if there were any group, time, or group X time differences in perceived drinking norms. There was not a

significant main effect of group [$F(4, 127) = .85$, $p = .494$, $\eta^2_p = .026$] or time [$F(1, 127)$ $= 1.54$, $p = .217$, $\eta^2_p = .012$], and there was not a significant interaction effect [$F(4, 127)$ $= 0.49$, $p = .745$, $\eta^2_p = .015$] (see Table 5).

Table 5

Descriptives for Drinking Norms: Study 2

Condition	Time 1		Time 2		
	M	*SD*	*M*	*SD*	*n*
No Feedback (control group)	20.09	10.77	19.85	14.53	52
Pre-Time 1 Feedback	18.88	10.20	17.04	8.80	25
Post-Time 1 Feedback	15.56	10.55	15.72	8.52	18
Post-Time 1/Pre-Time 2 Feedback	21.75	19.31	17.63	8.97	16
Pre-Time 2 Feedback	16.86	9.60	16.43	9.25	21
Overall	18.93	11.80	17.94	11.43	132

CHAPTER 4

DISCUSSION

Reviewing the Purpose

In Study 1, a large sample of college student drinkers were sampled to examine the potential effect of normative information on self-reported alcohol use. Given the cross-sectional design, any observed differences could not be accounted for by actual change in behavior, rather these differences could be interpreted as demonstrating the effect of a cognitive bias (the anchoring and adjustment heuristic) on quantitative estimation (the anchoring effect; Tversky & Kahneman, 1974). The large sample of Study 1 was aimed to examine moderators of the anchoring effect including the relevance of the anchor (i.e., gender-specific vs. gender-neutral feedback) and awareness of the anchoring effect (i.e., forewarned vs. not warned of the effect), both of which were experimentally manipulated. In Study 2, a longitudinal design was used to test the predictions of social norms theory against the predictions based on the anchoring effect. In addition, this longitudinal design allowed the examination of whether the effect of normative information on self-reported alcohol use was mediated by change in perceived drinking norms.

Summary of Findings

Neither Study 1 nor Study 2 found convincing evidence of an anchoring effect. In Study 1, there was no main effect of anchoring condition, nor were there any significant interactions that demonstrated a more conditional anchoring effect. However, Study 1 did show a significant effect of anchoring condition on perceived drinking norms. Although this effect was significant, it was of small magnitude ($d < .30$). In Study 2,

there was no significant cross-sectional or longitudinal change in self-reported alcohol use, and the pattern of means did not offer consistent support for either the predictions based on the anchoring effect or the predictions based on social norms theory. Unlike Study 1, the anchor was not successful at changing perceived drinking norms, which was assumed to mediate the anchoring effect.

Although null findings are notoriously difficult to interpret, it is important to reconcile these findings with the vast number of studies supporting the anchoring effect (Gigerenzer, Todd, & ABC Research Group, 2004; Tversky & Kahneman 1974), the findings of Lombardi and Choplin (2010) where they observed an anchoring effect on self-reported alcohol use across three studies and the findings from social norms studies (Doumas et al., 2009, 2010; Lewis et al., 2007; Neighbors et al., 2006).

The Anchoring Effect

It is important to recall that the anchoring effect is believed to result from a cognitive heuristic (the anchoring and adjustment heuristic). Cognitive heuristics are "fast and frugal" rules of thumb that help guide decision making under uncertainty (Tversky & Kahneman, 1974). As noted in both scientific (Gigerenzer & Goldstein, 1996) and popular books (Gigerenzer, Todd, & ABC Research Group, 2004), heuristics help us make good decisions under sub-optimal conditions, including having limited time, limited information, or limited cognitive resources. One of the primary assumptions underlying the present studies is that estimating one's own level of alcohol consumption involves a certain level of uncertainty ("limited information"). Most anchoring effect studies involve topics about which the participants know very little. For

example, most North Americans know very little about the number of African nations in the United Nations (Tversky & Kahneman, 1974).

One may believe that the anchoring effect would not matter as much to estimating one's own level of alcohol consumption, because people may be less uncertain regarding their own behaviors. However, two lines of research contradict this interpretation. First, research has demonstrated multiple retrospective memory biases (Takarangi, Garry, & Loftus, 2006). When an individual is unable to use a "recall-and-count" strategy to report a drinking frequency such that they are expected to recall and sum each incidence, they must instead rely on estimation strategies (Schwarz, 2007). Participants may extrapolate from partial recall. For example, one may recall frequency or quantity of alcohol use during the past week and use this information to extrapolate to the past 30 to 90 days. Participants are more likely to use estimation strategies when behavior is less salient and memorable. In other words, the more frequent, mundane, and irregular a behavior, the more likely these estimation strategies will be used. The characterization of alcohol use as frequent, mundane, and irregular can account for the growing literature showing significant recall biases in terms of self-reported alcohol use specifically (Gmel & Daeppon 2007; Patrick & Lee, 2010).

Second, a growing number of studies have found anchoring effects among participants who know a great deal regarding the topic of study. For example, in a study of judges, Englich, Mussweiler, and Strack (2006) found that these sentencing experts were affected by irrelevant anchors. Thus, even in areas that individuals do know a great deal, the anchoring effect has been observed. So it does not seem that the decision must be made under situations of complete uncertainty to observe an anchoring effect; rather,

even minimal to moderate levels of uncertainty in a situation can allow the anchoring effect to take place. Overall, these lines of study suggest that self-reports of alcohol use meet the criteria of involving at least enough uncertainty to allow an anchoring effect to occur.

Comparisons to Lombardi and Choplin (2010)

Not only does it seem that self-reported alcohol use could potentially be influenced by the anchoring effect given the level of uncertainty associated with such estimations, but also Lombardi and Choplin (2010) found support for an anchoring effect on self-reported alcohol use estimates across three experimental studies. In order to understand their seemingly conflicting findings with the current research, it is important to examine one important difference between the methodologies. In each of the three Lombardi and Choplin studies, alcohol use was assessed in the same metric as the normative information was given. For example, in studies 1 and 2, they provided information regarding the ostensible drinking norm in drinks per week, and then they assessed self-reported alcohol use in terms of drinks per week. In Study 3, they presented normative information in terms of how much most students consume on a single occasion while partying, then they assessed self-reported alcohol use in terms of how much they usually consume while partying.

To be more consistent with standard measures of alcohol consumption used in normative feedback interventions, the present studies assessed alcohol consumption using the Daily Drinking Questionnaire (Collins et al., 1985). Thus, unlike Lombardi and Choplin (2010), the present studies did not assess alcohol consumption using the same metric used to provide normative feedback. Although participants self-aggregated their

weekly alcohol use to create a "typical drinking quantity" estimate in the Lombardi and Choplin studies, the participants in the present studies did not have to self-aggregate; rather, they indicated how many drinks they consumed on each day during a typical drinking week. Therefore, the effect of anchoring on self-reported alcohol consumption may be more limited than expected. The standard normative information delivered in most interventions ("typical weekly use") may anchor self-reported estimates using the same metric, but not when alcohol use is assessed on a different metric. The idea that the effect of the anchor is limited to when it is most relevant is supported in the anchoring literature (Strack & Mussweiler, 1997).

Comparisons to Social Norms Interventions

The present studies also differ in some important ways from most successful social norms interventions that could account for a lack of significant findings. The norms studies reviewed above (e.g., Neighbors, Lewis et al., 2010) usually provide normative information in both text format as well as graph format to make the information more salient. In the present studies, the information was provided only in text format. Thus, the presentation in this format may not have made the anchor salient enough (i.e., memorable enough) to have a robust effect on alcohol use estimates. In fact, such an interpretation could account for the small effects in Study 1 and the null findings in Study 2 in regards to perceived drinking norms. However, it is important to note that standard anchoring effect studies typically provide the number in text format only, consistent with the present studies.

Limitations and Future Directions

It is important to make note of some important limitations to the present studies so that they may be overcome in future research. Although Study 1 had a rather large sample size, Study 2 only had sufficient power to detect medium to large effects; it did not have sufficient power to detect small effects ($\eta^2_p = .04$; $n* = 260$). Also, the randomization procedure in Study 2 resulted in unequal sample sizes, which can further reduce statistical power. Both studies offered few incentives for participation. In Study 1, offering a chance to win a cash prize may not have been sufficient incentive to encourage some participants to "take their time" in completing the survey as some participants appeared to be rushing through the items. In Study 2, participants completed both assessments online for research credit. Most norm-based interventions are able to provide a guaranteed monetary incentive for completing surveys at each assessment wave. Thus, perhaps providing additional incentives would result in participants paying closer attention to the information provided to them. Even without adding additional incentives, other methods could be used to screen out individuals who did not sufficiently attend to the normative information including the use of psychometric antonyms and synonyms, bogus items, and recording completion time (Meade & Craig, in press). Given that the samples were collected from one college campus, it is not known whether the findings would generalize to other populations.

Conclusion

The present studies sought to examine whether a well-studied cognitive bias (i.e., the anchoring effect) may account for a host of findings in the rather large literature of norm-based alcohol interventions. Specifically, it was predicted that normative

information would serve as an anchor and result in changes to self-reported alcohol use even when actual behavioral change was not possible. Using both a cross-sectional design with a large sample (Study 1) and a longitudinal design with a more modest sample (Study 2), no evidence for an anchoring effect was found. These findings suggest that perhaps the anchoring effect has not obscured the findings of norm-based interventions to the extent that was predicted. Based on both the findings in the present studies and the studies conducted by Lombardi and Choplin (2010), it does appear to be important that interventionists not use the same metric to assess self-reported alcohol use as used in providing the normative feedback. Using more objective assessments of behavior (i.e., ecological momentary assessment, Shiffman, 2009; transdermal alcohol monitoring, Dougherty et al., in press) would be a better way to ensure that cognitive biases do not obscure the efficacy of alcohol interventions. Given that few studies have specifically examined the effect of the anchoring and adjustment heuristic on self-reported alcohol use, it is important that research continue to examine the ways in which this cognitive bias and others affect alcohol studies.

REFERENCES

Baer, J. S., Stacy, A., & Larimer, M. (1991). Biases in the perception of drinking norms among college students. *Journal of Studies on Alcohol, 52*, 580-586.

Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13*, 391-424.

Borsari, B., & Carey, K. B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol, 64*, 331-341.

Brewer, N. T., & Chapman, G. B. (2002). The fragile basic anchoring effect. *Journal of Behavioral Decision Making, 15*, 65-77. doi: 10.1002/bdm.403

Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*, 189-200.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*, 349-354.

Dougherty, D. M., Charles, N. E., Acheson, A., John, S., Furr, R. M., & Hill-Kapturaczak, N. (in press). Comparing the detection of transdermal and breath alcohol concentrations during periods of alcohol consumption ranging from moderate drinking to binge drinking. *Experimental and Clinical Psychopharmacology.* doi: 10.1037/a0029021

Englich, B., Mussweiler, T., Strack, F. (2006). Playing dice with criminal sentences: The influence of irrelevant anchors on experts' judicial decision making. *Personality and Social Psychology Bulletin, 32*, 188-200.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible

    statistical power analysis for the social, behavioral, and biomedical sciences.

    Behavior Research Methods, 39, 175-191.

Fisher, R. (1935). *The Design of Experiments.* New York: Hafner Press.

Fritz, M. S., & MacKinnon, D. P. (2007). Required size to detect the mediated effect.

    Psychological Science, 18, 233-239.

Gigerenzer, G., & Goldstein, D. G. (1996). Reasoning the fast and frugal way: Models of

    bounded rationality. *Psychological Review, 103,* 650-659.

Gigerenzer, G., Todd, P. M., & the ABC Research Group. (1999). *Simple heuristics that*

    make us smart. New York: Oxford University Press.

Gmel, G., & Daeppen, J. (2007). Recall bias for seven-day recall measurement of alcohol

    consumptions among emergency department patients: Implications for case-

    crossover designs. *Journal of Studies on Alcohol, 68,* 303-310.

Hummer, J. F., LaBrie, J. W., & Lac, A. (2009). The prognostic power of normative

    influences among NCAA student-athletes. *Addictive Behaviors, 34,* 573-580.

    doi:10.1016/j.addbeh.2009.03.021

Jacowitz, K. E., & Kahneman, D. (1995). Measures of anchoring in estimation tasks.

    Personality and Social Psychology Bulletin, 21, 1161-1166. doi:

    10.1177/01461672952111004

LaBrie, J. W., Hummer, J. F., Grant, S., & Lac, A. (2010). Immediate reductions in

    misperceived social norms among high-risk college student groups. *Addictive*

    Behaviors, 35, 1094-1101. doi:10.1016/j.addbeh.2010.08.003

Larimer, M. E., & Cronce, J. M. (2007). Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999-2006. *Addictive Behaviors, 32,* 2439-2468.

Lee, C. M., Lewis, M. A., Geisner, I. M., Neighbors, C., & Larimer, M. E. (2007). Social motives and the interaction between descriptive and injunctive norms in college student drinking. *Journal of Studies on Alcohol and Drugs, 68,* 714-721.

Lewis, M. A., & Neighbors, C. (2004). Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health, 54,* 213-218.

Lombardi, M. M., & Choplin, J. M. (2010). Anchoring and estimates of alcohol consumption: Implications for social norm interventions. *Journal of Alcohol and Drug Education, 54,* 53-71.

Knight, J. R., Wechsler, H., Kuo, M., Seibring, M., Weitzman, E. R., & Schuckit, M. A. (2002). Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol, 63,* 263-270.

Matthews, D. B., & Miller, W. R. (1979). Estimating blood alcohol concentration: Two computer programs and their applications in therapy and research. *Addictive Behaviors, 4,* 55-60.

Meade, A. W., & Craig, S. B. (in press). Identifying careless responses in survey data. *Psychological Methods.* doi: 10.1037/a0028085

Monti, P. M., Barnett, N. P., Colby, S. M., Gwaltney, C. J., Spirito, A., Rohsenow, D. J.,

    & Woolard, R. (2007). Motivational interviewing versus feedback only in

    emergency care for young adult problem drinking. *Addiction, 102*, 1234-1243.

    doi:10.1111/j.1360-0443.2007.01878.x

Murphy, J. G., Dennhardt, A. A., Skidmore, J. R., Martens, M. P., & McDevitt-Murphy,

    M. E. (2010). Computerized versus motivational interviewing alcohol

    interventions: Impact on discrepancy, motivation, and drinking. *Psychology of*

    Addictive Behaviors, 24, 628-639. doi: 10.1037/a0021347

Muthén, L.K. and Muthén, B.O. (1998-2010). *Mplus User's Guide. Sixth Edition.*

    Los Angeles, CA: Muthén & Muthén.

Neighbors, C., LaBrie, J. W., Hummer, J. F., Lewis, M. A., Lee, C. M., Desai, S., Kilmer,

    J. R., & Larimer, M. E. (2010). Group identification as a moderator of the

    relationship between perceived social norms and alcohol consumption.

    Psychology of Addictive Behaviors, 24, 522-528. doi: 10.1037/a0019944

Neighbors, C., Lewis, M. A., Atkins, D. C., Jensen, M. M., Walter, T., Fossos, N., Lee,

    C. M., & Larimer, M. E. (2010). Efficacy of web-based personalized normative

    feedback: A two-year randomized controlled trial. *Journal of Consulting and*

    Clinical Psychology, 78, 898-911. doi: 10.1037/a0020766

Neighbors, C., Lewis, M. A., Bergstrom, R. L., & Larimer, M. E. (2006). Being

    controlled by normative influences: Self-determination as a moderator of a

    normative feedback alcohol intervention. *Health Psychology, 25*, 571-579. doi:

    10.1037/0278-6133.25.5.571

Shiffman, S. (2009). Ecological momentary assessment (EMA) in studies of substance use. *Psychological Assessment, 21*, 486-497. doi: 10.1037/a0017074

Strack, F., & Mussweiler, T. (1997). Explaining the enigmatic anchoring effect: Mechanisms of selective accessibility. *Journal of Personality and Social Psychology, 73*, 437-446.

Takarangi, M. K. T., Garry, M., & Loftus, E. F. (2006). Dear diary, is plastic better than paper? I can't remember: Comment on Green, Rafaeli, Bolger, Shrout, and Reis (2006). *Psychological Methods, 11*, 119-122.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185*, 1124-1131.

Vasilaki, E. I., Hosier, S. G., & Cox, W. M. (2006). The efficacy of motivational interviewing as a brief intervention for excessive drinking: A meta-analytic review. *Alcohol & Alcoholism, 41*, 328-335. doi:10.1093/alcalc/agl016

Walters, S. T., Vader, A. M., Harris, T. R., Field, C. A., Jouriles, E. N. (2009). Dismantling motivational interviewing and feedback for college drinkers: A randomized clinical trial. *Journal of Consulting and Clinical Psychology, 77*, 64-73. doi: 10.1037/a0014472

Wilson, T. D., Houston, C. E., Etling, K. M., & Brekke, N. (1996). A new look at anchoring effects: Basic anchoring and its antecedents. *Journal of Experimental Psychology: General, 125*, 387-402.

Wu, C. S., Cheng, F. F., & Lin, H. H. (2008). Exploring anchoring effect and the moderating role of repeated anchor in electronic commerce. *Behavior & Information Technology, 27*, 31-42.

APPENDIX A

RECRUITMENT FLYER

OFF – College Drinking

Abstract	This study requires completing two surveys using a computer.
Description	This study is a multi-part study that examines alcohol use among college student drinkers. Therefore, we ask that only participants who drink alcohol sign up for this study. After participants sign up, they will be contacted via confidential email on Monday morning to complete a quick online survey (< 30 minutes). One week later, they will be contacted to complete a second online survey (< 30 minutes). Please do not sign up for this study unless you will be able to complete both surveys. Participants will earn 1 off-site research credit for completing both surveys.
Eligibility Requirements	Anyone 18 years or older may participate.
Duration	60 minutes
Researcher	Matthew Pearson Email: mpear008@odu.edu
Principal Investigator	Matt Henson
Deadlines	Sign-Up: 24 hour(s) before the appointment Cancellation: 24 hour(s) before the appointment

APPENDIX B

NOTIFICATION STATEMENT

Notification Statement
OLD DOMINION UNIVERSITY

PROJECT TITLE: College Drinking

INTRODUCTION
The purpose of this form is to give you information that may affect your decision whether to say YES or NO to participation in the research entitled "College Drinking", and to acquire consent from those individuals who choose to participate. It is your responsibility to inform the experimenter if you wish to discontinue your participation.

RESEARCHERS
James M. Henson, Ph.D., Responsible Project Investigator, Assistant Professor, College of Sciences, Psychology Department
Matthew R. Pearson, M.S., Investigator, Ph.D. Candidate, College of Sciences, Psychology Department

DESCRIPTION OF RESEARCH STUDY
The primary purpose of this study is to examine alcohol use among college students. We are interested in both personality and contextual factors that relate to alcohol use.

Participation in this experiment will require you to complete two surveys using a computer, one week apart. Each survey will take approximately 20-30 minutes.

EXCLUSIONARY CRITERIA
You must be at least 18 years of age to participate in this study. You must consume alcohol to participate in this study.

RISKS AND BENEFITS
RISKS: The potential risks are those similar to normal computer viewing and usage. In addition, participants are asked to report potentially sensitive information regarding their substance-use behaviors; this may cause some psychological discomfort. You are free to leave any question blank that you do not feel comfortable answering.

BENEFITS: There are no direct benefits for participating in this study.

COSTS AND PAYMENTS
The researchers want your decision about participating in this study to be absolutely voluntary. There will be no costs to you, nor any monetary payments. Participation in this study will give you 1 Psychology Department Research Credit, which may be applied for extra credit in certain Psychology courses. Equivalent credits may be obtained in other ways. You do not have to participate in this study, or any Psychology Department study, in order to obtain this credit.

NEW INFORMATION
If the researchers find new information during this study that would reasonably change your decision about participating, then they will give it to you.

CONFIDENTIALITY

All information obtained about you in this study is strictly anonymous.. The results of this study may be used in reports, presentations and publications, but the researcher will not identify you. All data will be kept on a secure server accessible only by the investigators. Because we do not ask for any identifying information, so **your responses cannot be traced back to you.**

WITHDRAWAL PRIVILEGE

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time. Your decision will not affect your relationship with Old Dominion University, or otherwise cause a loss of benefits to which you might otherwise be entitled.

COMPENSATION FOR ILLNESS AND INJURY

By clicking the "Next" button below, then your consent in this document does not waive any of your legal rights. However, in the event of harm or injury arising from this study, neither Old Dominion University nor the researchers are able to give you any money, insurance coverage, free medical care, or any other compensation for such injury. In the event that you suffer injury as a result of participation in this research project, you may contact Dr. James Henson at 757-683-5761, the responsible project investigator at Old Dominion University, who will be glad to review the matter with you.

VOLUNTARY CONSENT

By clicking the "Next" button below, you are saying several things. You are saying that you have read this form or have had it read to you, that you are satisfied that you understand this form, the research study, and its risks and benefits. The researchers should have answered any questions you may have had about the research. If you have any questions later on, then the researchers should be able to answer them:

Dr. James Henson. 757-683-5761. jhenson@odu.edu

And importantly, by clicking the "Next" button, you are telling the researcher YES, that you agree to participate in this study.

APPENDIX C

ALCOHOL USE BEHAVIORS

Think about your drinking behaviors during the last month (i.e., past 30 days) for the following questions.

With respect to alcohol consumption, 1 standard drink is equivalent to 12 oz beer OR 4 oz wine OR 1 oz shot of liquor straight or in a mixed drink.

1. On how many days during the last 30 days did you consume alcohol?
2. On how many days during the last 30 days did you drink to the point of being drunk?
3. On how many days in the last 30 days did you pass out or get sick from drinking alcohol?
4. How old were you the first time you drank alcohol?
5. In the past 30 days, how many times have you consumed five or more drinks (if you are male) or four or more drinks (if you are female) on one drinking occasion?
6. Think of the one day you consumed the most alcohol in the last month: How many standard drinks did you consume on that day?
7. On this heaviest drinking day, approximately how many hours passed from the beginning of the first drink to the finishing of the last?
8. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Sunday
9. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Monday
10. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Tuesday
11. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Wednesday
12. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Thursday
13. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Friday
14. How many standard drinks did you consume each day during a TYPICAL week during the past month? - Saturday
15. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? - Sunday
16. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? - Monday
17. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? - Tuesday
18. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? - Wednesday
19. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? - Thursday
20. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? - Friday
21. How many standard drinks did you consume each day during the week of HEAVIEST consumption last month? – Saturday

APPENDIX D

DRINKING NORMS

Think about the drinking behaviors of the typical college student during the last month (i.e., past 30 days) for the following questions.

With respect to alcohol consumption, 1 standard drink is equivalent to 12 oz beer OR 4 oz wine OR 1 oz shot of liquor straight or in a mixed drink.

1. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Sunday
2. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Monday
3. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Tuesday
4. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Wednesday
5. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Thursday
6. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Friday
7. How many standard drinks do you think the typical college student consumed each day during a TYPICAL week during the past month? - Saturday
8. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? - Sunday
9. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? - Monday
10. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? - Tuesday
11. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? - Wednesday
12. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? - Thursday
13. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? - Friday
14. How many standard drinks do you think the typical college student consumed each day during the week of HEAVIEST consumption last month? – Saturday

APPENDIX E

GROUP IDENTIFICATION

Please indicate to what extent you agree with the following statements.

Participants use the following response scale:
( ) 1 - Not at all
( ) 2
( ) 3 -
( ) 4 - Moderately
( ) 5 -
( ) 6 -
( ) 7 - Very much

I identify with the typical college student
I am like the typical college student
Being the typical college student is an important reflection of who I am

APPENDIX F

SOCIAL DESIRABILITY

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to your personally. It's best to go with your first judgment and not spend too long mulling over any one question.

Participants use the following response scale:
( ) True
( ) False

I'm always willing to admit it when I make a mistake.
I always try to practice what I preach.
I never resent being asked to return a favor.
I have never been irked when people expressed ideas very different from my own.
I have never deliberately said something that hurt someone's feelings.
I like to gossip at times.
There have been occasions when I took advantage of someone.
I sometimes try to get even rather than forgive and forget.
At times I have really insisted on having things my own way.
There have been occasions when I felt like smashing things.

APPENDIX G

DEMOGRAPHICS

What is your gender?
{Choose one}
( ) Male
( ) Female

What is your class standing?
{Choose one}
( ) Freshman
( ) Sophomore
( ) Junior
( ) Senior
( ) Graduate

What racial group best describes you?
{Choose one}
( ) African-American or Black
( ) Asian or Pacific Islander
( ) Caucasian or White
( ) Latino or Latina
( ) Native American
( ) Other [   ]

What is your marital status?
{Choose one}
( ) Single
( ) Married
( ) Divorced
( ) In a committed relationship

What is your birthdate (mm/dd/yyyy)?
{Enter text answer}
[   ]

Current residence:
{Choose one}
( ) On-campus dormitory
( ) Off-campus house or apartment
( ) Greek-affiliated residence (fraternity / sorority)
( ) With family

Are you a member or pledge of a social fraternity or sorority?
{Choose one}
( ) Not a member
( ) Currently pledging
( ) Member

Your height in feet and inches (e.g., put 6'2" for 6 feet 2 inches tall):
Your weight in pounds:

Please provide us with your 5-digit confidential personal identification number **(This is how you get participation credit through SONA):**

APPENDIX H

DEBRIEFING

The purpose of the present study was to examine whether giving individuals 'normative' information about how much alcohol the typical college student at ODU consumes per week can change how they estimate their own alcohol consumption. Some participants were told that the average ODU student consumes 19 drinks per week, while other participants were told that the average ODU student consumes 6 drinks per week. In reality, the actual number of drinks consumed by participants recruited from the Psychology Department participant pool is about XX drinks during a typical drinking week. If you would like more information or would like for your data to be withdrawn from the present study, please contact the investigator at **mpear008@odu.edu**.

CURRICULUM VITAE

Matthew R. Pearson

Business Address:	Old Dominion University
	Department of Psychology
	Mills Godwin Building-Rm 250
	Norfolk, VA 23529-0267
Work Phone:	(757) 683-4241
Fax:	(757) 683-5087
Email:	mrpearso@odu.edu
Home Address:	4222 Race Street
	Portsmouth, VA 23707
Cell Phone:	(757) 339-5018

Education

Ph.D. August 2012   Old Dominion University
Major: Applied Experimental Psychology
Area of Emphasis: Quantitative Psychology
Advisor: James M. Henson, Ph.D.
Doctoral Dissertation: When Cognitive Bias Masquerades as Intervention Efficacy: Drinking Norms as Anchors and Norm Interventions as Anchoring Effects

M.S. August 2009   Old Dominion University
Major: Experimental Psychology
Advisor: James M. Henson, Ph.D.
Master's Thesis: Implicit and Explicit Alcohol Expectancies, Drinking Motives, Alcohol Use, and Alcohol Problems: A Comprehensive Evaluation of College Student Drinking

B.S. May 2005   Virginia Polytechnic Institute and State University
Major: Psychology (Magna cum laude)

Selected Publications (Italics denote a student under my supervision)

1. Pearson, M. R., & Richardson, T. R. (in press). Teaching the truth about lies to psychology students: The speed lying task. *Teaching of Psychology*.
2. Pearson, M. R., *Kite, B. A.*, & Henson, J. M. (in press). Predictive effects of good self-control and poor regulation on alcohol-related problems: Do protective behavioral strategies mediate? *Psychology of Addictive Behaviors*. doi: 10.1037/a0028818
3. Pearson, M. R., *Kite, B. A.*, & Henson, J. M. (in press). The assessment of protective behavioral strategies: Comparing prediction and factor structures across measures. *Psychology of Addictive Behaviors*. doi: 10.1037/a0028187
4. Pearson, M. R., *D'Lima, G. M.*, & Kelley, M. L. (2012). Maternal and paternal alcohol abuse and alcohol-related outcomes among college students. *Substance Use & Misuse, 47*, 708-717. doi: 10.3109/10826084.2012.664237
5. Pearson, M. R., *Kholodkov, T.*, Henson, J. M., & Impett, E. A. (2012). Pathways to early coital debut for adolescent girls: A recursive partitioning analysis. *Journal of Sex Research, 49*, 13-26. doi: 10.1080/00224499.2011.565428
6. Pearson, M. R., *D'Lima, G. M.*, & Kelley, M. L. (2011). Self-regulation as a buffer of the relationship between parental alcohol misuse and alcohol-related outcomes in first-year college students. *Addictive Behaviors, 36*, 1309-1312. doi: **10.1016/j.addbeh.2011.07.009**