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An Evaluation of Individual and Group Behavioral Skills Training to Teach Members of Greek Letter Organizations to Free-pour Standards of Alcohol

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AN EVALUATION OF INDIVIDUAL AND GROUP BEHAVIORAL SKILLS TRAINING TO TEACH MEMBERS OF GREEK LETTER ORGANIZATIONS TO FREE-POUR STANDARD SERVINGS OF ALCOHOL

By

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DEDICATION

This thesis is dedicated to my family and friends whose support for me never wavered.

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Abstract

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College students engage in high levels of excessive drinking and certain subpopulations of college students, such as members of Greek Letter Organizations (GLOs) report higher levels of excessive alcohol consumptions. Those who report less excessive drinking also report counting their drinks and setting drink limits. However, the effectiveness of these strategies may be improved by the ability to accurately identify and pour standard servings of alcohol, an area in which college students' knowledge is generally quite poor. Although individual behavioral skills training (BST) has been used to teach college students to accurately pour beer (Hankla et al., 2017), little is known about the effectiveness of BST when taught in a group setting, the setting most commonly used to teach college students accurate pouring, or when used with other alcohol types. Using a nonconcurrent multiple baseline across GLO design, we evaluated the effects of BST on the accuracy of college students' (n = 10) free-pours into an 18-oz red plastic cup of standard servings of (a) beer when taught in a group setting and (b) liquor when taught in an individual setting. Results indicate that following group BST, all participants provided accurate free-pours of beer, but fewer did so with the untrained generalization cup that differs in shape. Following individual BST, participants free-pours of liquor were variable and most required at least two BST sessions. These results suggest BST can be used to teach pairs of college students

to pour standard serving of beer. Future research should further examine the variability observed in individual BST for liquor and further examine generality across vessel shape.

Keywords: Alcohol education, behavioral skills training, college students, pour training

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BST	Behavioral Skills Training
GLO	Greek Letter Organization
IOA	Interobserver Agreement

CHAPTER 1: INTRODUCTION

Approximately 57% of college students report consuming alcohol (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2018a). Of these students, nearly 40% meet the criteria for binge or excessive drinking (NIAAA, 2018a), a drinking pattern defined as four or more drinks for females and five or more standard drinks for males across a two-hour period (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2018b). In the United States, a standard drink contains roughly 14 grams of pure alcohol and is defined as 12 oz (5% ABV) for beer and 1.5 oz (40% ABV) for liquor (NIAAA, n.d.). Excessive drinking can result in serious negative consequences, including, but not limited to, non-fatal injuries, assault, sexual assault, and fatal injuries (e.g., burns/fire, hypothermia/cold, drowning, falling, gunshots, and poisoning: Hingson, Heeren, Winter, & Wechsler, 2005; Hingson, Zha, & Weitzman, 2009; White & Hingson, 2019).

Members of Greek Letter Organizations (GLOs) account for a large proportion of students who engage in excessive drinking (Scott-Sheldon, Carey, & Carey, 2008; Wechsler et al., 2002). When compared to non-members, GLO members report consuming alcohol more frequently, engaging in higher rates of excessive drinking, and experiencing more negative consequences (Cashin, Presley, & Meilman, 1998; NIAAA, 2015; Scott-Sheldon et al., 2008). Thus, interventions specific to GLO members would likely reach a large number of students at risk for excessive drinking and the concomitant negative consequences.

To combat theses consequences, college students, including GLO members, have reported using protective behavioral strategies including counting drinks and setting drink limits to reduce excessive alcohol consumption (Araas & Adams, 2008; Borden et al., 2011; Martens, Martin, Littlefield, Murphy, & Cimini, 2011; Pearson, 2013; Soule, Barnett, & Moorhouse,

2013). These strategies are also correlated with college students' reports of reduction in related negative consequences (Araas & Adams, 2008; Boren et al., 2011; Haines, Barker, & Rice, 2006; Martens et al., 2011). However, it is unclear whether these self-reports are accurate, especially given what we know about the discrepancy between students' definitions and free-pours (Kohn, Schultz, Bettencourt, & Dunn Carton, 2017). Some researchers have suggested that teaching college students to accurately state the definition of standard servings is insufficient; instead, the recommendation is to teach them to both accurately state and pour standard servings of alcohol, and that combining these skills might improve their ability to accurately identify standard servings (White et al., 2005).

Although some researchers have suggested teaching college students to identify standard servings might remediate poor knowledge of standard servings and reduce risky drinking practices (White et al., 2005), only a few researchers have examined whether this is a skill that can be taught and maintained across time (Hankla, Kohn, & Normand, 2018; Metz, Kohn, Schultz, and Bettencourt, 2016). Hankla et al. (2018) taught 19 college students to pour a standard serving of alcohol using behavioral skills training (BST). Training consisted of verbally telling participants that a standard serving of beer is 12 oz, having the participant observe the experimenter pour a standard serving of beer, having the participant practice pouring a standard serving, and providing the participant with verbal feedback on the accuracy of their pours. Immediately following training, participants who received BST poured accurately and the skills maintained in the presence of peers who poured accurately and inaccurately, suggesting BST might be effective when taught in a group format.

Although Hankla et al. (2018) demonstrated that BST can be used to teach students to pour accurate standard servings of beer, their study is not without limitations. First, they did not

evaluate the effects of the presence of peers during the training process, only during maintenance probes immediately following training. This is important because university alcohol education and training typically occur in a group format, particularly for members of GLOs (Scott-Sheldon, Carey, Kaiser, Knight, & Carey, 2016). Group settings may introduce confounds such as distractions from peers and other diversions of attention that negatively impact the efficacy of the training (Himle, Miltenberger, Gatheridge, & Flassner, 2004). Second only beer has been the subject of published research on skills training to teach accurate pouring of alcohol (Hankla et al., 2018; Metz et al., 2016); other types of alcohol have not been examined. Third, skills training studies have all been conducted in a laboratory environment (e.g., Hankla et al. 2018; Metz et al., 2016), and it is important to understand whether BST can be effective in more naturalistic settings (Himle et al., 2004). Fourth, few studies have examined generality of skill maintenance across time. Although they did not specifically use BST to teach accurate pouring, Metz et al. (2016) did find that skills maintained for 85% of participants at seven days and 64% of participants at 30-day follow-ups ($N = 18$). Hankla et al. (2018) used BST but did not conduct follow-up assessments. Without an understanding of the generality of skills across time, it is difficult to assess the overall effectiveness and social acceptability of using BST to teach accurate pouring. If skills do not last overtime, because of the amount of time needed to train the skills, the practicality of this training would be questionable. Lastly, Hankla et al. (2018) did not test for skill generality across different types of cups. Metz et al. (2016) did probe for stimulus generality by asking participants to pour into untrained square, red Solo® cup; 69% of the participants demonstrated an ability to accurately pour into untrained cups 7 days following training and 64% poured accurately into the untrained cups 30 days following training. This is important because if BST effectively teaches college students to pour accurately, but every

conceivable cup must be used during training, this would greatly diminish the social acceptability and practicality of BST; however, if generalization across untrained cups occurs, this would provide additional support for the use of BST to teach these skills to college students..

Given the limitations described above, the purpose of the current study was to (1) evaluate the use of *group* BST to teach GLO members to pour a standard serving of beer, as only individual BST for beer has been examined (2) evaluate the use of *individual* BST to teach GLO members to pour a standard serving of liquor (i.e., an alcohol type other than beer), as BST has yet to be used with alcohol other than beer (3) conduct training in a more naturalistic setting, (4) evaluate the generality of skill maintenance across time, and (5) probe for generalization across cup shape (i.e., pouring into untrained cups that differ in shape). Many have called for tailoring alcohol education to the university setting and student needs with the goal of improving student knowledge and decreasing experience of alcohol related negative consequences (Hingson, Zha, & Smyth, 2017). Expanding the use of BST into group settings and different types of alcohol is a first step towards these goals (Hingson et al., 2017).

CHAPTER 2: METHODS

Experimental Design

We used a nonconcurrent multiple baseline across GLOs design to examine change in volume (oz/ml) of participants' free-pours of standard servings of beer and liquor after receiving group BST (beer) and individual BST (liquor). We also collected data on participants' self-reported alcohol consumption and definitions of standard servings of alcohol. We initially proposed a concurrent multiple baseline across GLO; however, due to difficulties recruiting, chapter commitments, and school schedules, we used a nonconcurrent multiple baseline design. The general methodology for both the free-pour and self-report components of the study are reviewed in the *General Procedures* section below.

Recruitment

To recruit participants, we partnered with the Office of Fraternity and Sorority Life (OFSL) and sent emails to chapter leadership, attended individual chapter meetings, and presented the study to GLO leadership. Initially the OFSL sent recruitment emails directly to GLO leadership on our behalf. This method yielded no participants. We then followed up with chapter leadership directly via email and attended the Interfraternity Council and Panhellenic Council leadership meetings. At these meetings we collected contact information and sent follow-up emails inviting GLOs to participant in the study. Other recruitment methods included attending chapter meetings, phone conversations with chapter leadership, and direct communication with individual participants. Ultimately, three GLOs agreed to let us recruit from their chapter houses.

Participants and Setting

Participants were 18 undergraduate members of three campus GLOs (one fraternity and two sororities), ranging in age from 18 to 22 years old, who completed consent forms for both the self-report and free-pour components of the study. Participants were Caucasian (n = 13), Asian (n = 2), or multiple ethnicities (n = 2). There were 10 females and seven males; one participants did not indicate their sex. Participants also indicated if they had previously participated in alcohol training (n = 10), pour training (n = 2), or had previous experience as a bartender (n = 0). Lastly, participants reported their drink of choice as beer (n = 3), liquor (n = 2), wine (n = 0), mixed drinks (n = 4), multiple drink types (n = 7), or they indicated they did not drink (n = 1). See Table 1 for additional demographic information.

Table 1
Demographics Information for all Participants (N=18)

Demographic	*n*
Age	
18	1
19	3
20	10
21	2
22	1
Ethnicity	
Caucasian	13
Asian	2
Multiple	2
Sex	
Female	10
Male	7
Year in School	
Sophomore	5
Junior	9
Senior	3
Residence in GLO house	
Yes	17
No	0
Professional GLO Membership	
Yes	2
No	15

Drink of Choice	
Beer	3
Liquor	2
Wine	0
Mixed Drinks	4
Multiple types	7
Does not drink	1
Experience as Bartender	
Yes	0
No	17
Previous Alcohol Training	
Yes	10
No	7
No Demographic Data	1

The study was conducted in a private room at each GLO's chapter house on the campus of the University of the Pacific. All participants ($N = 18$) were involved in the self-report component of the study. Initially, 13 participants were enrolled in the free-pour component of the study; however, 3 of these participants accurately poured beer during baseline and thus were excluded from the study, leaving a total 10 eligible participants. One of the 10 participants poured both beer and liquor inaccurately during the first baseline but poured accurately during subsequent baselines, and therefore did not receive BST. Of these participants, total of seven participants were present for training sessions and received BST; among those seven participants, one received BST only for beer, two received BST only for liquor, and five received BST for both beer and liquor.

Materials

Materials included 18-oz red Solo® cups, 18-oz red square Solo® cups, a Taylor® digital scale, a glass measuring cup, plastic pitchers filled with tea to simulate beer, a glass bottle filled with water to simulate liquor, an iPhone for taking photos of measurement read outs, a

demographics questionnaire, and the Alcohol Timeline Followback calendar (TLFB, Sobell & Sobell, 2003).

Measurement

Demographics Questionnaire

During the first meeting with the GLO, participants completed a demographics questionnaire which included questions about their age, ethnicity, sex, year in school, residence type, professional fraternity membership status, and drink of choice. They also answered questions regarding their experience as a bartender and if they had previously participated in alcohol or pour training.

Free-pour Volumes

The dependent measures in this study were free-poured volumes measured in ounces (oz) for beer, and oz and milliliters (ml) for liquor, all of which were converted into a percentage deviation from the standard servings (Hankla et al., 2018; Metz et al., 2016). A standard serving of beer is 12 oz (5% ABV) and a standard serving of liquor is 1.5 oz (40% ABV) (NIAAA, n.d.). For the purpose of this study, accurate pours of beer were defined as pours within a +/- 10% deviation from the standard serving, or free-pours between 10.8 oz and 13.2 oz; inaccurate pours were those less than 10.8 oz or greater than 13.2 oz.

Because the Taylor® digital measuring scale rounded to the nearest one-eighth of an ounce, it was not a sensitive enough measure for determining +/- 10% deviation from a standard serving of liquor, which ranges between 1.35 oz and 1.65 oz. Thus, for measuring pours of liquor we used a glass measuring cup with volumes listed in intervals of 10 milliliters (ml). An accurate pour of liquor was defined as those between 40 ml and 50 ml, or 1.35 oz to 1.69 oz, equivalent to plus 12.7% and minus 9.8% from the standard serving of liquor. These percentages

do not map directly onto the +/- 10% criterion previously referenced due to limitations with the measuring vessel. Inaccurate pours of liquor defined were those under 40 ml or above 50 ml.

Alcohol Timeline Followback Calendar (TLFB)

The TLFB is a commonly used paper and pencil self-report questionnaire used to obtain participants' reports of alcohol consumption during the previous two weeks (NIAAA, 2003; Sobell & Sobell, 2003). Sobell & Sobell (2003) reported the measure has good test-retest reliability as well as content, criterion and construct validity. However, more recently, Dulin, Alvarado, Fitterling, and Gonzalez (2017) found the correlation between the 42-day retrospective reports on the TLFB calendar and electronic daily reports decreased as the time between consumption and reporting increased, raising questions about the reliability and validity of the data obtained through current self-report methods.

Knowledge Questionnaire

In addition to the TLFB, participants also provided their definitions of a standard serving of beer, wine, liquor, and mixed drinks and indicated the number standard servings of each alcohol type they consumed during the previous two weeks. Although similar to the TLFB, it differed in that we asked participants to report a total for each type of drink separately and asked participants to indicate their definitions of standard drinks, both of which are not part of the standard TLFB (Sobell & Sobell, 2003) but which are important variables for comparing self-report with behavior (i.e., free-pours; Kohn et al., 2017) and other forms of self-report (Dulin et al., 2017).

At each meeting, participants were asked to report their alcohol consumption for the two weeks prior using both the TLFB and the Knowledge Questionnaire. Figure 1 depicts a fairly

patterned correlation between the two self-reports, suggesting some reliability between both self-report measures.

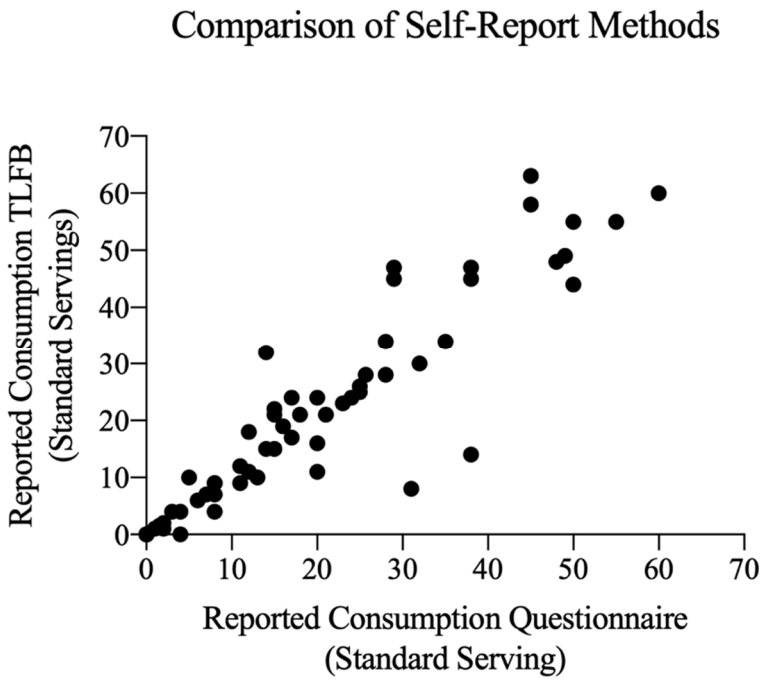

Figure 1. Comparison of (1) reports of consumption by alcohol typed (questions) and (2) the Alcohol Timeline Followback (TLFB). Alcohol consumption by alcohol type is on the x-axis and consumption reported using the TLFB is on the y-axis. Each data point represents an individual participants' reported consumption on the knowledge questionnaire compared to the reported consumption on the TLFB.

Social Validity Questionnaire

At the conclusion of the study, participants who received BST completed a social validity questionnaire. Participants answered a series of questions regarding their general impressions of the training, how the training impacted their drinking, and their reported use of any protective behavioral strategies. See Appendix A for a list of specific questions.

General Procedure

All aspects of this study were reviewed and approved by the local institutional review board prior to the start of participant recruitment. After we contacted several GLOs as described above, three GLOs indicated some of their members would be interested in participating. However, as they did not contact us simultaneously, and because we were working within the constraints of a 15-week semester, we assigned GLOs to a baseline based on the order in which they contacted us (i.e., the first GLO to enter was assigned the longest baseline, the second GLO to the second longest baseline, and the third GLO to the shortest baseline).

We coordinated our meeting time with GLO1 and GLO2 to coincide with their weekly chapter meetings, meeting directly before or after. Meetings for GLO 3 were determined based on the enrolled participant's schedule. We arrived approximately 10 min prior to the scheduled start of the session. At the time of arrival, participants who wished to participate gathered in the main meeting space. First, we reviewed the consent form for the self-report component of the study and those who consented to participate completed the questionnaires. Next, we reviewed the consent form for the free-pour component of the study. Participants who consented and did not report previous participation in university level one alcohol training, a sanctioned course for alcohol policy violators, were eligible to participate in the free-pour and BST component of the study; we randomized these eligible participants and called individuals one by one until we identified four participants who poured inaccurately. Prior to each session, participants completed the TLFB and knowledge questionnaire.

Baseline

Of the 18 participants enrolled in the study, 16 (GLO1 n = 7; GLO2 n = 8; GLO3 n = 1) completed the paper and pencil TLFB, knowledge questionnaire, and demographics

questionnaires during the first baseline meeting. Of these participants, two (GLO1 n = 1; GLO2 n = 1) did not return the survey material to the experimenter at the initial meeting; one of these (from GLO2) was also enrolled in the free-pour component of the study. Participants were invited to participate in the free-pour component of the study if they completed the questionnaires and reported no prior university alcohol policy violations requiring mandatory alcohol education classes, with the exceptions described above and below. One participant (P4), had university training; however, P4 inaccurately poured both beer and liquor during baseline and thus met inclusion criteria for BST.

Participants from GLO1 and GLO2 were randomized and called individually to provide baseline free-pours until we were able to identify at least four inaccurate pourers; the one participant from GLO3 was automatically enrolled after demonstrating inaccurate pouring. To identify inaccurate pourers, we asked each participant to provide a minimum of three pours of a standard serving of beer followed by a minimum of three pours of a standard serving of liquor into an 18-oz red Solo® cup. Three pours were the minimum number collected per alcohol type per baseline session, but baseline pours were carried out until pouring stability was observed. Stability was defined as three consecutive pours that were all above 10% of the standard serving, all below 10% of the standard serving, or all accurate pours. During all free-pour assessments, participants always poured beer first followed by liquor. As described under the "Participants and Setting" section above, 3 participants (n = 1 from GLO1 and n = 2 from GLO2) provided two or more accurate free-pours for beer during this phase and were excused from further free-pour participation. Following the first baseline session, two additional participants (P1 and P2) provided two or more accurate pours and thus did not receive BST; instead, they remained in the study and we tracked their pours over the course of the study.

Baseline pours for beer were assessed for three weeks for GLO 1, two weeks for GLO 2, and one week for GLO3. Baseline pours for liquor were assessed for four weeks for GLO 1, three weeks for GLO 2, and one week for GLO3. For both GLO1 and GLO2, BST for liquor occurred one week after BST for beer as we had only one hour to complete BST per meeting.

Group BST for Beer

Group BST occurred after participants provided baseline pours for beer and liquor, respectively. Due to scheduling difficulties, group BST for both GLO1 and GLO2 consisted of two individuals each, and thus was more of a paired BST rather than group BST. Due to recruitment challenges, the one participant from GLO3 received individual BST for beer.

Participants stood at pour stations containing an 18-oz red Solo® cup, a plastic pitcher of water colored with tea to simulate beer, and a Taylor® digital measuring cup. Group BST include four phases: instruction, modeling, rehearsal, and feedback (Hankla et al., 2018; Himle et al., 2004; Miltenberger et al., 2004). The experimenter informed the participants that the purpose of the training was to aid the participants' ability to recognize and pour standard servings of beer, and that a standard serving of beer is 12 oz. The experimenter then poured a standard serving of beer into an 18-oz red Solo® as a model; participants were provided the opportunity to examine the pour before the cup was removed from the table. Next, we instructed the participants to simultaneously pour a standard serving of beer into their red Solo® cup. The participants then emptied the contents of their cups into the measuring scale. The experimenter provided verbal and visual feedback on each participant's pour volume starting with the individual on the experimenter's right and then moving to the left. The experimenter informed each participant if they over-, under-, or accurately poured a standard serving of beer (i.e., "A standard serving of beer is 12 oz and you poured accurately" or "A standard serving of beer is 12

oz and you poured 15 oz, that is an over-pour"). A marker was then placed on a poster of a Solo® cup, that had a reference line at 12 oz, at a spot equivalent to their pour volume. Because two participants were present, the second participant heard and observed the feedback given to the first participant prior to providing their free-pours. BST was terminated after participants provided three, consecutive accurate rehearsal pours (Casey & McWilliams, 2011).

Individual BST for Liquor

For both GLO1 and GLO2, individual BST for liquor occurred in the week following BST for beer. For GLO 3, individual BST occurred following baseline pours for beer and liquor, and BST for beer and during the same week as BST for beer.

Steps for individual BST were the same as group BST with a few exceptions. During individual BST, only one participant was in the training room. Each participant stood at a pour stations with an 18-oz red Solo® cup, a glass bottle filled with water to simulate liquor, a Taylor® digital scale measuring cup, and a glass measuring cup. As in group BST, individual BST included four phases: instruction, modeling, rehearsal and feedback (Hankla et al., 2018). Due to the narrow range of an accurate pour of liquor, and to ensure the experimenter always pour within accurate criterion (1.35 oz to 1.69 oz), the experimenter used a glass bottle that contained a pre-portion standard serving of liquor. The participant was asked to pour a standard using a glass bottle filled with water and received immediate feedback regarding the accuracy of their pour based on the reading from the glass measuring vessel (ml). Feedback was conveyed in ounces as it is the unit the NIAAA (n.d.) uses when defining a standard serving of alcohol. The experimenter then stated whether the participant over-, under-, or accurately poured (i.e., "A standard serving of liquor is l.5 oz and you poured accurately" or "A standard serving of liquor is 1.5 oz and you poured 3 oz, that is an over-pour."). Rehearsal and feedback pours continued

until participants poured accurately three consecutive times (Hankla et al., 2018). BST was terminated after participants provided three, consecutive accurate rehearsal pours (Casey & McWilliams, 2011).

There were occasions when participants provided at least one inaccurate rehearsal pour (i.e., P1, P4, P6, P13). When this occurred, participants completed an additional round of individual BST (i.e., instructions, modeling, rehearsal, and feedback). Individual BST was conducted a maximum of three times; P6 and P13 each received three rounds of individual BST and continued to pour inaccurately, which lead to our using model stimulus training and marked stimulus training methods described in the subsequent sections.

Model Stimulus Training

Participants who failed to provide three consecutive and accurate BST rehearsal or post-BST free-pours and who completed the maximum of three BST sessions received model stimulus training (P6 and P13). Instruction and modeling were the same as individual BST. During rehearsal, the cup with the experimenter's sample pour was provided to the participants to use for guidance while they completed their pours. Specific instructions were not provided for the use of the model cup; however, participants typically viewed the cup and placed it adjacent to their empty cup. Each participant was instructed to make three pours of a standard serving into the solo cup. After each pour, the experimenters emptied the contents of the participant's cup into the digital measuring scale and, for liquor, into the measuring scale and then the glass measuring cup. The experimenter then provided feedback to the participant on the accuracy of the pour as described in individual BST. This phase was terminated following three consecutive, accurate pours.

P13 received model stimulus training for beer during the second follow-up, and after pouring accurately during all three rehearsal pours training was ended. P6 and P13 received model stimulus training for liquor. P13 was provided model stimulus training booster sessions during both follow-up one and two and poured liquor accurately during the rehearsal phases. Because P6 poured inaccurately during model stimulus rehearsal phases, P6 received marked stimulus training as described below.

Marked Stimulus Training

P6 received marked stimulus training after failure to pour three consecutive accurate pours of liquor during model stimulus training. P6 received instructions and modeling similar to that received during individual BST for liquor and was then provided with an 18-oz red Solo® cup with a black lined marked on the inside of the cup at a point equivalent to 1.5 oz, an accurate pour of liquor. P6 used this cup during rehearsal pours. The experimenter provided feedback on the accuracy of the pour as described in individual BST for liquor. P6 poured accurately during all three rehearsal pours for this phase and, because we were out of time, training ended here.

Post BST Free-Pours

Immediately following completion of BST, participants free-poured a standard serving into an 18-oz red Solo® cup three times. During this phase, for both beer and liquor, only the participant providing the free-pours was present in the training room with the experimenters. Participants always completed all pours of beer before moving on to liquor. Feedback was not provided. Five participants (n = 1 for beer and n = 4 for liquor) were unable to provide three consecutive accurate pours and received booster sessions of BST, and if needed modified forms of BST (i.e., modeled and marked stimulus training).

Follow-up

During follow-up assessments for beer, participants provided three free-pours into the 18-oz red Solo® cup and then three free-pours into an untrained cup that differed in shape (e.g., square 18-oz red Solo® cup) to probe for generality across cup shape; generality across cup shape was only probed for free-pours of beer. During follow-up assessment for liquor, participants made three free-pours into the 18-oz red Solo® cup. Pours of beer always preceded pours of liquor in order to control for potential order effects. During weeks in which follow-up pours for beer were scheduled along with individual BST for liquor, participants provided their follow-up pours prior to receiving BST for liquor. Participants who provided at least one inaccurate pour into the trained red Solo® cup, received a booster BST, model stimulus or marked stimulus training (Miltenberger et al., 2004) using the procedures described above and below.

Social Validity Survey

Of the 10 participants enrolled in the *free-pour* component, seven received training. Of these seven participants, six completed the social validity survey because one participant was not present during the final session when it was administered. At the end of the last session, we provided a chapter representative with alcohol education sheets to be distributed to all participants ($N = 18$) (see Appendix B).

Interobserver Agreement (IOA)

Each experimenter present during baseline, training, and follow-up independently recorded the pour volumes of each participant's pour. In addition, digital photos were taken to serve as permanent product of pour volume. All (100%) recorded volumes were compared and scored as an agreement (i.e., the recorded volumes matched) or a disagreement (i.e., the recorded

volumes did not match). The number of agreements where then divided by the total number of agreements plus disagreements. IOA was 97% for GLO 1, 98% for GLO 2, and 96% for GLO 3 across all sessions and alcohol types.

Experimenter Integrity

During 100% of group BST sessions and 92% of individual BST sessions, the secondary experimenter scored the primary experimenter on their integrity in administering the BST procedure. Integrity of implementing group and individual BST was scored as a percentage of steps implemented in the correct order: (1) the experimenter provided definitions of a standard serving of beer or liquor, (2) the experimenter modeled an accurate pour of beer/liquor, (3) the experimenter provided the participant(s) the opportunity to rehearse the skill, (4) the experimenter provided feedback to the participant(s) regarding accuracy of pour, and (5) the experimenter repeated steps 3 and 4 until the participant(s) pour accurately across three consecutive pour trials or experimenter repeated group and individual BST as needed. Experimenter integrity for group BST was 100% across all training sessions for which the data sheet was completed correctly (i.e., circling "yes" if the criterion was met). During one group BST session, the secondary experimenter placed a check mark next to the item but failed to indicate if the criteria had been met, as such experimenter integrity could not be completed for missing data. Experimenter integrity for liquor was 100% across all sessions in which the associated data sheet was correctly completed (i.e., circling "yes" if the criterion was met). During one training sessions the secondary experimenter placed a check mark next to the criteria but did not circle whether all the criteria was met of not; experimenter integrity was not calculated for missing data.

CHAPTER 3: RESULTS

Free-Pour (Beer)

Figure 2 and Figure 3 depict participants' free-pours of beer across all phases of the study. During baseline, five participants (P3, P4, P6, P9, P13) under-poured, three over-poured (P5, P7, P8), and two accurately poured (P1 and P2). All participants accurately poured beer during BST (P3, P5, P6, P9, P13) and maintained accurate pouring immediately following training.

Among the five participants who completed BST for beer, three participants (P5, P6, P13) completed two follow-ups and two participants (P3 and P9) completed one follow-up. P5 and P6 poured accurately into the trained cup during follow-up one; P5 made one over-pour and one under-pour into the untrained cup while P6 poured accurately into the untrained cup. P13 underpoured into the training cup at follow-up one and received a BST booster session and poured accurately immediately following training; only participants who pour inaccurately into the *trained* cup received a BST booster session. During the second follow-up, P5 poured accurately into the trained cup and made two under-pours into the generalization cup while P6 poured accurately into both the trained and untrained cup. P3 poured accurately into the trained cup and consistently under-poured into the untrained cup; P9 poured accurately into both the trained and untrained cup. P13 poured inaccurately into the trained cup at the second follow-up and received a BST booster session and underpoured at least once during rehearsal pours, after which P13 received model stimulus training and poured accurately during the training. Only participants who provided accurate pours into the trained cup at follow-up (P3, P5, P6, P9) were asked to demonstrate generality across untrained cups.

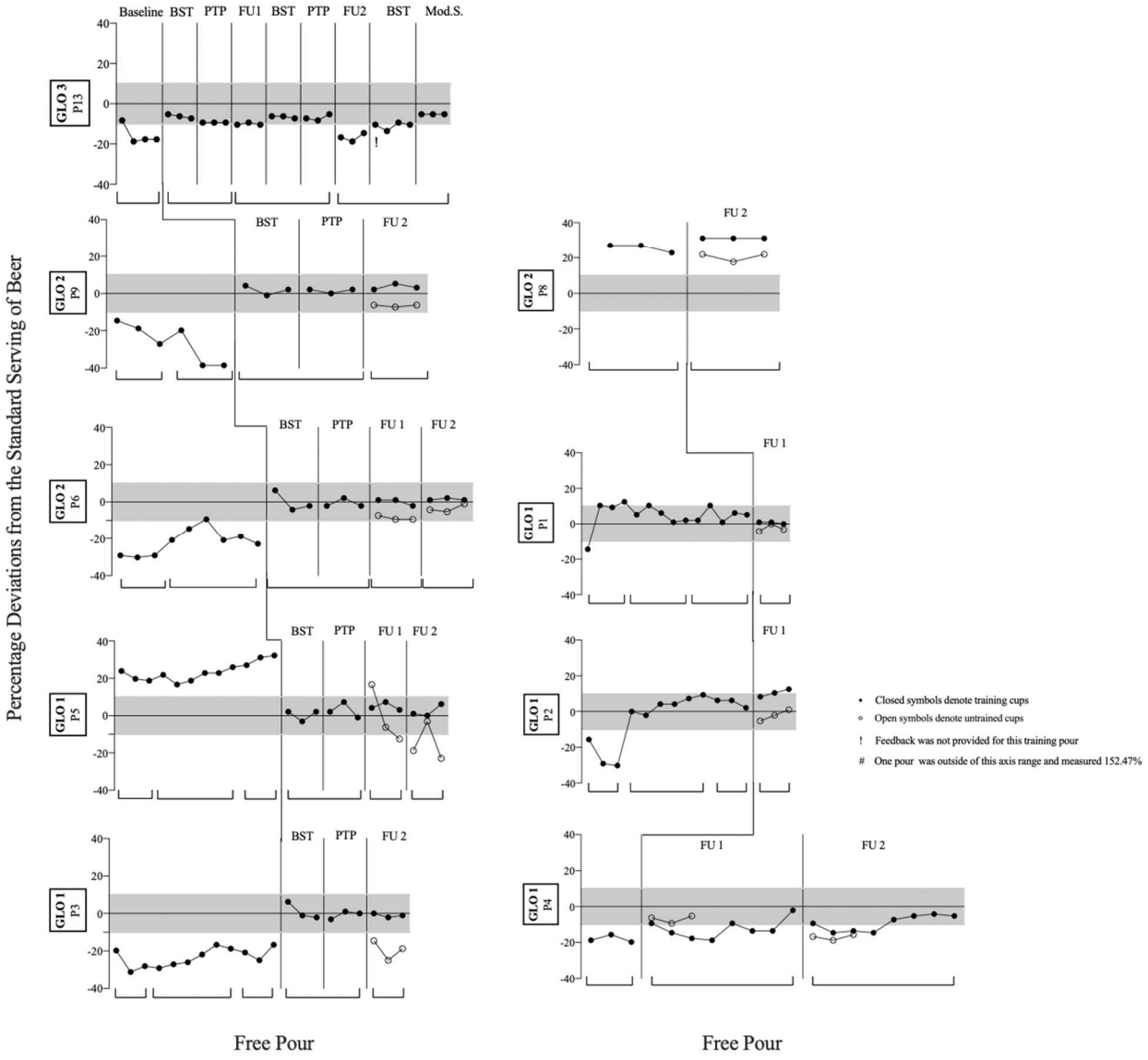

Figure 2. Participant pour data measured as percentage deviation from the standard serving of beer (12 oz). The grey shaded area represents an accurate pour defined as a plus or minus 10% deviation from the standard serving of beer (10.8 to 13.2 oz). Participants are denoted on the x-axis and the percentage deviation from the standard serving is depicted on the y-axis. Brackets indicate free-pours made during the same session. Each data point represents an individual participant's single pour. The left panel represents data collected from participants who completed behavioral skills training (BST) for beer and the right panel represents the control group (i.e., individuals who did not receive BST). Note: BST = behavioral skills training; PTP = post BST pours; FU = follow-up pours; Mod.S = model stimulus training; and Mar.S = marked stimulus training.

Free-Pour (Liquor)

Figure 3 also depicts participants' free-pours of liquor across all phases of the study. During baseline, six participants under-poured (P5, P6, P7, P8, P9, P13), three over-poured (P1, P3, P4), and one (P2) poured accurately. The results of BST were mixed. Four participants poured inaccurately during BST (P1, P4, P6, P13). Even when participants successfully completed BST (i.e., provided three consecutive and accurate rehearsal pours), they provided inaccurate post-BST pours immediately following BST (P1, P5, P6, P13). Additionally, all but one participant (P3) required multiple BST training sessions (P1, P4, P5, P6, P13) and two required additional training in the form of model stimulus or marked stimulus training (P6 and P13). P4 poured accurately during follow-up and P13 poured inaccurately during follow-ups and received the aforementioned booster training.

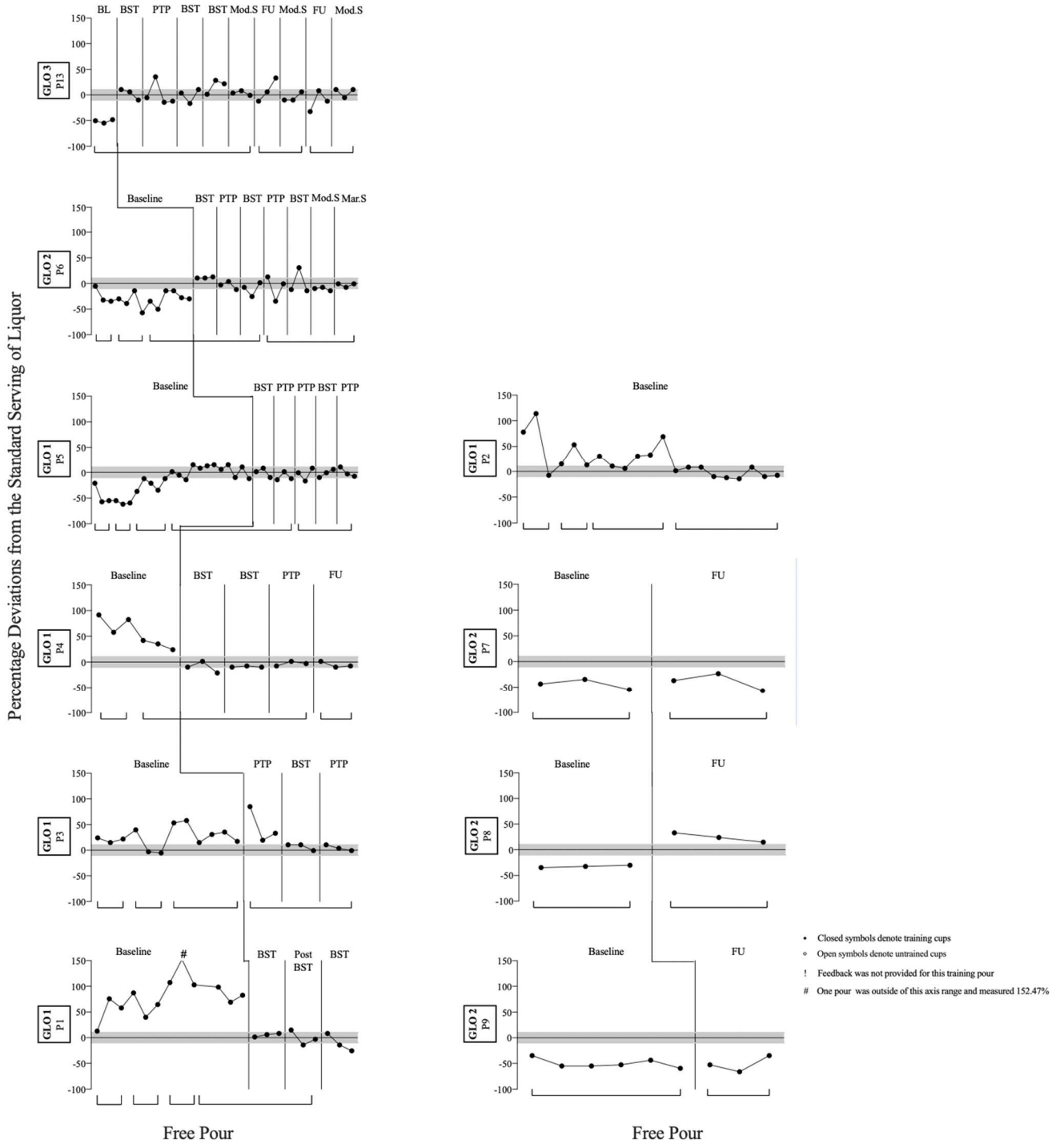

Figure 3. Participant pour data measured as percentage deviation from the standard serving of liquor (1.5 oz). The grey shaded area represents an accurate pour defined as a plus or minus 10% deviation from the standard serving of liquor*(1.35 oz to 1.69 oz). Participants are denoted on the x-axis and the percentage deviation from the standard serving is depicted on the y-axis. Brackets indicate free-pours made during the same session. Each data point represents an individual participants' single pour. The left panel represent data collected from participants who completed behavioral skills training (BST) for liquor and the right panel represents the

(continued) control group (i.e., individuals who did not receive training). P4 only made pours during two baseline sessions due to absences. Note: BST = behavioral skills training; PTP = post BST pours; FU = follow-up pours; Mod.S = model stimulus training; and Mar.S = marked stimulus training.

*Because the measuring vessel we used did not measure in fractions of ml, the actual deviation range for liquor is plus 12.7% and minus 9.8%.

Reported Definitions

Table 2, Table 3, and Table 4 list, by GLO, all participants' (N = 18) definitions of standard servings of alcohol (i.e., beer, liquor, wine, and mixed drinks), reported alcohol consumption by alcohol type, and responses to the TLFB, including those that did not participate in BST. For ease of comparison, the paragraphs below compare participants' first report prior to BST implementation within the GLO and participants' first report following BST. Figure 4 depicts all participants' reports obtained during the study.

Table 2

Definitions and Self-Report GLO 1 (n = 8)

Definitions of Standard Servings	Range (oz)	Mean oz (SD)	Mode oz (n)
Beer			
Survey 1 (n = 7)	8-16	11.14 (2.79)	12 (3)
Survey 2 (n = 7)	4-12	8.86 (3.24)	12 (3)
Survey 3* (n = 8)	8-15	11.63 (1.99)	12 (5)
Survey 4# (n = 6)	8-12.8	11.46 (1.73)	12 (4)
Survey 5 (n = 6)	3-12	9.83 (3.71)	12 (4)
Liquor (Shot)			
Survey 1	1-2	1.43 (0.45)	1 (3)
Survey 2	1-4	1.64 (1.11)	1 (4)
Survey 3*	1-2	1.5 (0.38)	1.5 (4)
Survey 4#	1-4	1.83 (1.13)	1, 1.5 (2)
Survey 5	1-2	1.42 (0.376)	1.5 (3)
Wine			
Survey 1	4-10	6.29 (2.43)	4 (3)
Survey 2	2-32	10.57 (10.50)	8, 4 (2)
Survey 3*	3-8	6.5 (2)	8 (4)
Survey 4#	4-10	7(2.1)	6, 8 (2)
Survey 5	2-7	4.5 (1.76)	4 (3)
Mixed Drink			
Survey 1	1-4	2.07 (0.93)	2 (4)
Survey 2	1-12	3.5 (3.86)	2 (3)
Survey 3*	1.5-12	3.25 (3.57)	2 (4)
Survey 4#	1.5-12	4 (4.01)	2 (2)
Survey 5	1.5-2	1.92 (0.20)	2 (5)
Number of Drinks Consumed in Previous Two Week	Range (oz)	Mean oz (SD)	Mode oz (n)
Beer			
Survey 1	0-20	9.14 (7.17)	N/A
Survey 2	1-20	12.45 (8.41)	20 (3)
Survey 3*	1-12	7.25 (3.65)	8, 10 (2)
Survey 4#	1-23	11.83 (7.33)	N/A
Survey 5	4-12	8 (3.022)	N/A
Liquor (Shot)			
Survey 1	1-20	10.36 (9.31)	20 (3)
Survey 2	0-25	6.33 (8.73)	1 (2)
Survey 3*	0-15	5.38 (5.97)	0, 5 (2)
Survey 4#	4-20	12.17 (8.73)	8 (2)
Survey 5	2-29	10.5 (12.85)	2 (3)
Wine			
Survey 1	0-10	5 (4.163)	10 (2)
Survey 2	0-6	1.71 (2.63)	0 (4)
Survey 3*	0-7	1.38 (2.50)	0 (5)

(Table 2 Continued)

Survey 4[#]	0-2	0.5 (0.836)	0 (4)
Survey 5	0-3	1.17 (1.47)	0 (3)
Mixed Drink			
Survey 1	0-10	2.86 (3.63)	0 (2)
Survey 2	0-10	1.43 (3.78)	0 (6)
Survey 3[*]	0-8	2.63 (3.20)	0 (3)
Survey 4[#]	0-15	5.33 (5.43)	N/A
Survey 5	0-20	6 (7.40)	0 (2)
TLFB			
Survey 1	1.5-63	32.36 (23.43)	N/A
Survey 2	1-60	28.57 (20.74)	N/A
Survey 3	1-45	19.25 (14.01)	N/A
Survey 4	9-55	33.17 (19.49)	N/A
Survey 5	9-55	29.5 (18.96)	N/A

Note. GLO1 participants' (n = 8) definitions of a standard serving for beer, liquor (shots), wine, and mixed drinks, their reported alcohol consumption by alcohol type and on the Timeline Followback Calendar (TLFB). An asterisk (*) denotes the week in which Behavioral Skills Training (BST) for beer was introduced and the number sign (#) denotes the week in which BST for liquor was introduced. On the weeks BST was introduced, surveys were completed prior to training. The number of participants that completed the survey each week is indicated in the left most column and remains the same for all variables.

Table 3

Definitions and Self-Report GLO 2 (*n* = 9)

Definitions of Standard Servings	Range (oz)	Mean oz (SD)	Mode oz (*n*)
Beer			
Survey 1 (*n* = 9)	8-16	11.38 (3.5)	12 (3)
Survey 2* (*n* = 7)	6-12	10 (2.58)	12 (4)
Survey 3# (*n* = 1)	N/A	12 (N/A)	12 (1)
Survey 4 (*n* = 8)	7-16	11.38 (2.77)	12 (5)
Liquor (Shot)			
Survey 1	0.5-5	2.5 (1.63)	2, 4 (2)
Survey 2*	1-2	1.21 (0.39)	1 (5)
Survey 3#	N/A	2 (N/A)	2 (1)
Survey 4	1-2	1.5 (0.46)	1, 2 (3)
Wine			
Survey 1	4-30	8.94 (8.73)	8 (3)
Survey 2*	4-10	6.29 (2.63)	4 (3)
Survey 3#	N/A	5 (N/A)	5 (1)
Survey 4	3.5-10	6.19 (2.51)	4 (2)
Mixed Drink			
Survey 1	0.5-12	3.94 (3.53)	4 (3)
Survey 2*	1-8	3.86 (2.73)	3 (2)
Survey 3#	N/A	10 (N/A)	10 (1)
Survey 4	1-8	3.38 (2.50)	1, 2 (2)
Number of Drinks Consumed in Previous Two Weeks	Range (oz)	Mean oz (SD)	Mode oz (n)
Beer			
Survey 1	0-10	2.67 (3.16)	0, 2 (3)
Survey 2*	0-10	3.86 (4.18)	0 (3)
Survey 3#	N/A	2 (N/A)	2 (1)
Survey 4	0-5	1 (1.91)	0 (5)
Liquor (Shot)			
Survey 1	0-20	7.55 (7.98)	0 (4)
Survey 2*	0-10	5.38 (3.02)	6 (2)
Survey 3#	N/A	6 (N/A)	6 (1)
Survey 4	0-7	2.75 (3.2)	0 (4)
Wine			
Survey 1	0-18	2.89 (6.01)	0 (6)
Survey 2*	0-7	2.57 (3.26)	0 (4)
Survey 3#	N/A	15 (N/A)	15 (1)
Survey 4	0-6	1 (2.14)	0 (6)
Mixed Drink			
Survey 1	0-8	3.44 (2.46)	2 (3)
Survey 2*	0-16	6 (5.39)	5 (2)
Survey 3#	N/A	8 (N/A)	8 (1)
Survey 4	0-6	1.75 (2.3)	0 (4)

(Table 3 Continued)

TLFB			
Survey 1	0-47	15.44 (14.28)	4 (2)
Survey 2*	4-34	16.85 (11.95)	N/A
Survey 3#	N/A	8 (N/A)	8 (1)
Survey 4	0-19	6.5 (7.73)	0 (4)

Note. Participants in GLO 2 (n = 9) reported definitions of standard servings of beer, liquor (shots), wine, and mixed drinks as well as their reported alcohol consumption by alcohol type and as reported on the Alcohol Timeline Followback Calendar (TLFB). An asterisks (*) denotes the week in which Behavioral Skills Training (BST) for beer was introduced and the number sign (#) denotes the week in which BST for liquor was introduced. On the weeks BST was introduced, surveys were completed prior to training. The number of participants that completed the survey each week is indicated in the left most column and remains the same for all variables.

Table 4

Definitions and Self-Report GLO 3 (n = 1)

Definitions of Standard Servings	Ounces
Beer	
Survey 1*# (n = 1)	12
Survey 2 (n = 1)	12
Survey 3 (n = 1)	12
Liquor (Shot)	
Survey 1*#	2
Survey 2	1.5
Survey 3	1.5
Wine	
Survey 1	14
Survey 2	14
Survey 3	14
Mixed Drink	
Survey 1*#	4
Survey 2	2
Survey 3	2
Number of Drinks Consumed in Previous Two Weeks	Ounces
Beer	
Survey 1*#	0
Survey 2	0
Survey 3	0
Liquor (Shot)	
Survey 1*#	4
Survey 2	0
Survey 3	0
Wine	
Survey 1*#	0
Survey 2	0
Survey 3	0
Mixed Drink	
Survey 1*#	0
Survey 2	0
Survey 3	0
TLFB	
Survey 1*#	0
Survey 2	0
Survey 3	0

Note. Participants in GLO 3 (n = 1) reported definitions of standard servings of beer, liquor (shots), wine, and mixed drinks as well as their reported alcohol consumption by alcohol type and as reported on the Alcohol Timeline Followback Calendar (TLFB). An asterisks (*) denotes the week in which Behavioral Skills Training (BST) for beer was introduced and the number

(continued) sign (#) denotes the week in which BST for liquor was introduced. On the weeks BST was introduced, surveys were completed prior to training. The number of participants that completed the survey each week is indicated in the left most column and remains the same for all variables.

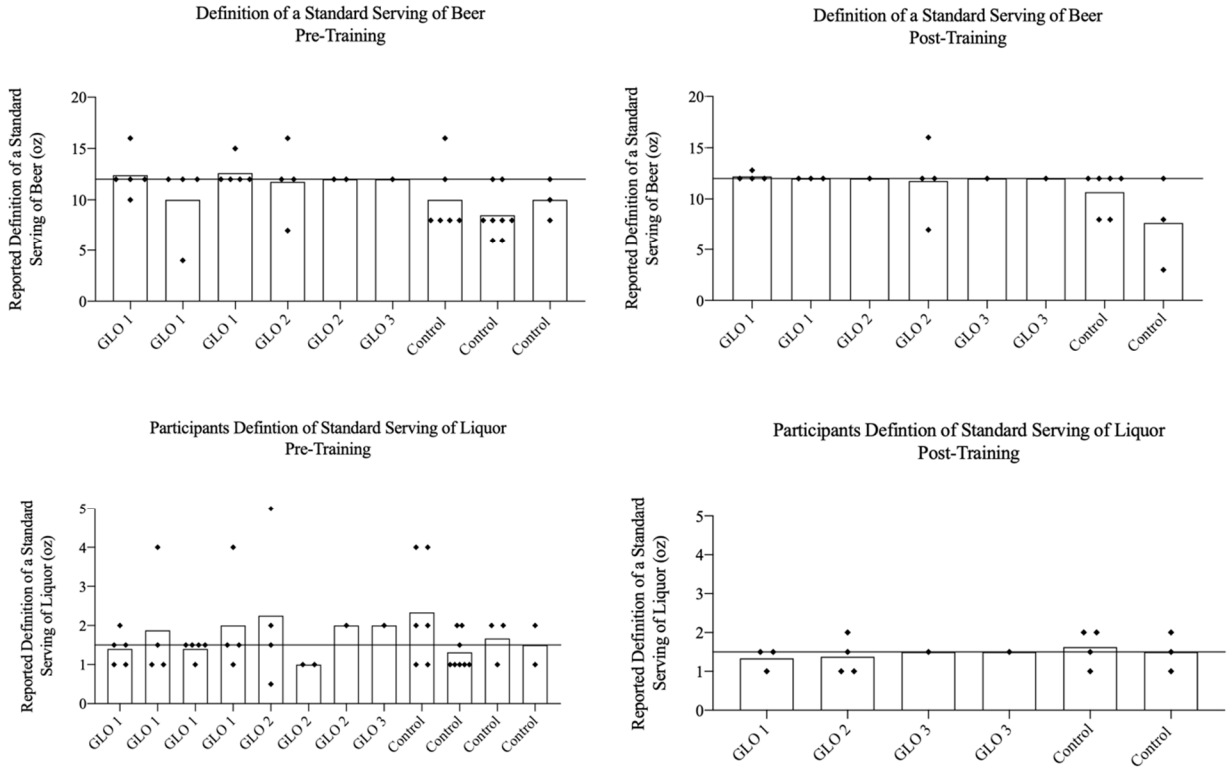

Figure 4. Participants' definitions of standard serving of beer and liquor before and after training. The x-axis represents the GLO and the y-axis is the reported definition of a standard serving of beer (top row) and liquor (bottom row). The graphs on the left represents the reported definition prior to training and the graphs on the left represents the reported definition following training. The bar indicated the average volume reported per GLO and each data point is an individual participant's reported definition.

Among the participants who received group BST for beer (n = 5), one participant underestimated, one participant overestimated, and three participants accurately reported a standard serving of beer prior to training. Following training all participants accurately reported the standard serving of beer. Among the participants who received individual BST for liquor (n = 6), one participant underestimated, three participants overestimated, and two participants accurately reported the standard serving of liquor prior to BST. Following BST, one participant underestimated and four participants accurately estimated standard servings of liquor. To summarize, compared to pretraining (baseline), participants who received BST correctly reported the standard serving of beer and liquor immediately following training.

We also looked at the definitions provided by the eight participants who only completed the self-report measures as well as the free-pour participants who *did* not receive group BST for beer or individual BST for liquor to examine whether their definitions changed as a result of time or their peers receiving training (i.e., those in training shared information with others). At baseline, six of these participants underestimated, two overestimated, and four accurately reported a standard serving of beer. After their GLO-mates received group BST, three participants underestimated, two overestimated, and six accurately reported the standard serving of beer, suggesting it is unlikely they receive information from their GLO-mates who received BST. Among the participants who *did not* receive individual BST for liquor, five underestimated and five overestimated a standard serving of liquor. After their GLO-mates received individual BST, four participants underestimated, four overestimated, and two accurately reported a standard serving of liquor, a small improvement. Thus, participants who did not receive training showed little overall improvement in the accuracy of their definitions of standard servings for both beer and liquor.

Reported Consumption

Participants reported their alcohol consumption between three to five times throughout the study (*Figure 5*). There was little difference in reported mean consumption at the start and at the completion of the study; however, the large standard deviations greatly reduce the meaningfulness of the means.

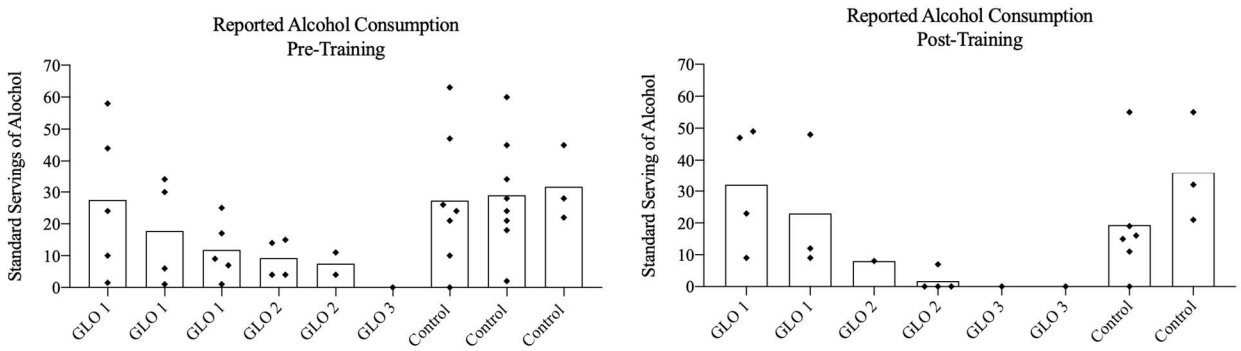

Figure 5. Participant reported alcohol consumption pre- and post-training. The x-axis represents the participant group and the y-axis is the reported standard serving. The graph on the left is consumption prior to training and the graph on the right is the reported consumption following training. Each data point represents an individual participants' reported consumption on a single TLFB survey.

Comparison of Participants' Free-Pour and Reported Definition (Beer)

Among the 10 participants who participated in group BST for beer, 9 participants provided definitions of standard servings of beer. Their free-pours of beer prior to BST were compared with their reported definition of a standard serving of beer (see Figure 6). The first baseline pour, and the first post-BST pour were compared to the definitions provided on the corresponding days. Seven participants poured volumes less than their reported definitions and two participants poured volumes greater than their reported definitions; similar to Kohn et al.'s (2018) findings, little correlation was observed between participants' free-pours and their

definition of a standard serving prior to training. Following the introduction of training, three participants poured less than the reported definition and two participants poured more than the provided definition; however, there was an increase in the correlation between the reported definition and free-pour.

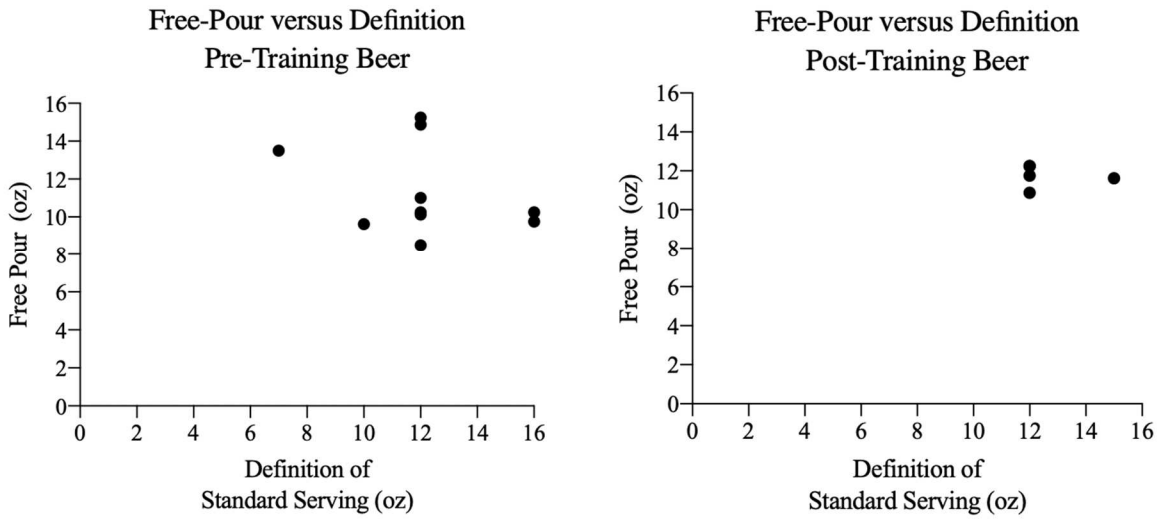

Figure 6. Participants' definitions of a standard serving of beer compared to free-pour of a standard serving of beer. The x-axis represents participants' definitions of standard serving of beer and the y-axis denotes participants' free-pours of a standard serving. The graph on the left represent data collected pre-training and the graph on the right represents data collected post-training. Each data point represents an individual participant's baseline or post-BST free-pour.

Comparison of Participants' Free-Pour and Reported Definition (Liquor)

Among the 10 participants who participated in the *free-pour* component of the study, 9 participants provided definitions of standard servings of liquor. Their free-pours of liquor prior to BST were compared with their definitions of a standard serving of liquor (see Figure 7). Similar to Kohn et al.'s (2018) findings, and our finding regarding beer, little correlation was observed between participants' free-pours and their definition of a standard serving prior to

training; four participants' poured less than their definitions and five participants' poured more than their definitions. Due to the variable results of individual BST, participants' reported definitions following training were not compared with their post-BST free-pours.

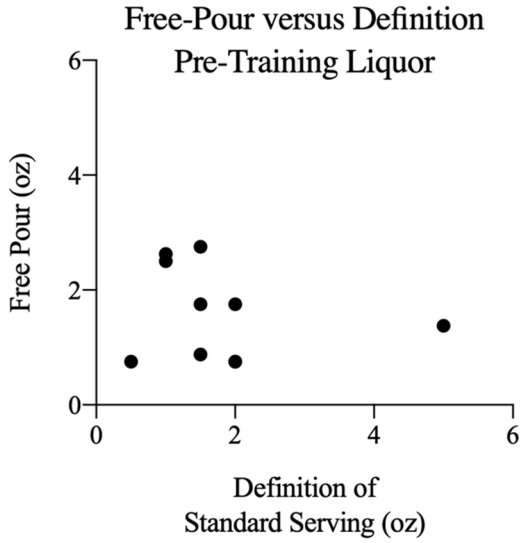

Figure 7. Participants' definitions of a standard serving of liquor compared to free-pour of a standard serving of liquor. The x-axis represents participants' definitions of standard serving of liquor and the y-axis denotes participants' free-pours of a standard serving. Each data point represents an individual participant's single baseline free-pour.

Social Validity

We assessed the acceptability of BST by asking participants to complete a questionnaire. Of the 10 participants who participated in the free-pour component of the study, seven participants engaged in BST, and of those seven, six responded to the social validity questionnaire. A direct transcription of their responses is presented in Table 5 and Appendix B. Three participants indicated their drinking habits changed as a result of participation in BST and three indicated their drinking habits did not change. Of those who reported their habits had changed, one participant reported drinking less per cup and the others did not specify whether the

change meant an increase or a decrease in their drinking. Five participants indicated BST increased their ability to accurately count drinks although none reported BST aided in adhering to drink limits. All six participants indicated they would recommend BST to other chapter members. In evaluating group BST for beer on a scale of one to five, where one was strongly dislike and five was strongly like, two participants rated it neutral, two indicted they liked it, and one indicated they strongly liked it. When asked why they liked group BST, comments included that it was useful, educational, easy to remember, and helpful when pouring beer. In a separate free-response section, when asked what, if anything, they disliked about group BST for beer, participants' comments included that the training was repetitive, there was no foam (i.e., to more closely mimic beer), and the group training could have been improved. With regards to individual BST for liquor, two participants indicated that they were neutral and four indicated they liked it; participants stated it was educational, useful, and easy to use. In a separate free-response section, participants' indicated their reasons for disliking individual BST for liquor were the repetition and the challenge of visualizing the pour.

Participants in GLO1 and GLO2 were asked if anything influenced their pouring during the participation of the study and answers included the lines on the cup (n = 4), feeling the weight (n = 1), and previous trainings (n = 2). This question was not provided to P13 in GLO3 due to experimenter error.

Table 6
Social Validity Survey Results (n = 6)

Question	*n*
Has participation in behavioral skill training (BST) changed your drinking habits?	
Yes	3
No	3
Has participation in BST aided in your ability to accurately count drinks?	
Yes	5
No	1
Has participation in BST aided in your ability to adhere to predetermined drink limits?	
Yes	0
No	6
Would you, or have you shared information you learned in this training with family or friends?	
Yes	5
No	1
Would you recommend this training to other chapters?	
Yes	6
No	0
How much did you like group BST for beer?	
1 (Strongly Dislike)	0
2	0
3 (Neutral)	2
4	2
5 (Strongly Like)	1
How much did you like individual BST for liquor?	
1 (Strongly Dislike)	0
2	0
3 (Neutral)	2
4	3
5 (Strongly Like)	0

Note. Participants' (n = 6) responses to the social validity questionnaire. Reponses to open ended questions are contained in Appendix B.

Results Summary

Of the eight participants who poured beer inaccurately prior to training, five participants received training and poured beer accurately during and immediately following group (paired) BST. Three participants failed to report for BST for beer, ultimately one poured accurately at follow-up and two continued to over-pour. All participants who received BST maintained accurate pouring for beer across time and half were able to accurately pour into an untrained cup, suggesting generality across the untrained cup. Prior to training, nine participants poured liquor

inaccurately. However, individual BST yielded mixed results, as five of the six participants who received individual BST for beer continued to pour inaccurately during or following training and required multiple training sessions. Three of the nine participants who poured inaccurately for liquor failed to report for individual BST for liquor; of these three participants one over-poured and two under-poured at follow up. During baseline, 10 of the 17 participants who completed at least one survey during the baseline period provided inaccurate definitions for beer; following training, all five individuals who received BST reported the accurate definition while only six of the 11 who did not receive training *and* complete surveys following the introduction of BST made accurate reports. Individual participant's definitions of a standard serving and their free-pours of a standard serving of beer and liquor prior to the introduction of training were not correlated; following training there was a greater correlation between free-pours of beer and the reported definition. Lastly, participants' self-reports of consumption varied somewhat depending on the method in which the information was gathered (i.e., Knowledge Questionnaire versus TLFB); though an overall correlation between the two types of self-report measures was observed.

CHAPTER 4: DISCUSSION

The results of this study suggest BST can be used to teach pairs of college students to pour standard servings of beer in a naturalist setting (e.g., their GLO chapter house) and that results generalized across time, and to some extent across stimulus, up to two weeks. These results extend previous research on the effectiveness of individual BST (e.g., Hankla et al., 2018). This is important, because the bulk training delivered in college, and GLO settings in particular, is provided in group formats (Scott-Sheldon et al., 2016).

However, despite evidence that individual BST can be effectively used to teach college students to pour accurate servings of beer, the same was not true when we used individual BST to teach college students to accurately pour standard servings of liquor. Among the six participants who received BST for liquor, five participants ultimately poured accurately for liquor and multiple trainings sessions were required to obtain accurate pouring for all but one participant (P3). Even with repeated trainings, two of the five participants that obtained accurate pouring required sessions of model stimulus or marked stimulus training in order to pour accurately. Although they used a different population and taught a distinctly different skill, when Himle et al., (2004) used group BST to teach children gun safety skills, they also required multiple BST sessions before the children acquired the skills. Importantly, even though participants' pours frequently were not accurate standard servings, the variability in their pours decreased following training.

Unfortunately, some of the college students in our study clearly noted that they disliked the repetitive nature of BST, suggesting individual BST may have low social validity, at least when used in the current manner. Because group BST for beer required only one training session, researchers should focus on the use of BST to teach standard servings of beer in groups

of three or more. Researchers should also continue to evaluate the use of BST to teach standard pours of liquor. If results are similar to ours, they may want to focus on evaluating training methods other than BST, particularly given that multiple training sessions may not be conducive for the limited training time available in university environment.

Similar to Hankla et al. (2018), the majority of participants in this study underpoured a standard serving of beer prior to training; participants also underpoured a standard serving of liquor. Also similar to Hankla et al. (2018), following group BST, all participants accurately poured a standard serving of beer. With regards to definitions, like previous results (e.g., Hankla et al., 2018; White et al., 2003; White et al., 2005) prior to training, about half of participants accurately reported a standard serving of beer and liquor. In participants' first report following training, all participants who received group BST for beer accurately reported the definition for beer and all but one participant who received individual BST for liquor accurately reported a standard serving of liquor. Hankla et al. (2018) also found that 15 of their 17 participants who received BST provided accurate definitions for beer following BST. These results suggest participation in BST improves participants definitions of the trained alcohol type.

When looking at the definitions provided by all participants across all surveys (Figure 4), the results are variable. Several factors might help to explain participants' inaccurate and variable reports during follow-ups observed in this study. First, the longitudinal nature of the current study required participants to accurately recall information provided during BST that occurred one to two weeks prior; whereas, Hankla et al. (2018) queried their participants immediately following BST. Second, not all individuals were present for one or both types of BST, which limited the access they had to the standard serving definitions. Additionally, most participants (i.e., both those who did and did not receive BST) provided overestimations of wine

and mixed drinks throughout the study. This corresponds with the current literature (Hankla et al., 2018; Schultz et al., 2017; White et al., 2003; White et al., 2005) and was expected as we did not include wine and mixed drinks in the training sessions.

The results of this study also correspond with those of Kohn et al. (2017), showing that, prior to training, individual college student's definitions and free-pours of a standard serving of beer were not correlated. In the current study, the correlation between participants' definitions and free-pours did improve following BST, suggesting BST reduce the discrepancy between college students' definitions and free-pours of standard servings (Hankla et al., 2018). However, we did not experimentally evaluate the relationship between free-pours and definitions; thus, no causal conclusions regarding the relationship between these variables can be made.

In addition to examining the efficacy of BST to teach accurate pouring, we also examined its social validity (Baer, Wolf, & Risely, 1987; Wolf, 1978) participants' perceptions of BST, as this can impact both the effectiveness of BST and the likelihood it will be used even if found effective. Understanding this information allows for a comparison between the investment of time and resources when using BST with the final results and whether the investment is worth the cost. Overall, participants responded favorably to the group BST for beer and individual BST for liquor, and all who completed the social validity follow-up questionnaire (n = 6) stated they would recommend BST to other chapters. Two participants stated that they disliked the repetitive nature of the training. Future research could incorporate this feedback and look at small changes that could reduce the reported perception of repetition within the study or further prepare and educate individuals on the importance of repetition.

Although data from the current study provides additional evidence that use of BST improves college students' definitions and free-pours of beer, even when taught in pairs, this

study is not without limitations. First, participant recruitment and retention were less than ideal. It took us several months to engage GLOs and recruit participants. As described in the methods section, early recruitment methods did not yield participants and new approaches to recruiting were made (i.e., in-person meetings, direct follow up from research team, etc.). Once GLOs agreed to participate, a limited number of members volunteered and consistently engaged in the study. This study was conducted over multiple weeks and inconsistent participation, including attrition, occurred for a variety of reasons including wildfires, school closure, previous commitments, holiday breaks, and other chapter obligations. Due to inconsistent participation, group BST was only conducted with two participants per chapter instead of the originally proposed four participants per group. We originally planned for 12 participants to complete BST for beer and liquor but only four completed BST for both beer and liquor, one participant completed BST for beer only, one participant completed BST for liquor only, and one began BST for liquor but failed to complete training. Difficulties with recruitment and retention also negatively affected the integrity of the multiple baseline across GLO design. More participants and better retention would have allowed for a more thorough investigation of the efficacy of group BST for beer and individual BST for liquor in university GLO settings.

Second, we faced a variety of time constraints. Due to individual chapter schedules, our meetings with the GLOs were limited to approximately an hour. This time constraint was particularly limiting when conducting individual BST for liquor as multiple sessions were needed. Additionally, individual BST had to be conducted across multiple sessions sometimes separated by one week. To date, studies examining alcohol pour training (e.g., Hankla et al., 2018; Metz et al., 2016) have conducted training in a single day. The segmented nature of the current study may have contributed to the variable results obtained with individual BST for

liquor. Though, research using BST for gun safety in children (e.g., Himle et al., 2004) conducted training across two separate days and training still resulted in the target behavior.

Third, we did not ask participants if they had ever poured their own drinks. Although previous experience may have impacted pours, all participants who received training poured inaccurately prior to training. Fourth, the conclusions regarding generalization across stimuli are limited as we did not have participants provide baseline free-pours into untrained cups. Without conducting baseline pours for the square, 18-oz red Solo® cup, we cannot state whether BST led to accurate pours into the untrained cup or if participants would have poured accurately into this vessel prior to training. To eliminate this limitation, researchers should take baseline measures of all vessels. Additionally, stimulus generalization refers to scenarios where behavior has been reinforced in the presence of a certain antecedent stimuli (i.e., trained red Solo® cup) and similar behavior may be evoked in situations where antecedent stimuli similar to that of the trained red Solo® (i.e., untrained red Solo®; Cooper, Heron, & Heward, 2007) is present. For example, although the shape of the trained and untrained vessels differed, the untrained cup also exhibited differing indentations; therefore, it is also possible the indentations on the trained cup played a role in evoking this behavior leading to the variability of generalization observed in this study. There are several other environmental cues which can influence pouring and which researchers ought to evaluate, such as the amount of time it takes to pour from a pitcher into the cup, silent counting, the weight of the cup as it fills, and other visual cues on the cups.

Fifth, our definition of an accurate pour of liquor was necessarily quite narrow. To remain consistent, we used a similar +/- 10% deviation criterion used by previous researchers (Hankla et al., 2018; Metz et al., 2016). This resulted in a narrow range, 1.65 oz to 1.35 oz, for accurate pouring of liquor. The range spanned 0.3 oz and only left room for a 0.15 oz deviation

from the standard. However, because slight deviations in liquor volume may result in large deviations in alcohol content, this narrow definition of an accurate pour is likely valid, albeit difficult to train. Sixth, participants reported that the clear liquid use to simulate liquor was more challenging to pour and harder to visualize than the tea-colored liquid used to simulate beer. These challenges do not negate the importance of the skill but point out important considerations in determining the best way to teach the skill, including the use of colored liquid to simulate other types of liquor (e.g., whiskey, tequila) and use of other vessels to teach the skill (e.g., smaller shot glasses or highball glasses).

The aforementioned limitations provide some directions for future research considerations. First, recruitment is a challenging aspect of data collection that is often overlooked; studies comparing recruitment methodology should be reviewed and conducted. Second, research is needed to further understand the variability in results observed during individual BST for liquor and may include a comparison of BST to different training types such as superimposition or stimulus fading (i.e., Metz et al., 2016). Third, BST training could be expanded to account for additional external cues (i.e., lines on cup, cup weight) that may influence pouring. Fourth, to further understand the generality across cup shape observed in free-pours of beer, studies systematically evaluating accurate pours across vessels are needed.

Excessive alcohol consumption among college students is a marked problem with serious consequences (Hingson et al., 2009; NIAAA, 2018; White & Hingson, 2019). Targeting college students' ability to recognize and pour standard servings may be important in reducing negative consequences. Recent studies (e.g., Hankla et al., 2018 and Metz et al., 2016) have taken preliminary steps in doing so. The current study contributes important information to our understanding of the use of BST in naturalistic setting with more than one individual and for new

alcohol types. Further research is needed to understand the use of BST in large group settings and for training for liquor. Studies comparing different types of training and the associated social validity may be useful in selecting the right application for college students in the university environment.

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APPENDIX A: FOLLOW-UP QUESTIONNAIRE

1. **Has participation in skills training changed your drinking habits?**

   □ Yes □ No

   If yes, please describe how your drinking habits have changed.

2. **Has participation in skills training aided in your ability to accurately count drinks?**

   □ Yes □ No

   If yes, please describe how this has changed your ability to accurately count drink.

3. **Would you or have you shared information you learned in this training with family or friends?**

   □ Yes □ No

   If yes, please described the information you have shared.

4. **Would you recommend this training to other chapters?**

   □ Yes □ No

   If yes, please describe why.

Please use the following scale to answer questions 5-6.

1 2 3 4 5

5. **Using the scale above, how much did you like group behavioral skills training for beer?**

   What did you like about it?

   What did you dislike about it?

6. **Using the scale above, how much did you like individual behavioral skills training for liquor?**

   What did you like about it?

   What did you dislike about it?

7. **Do you have any additional questions, comments, or concerns about the training, experimenters, or research study?**

If yes, please describe why.

APPENDIX B: FOLLOW-UP QUESTIONNAIRE RESULTS

Responses were transcribed directly from participants surveys.

1. **Has participation in behavioral skills training changed your drinking habits?**

□ Yes □ No

GLO 1	**GLO 2**	**GLO 3**
Yes	Yes	No
No	No	
Yes		

If yes, please describe how your drinking habits have changed:

GLO 1	**GLO 2**	**GLO 3**
• I drink less per cup • Better understanding of a standard serving; therefore, I can better keep track of my consumption	• I am more conscience of how much I serve myself	

2. **Has participation in behavioral skills training aided in your ability to accurately count drinks?**

□ Yes □ No

GLO 1	**GLO 2**	**GLO 3**
No	Yes	Yes
Yes	Yes	
Yes		

If yes, please describe how this has changed your ability to accurately count drinks:

GLO 1	**GLO 2**	**GLO 3**
• I stop counting when I start having fun ☹ • I can now keep track of how many serving I've had	• Since now I know how much is in each standard serving • I'm more aware of how much I drink	• I don't really drink, but now I can definitely count drinks if needed

- Referenced above answer

3. **Has participation in behavioral skills training aided in your ability to adhere to predetermined drink limits?**

□ Yes □ No

GLO 1	GLO 2	GLO 3
No	No	No
No	No	
No		

If yes, please describe how this has changed your ability to adhere to drink limits:

GLO 1

- I don't recall establishing predetermined drink limits as a function of the training

GLO 2

GLO 3

4. **Would you, or have you shared information you learned in this training with family or friends?**

□ Yes □ No

GLO 1	GLO 2	GLO 3
Yes	Yes	Yes
No	Yes	
Yes		

If yes, please described the information you have shared:

GLO 1

- I have told peers about standard alcoholic serving
- I have informed my family that I am participating

GLO 2

- I have told my friends
- I've showed a friend the measurements

GLO 3

- Talked to my parents about it, they think it was cool-some of my friends were curious about it, I explained the

participation to them

5. **Would you recommend this training to other chapters?**

□ Yes □ No

GLO 1	GLO 2	GLO 3
Yes	Yes	Yes
Yes	Yes	

If yes, please describe why:

GLO 1	GLO 2	GLO 3
• Because most people don't know how much alcohol is in a standard serving • I felt that it was a good opportunity to become more informed about drinking practices	• I think it is very important to know how much you are drinking • Repetition is useful/helpful	• Very helpful, could definitively keep people safer

Please use the following scale to answer questions 6 and 7.

1	2	3	4	5
Strongly Dislike		Neutral		Strongly Like

6. **Using the scale above, please circle the number corresponding to how much did you like group behavioral skills training for beer?**

1	2	3	4

GLO 1	**GLO 2**	**GLO 3**
3	4	5
4	3	

What did you like about it?

GLO 1	**GLO 2**	**GLO 3**
• What I learned from it, since I drink beer more often • That the different cup styles were taken into account	• It was very easy to do, easy to remember • Useful, feel indifferent	• Helped me to learn properly how much beer to pour, learned a new still

What did you dislike about it?

GLO 1	**GLO 2**	**GLO 3**
• The repetition • I believe that the group aspect could have been improved slightly	• Didn't show effect of foam, sometimes it may be misleading	• It was repetitive, but that is necessary to learn the skill anyways

7. **Using the scale above, please circle the number corresponding to how much did you like individual behavioral skills training for liquor?**

1 2 3 4 5

GLO 1	GLO 2	GLO 3
3	4	4
4	3	

What did you like about it?

GLO 1	GLO 2	GLO 3
• Also what I learned • Straight forward, educational, non-judgmental, different cup sizes and styles	• It was easy to do, easy to remember • Useful too, feel indifferent	• It was useful in understanding what a standard serving is

What did you dislike about it?

GLO 1	GLO 2	GLO 3
• The repetition • N/A	• Nothing	• I could barely see what I was pouring

8. **Do you have any additional questions, comments, or concerns about the training, experimenters, or research study?**

If yes, please describe:

GLO 1	GLO 2	GLO 3
• N/A	• Not at this time • N/A	• Very professional!! Great job!

What if anything influences your pouring during your participation in this research study?

GLO 1

- Lines on the solo cup; major reference; when didn't have line would feel the weight; lines and weight
- How much other people pour; try to reference lines on cup; instincts
- Alcohol level 1 class, direct activity, just watch, one or two activities a lot of watching; when the bottle was completely full liquor rushed out and was harder to pour

GLO 2

- Beer-I used the line of the cup to determine measurements; Liquor-clear liquid was personally hard for me to see where the lines are; I tried to use the cup line
- We had to finish a Title 9 training before coming to UoP so I remember seeing the lines and having a comparison to the line on the red solo cup.

GLO 3

- Very professional!! Great job!

APPENDIX C: ALOCHOL EDUCATION HANDOUT

Facts About Alcohol Overdose/Poisoning and Cowell Wellness Center Information

Excessive drinking can be hazardous to everyone's health! It can be particularly stressful if you are the sober one taking care of your drunk roommate, who is vomiting while you are trying to study for an exam.

Some people laugh at the behavior of others who are drunk. Some think it's even funnier when they pass out. But there is nothing funny about the aspiration of vomit leading to asphyxiation or the poisoning of the respiratory center in the brain, both of which can result in death.

Do you know about the dangers of alcohol poisoning? When should you seek professional help for a friend? Sadly enough, too many college students say they wish they would have sought medical treatment for a friend. Many end up feeling responsible for alcohol-related tragedies that could have easily been prevented.

Common myths about sobering up include drinking black coffee, taking a cold bath or shower, sleeping it off, or walking it off. But these are just myths, and they don't work. The only thing that reverses the effects of alcohol is time-something you may not have if you are suffering from alcohol poisoning. And many different factors affect the level of intoxication of an individual, so it's difficult to gauge exactly how much is too much.

What happens to your body when you get alcohol poisoning?

Alcohol depresses nerves that control involuntary actions such as breathing and the gag reflex (which prevents choking). A fatal dose of alcohol will eventually stop these functions.

It is common for someone who drank excessive alcohol to vomit since alcohol is an irritant to the stomach. There is then the danger of choking on vomit, which could cause death by asphyxiation in a person who is not conscious because of intoxication.

You should also know that a person's blood alcohol concentration (BAC) can continue to rise even while he or she is passed out. Even after a person stops drinking, alcohol in the stomach and intestine continues to enter the bloodstream and circulate throughout the body. It is dangerous to assume the person will be fine by sleeping it off.

Critical Signs for Alcohol Poisoning

- Mental confusion, stupor, coma, or person cannot be roused.
- Vomiting.
- Seizures.
- Slow breathing (fewer than eight breaths per minute).
- Irregular breathing (10 seconds or more between breaths).
- Hypothermia (low body temperature), bluish skin color, paleness.

What Should I do if I Suspect Someone has Alcohol Poisoning?

- Know the danger signals.
- Do not wait for all symptoms to be present.
- Be aware that a person who has passed out may die.
- If there is any suspicion of an alcohol overdose, call 911 for help. Don't try to guess the level of drunkenness.

What can happen to Someone with Alcohol Poisoning that goes Untreated?

- Victim chokes on his or her own vomit.
- Breathing slows, becomes irregular, or stops.
- Heart beats irregularly or stops.

- Hypothermia (low body temperature).
- Hypoglycemia (too little blood sugar) leads to seizures.
- Untreated severe dehydration from vomiting can cause seizures, permanent
- brain damage, or death.

Even if the victim lives, an alcohol overdose can lead to irreversible brain damage. Rapid binge drinking (which often happens on a bet or a dare) is especially dangerous because the victim can ingest a fatal dose before becoming unconscious.

Don't be afraid to seek medical help for a friend who has had too much to drink. Don't worry that your friend may become angry or embarrassed-remember, you cared enough to help. Always be safe, not sorry.

[Reproduced from: https://www.collegedrinkingprevention.gov/parentsandstudents/students/factsheets/factsaboutalcoholpoisoning.aspx]

Standard Serving of Alcohol

In accordance with the National Institute on Alcohol Abuse and Alcoholism (NIAAA), a standard serving of beer (5% alcohol by volume [ABV]) is 12 ounces (oz), wine (12% ABV) is 5 oz, and liquor (40% ABV) is 1.5 oz.

[Reproduced from: https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/what-standard-drink]

If you have concerns about your drinking, please make an appointment to speak to a professional at the Cowell Wellness Center, located on campus (1041 Brookside Road). Contact information and how to make an appointment can be found at: http://www.pacific.edu/Campus-Life/Student-Services/Counseling-and-Psychological-Services.html