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# Evaluation of Behavioral Skills Training (BST) to Teach College Students to Pour a Standard Serving of Alcohol: Skill Acquisition and Generality Across Cups and Time

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# EVALUATION OF BEHAVIORAL SKILLS TRAINING (BST) TO TEACH COLLEGE STUDENTS TO POUR A STANDARD SERVING OF ALCOHOL: SKILL ACQUISITION AND GENERALITY ACROSS CUPS AND TIME

By

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## Abstract

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Binge drinking is prevalent among college students and is associated with a number of serious consequences. However, research suggests college students who count drinks and set drink limits are less likely to engage in binge drinking. In order to successfully use these tactics, college students must identify and pour standard servings of alcohol. Unfortunately, college students typically cannot identify or pour standard servings of alcohol. Behavioral Skills Training (BST), comprised of instruction, modeling, rehearsal, and feedback (Miltenberger, 2008), can be used to teach college students to pour standard servings of alcohol (Hankla et al., 2017). If effective, universities might consider incorporating BST into their mandated alcohol education courses. However, because of the time investment required for properly using BST to teach this skill, it is important to examine whether participants demonstrate maintenance of skills over time and generalization across untrained cups. In the current study we used a non-concurrent multiple baseline across participants research design that included generality assessments with two untrained stimuli (cups), different in shape, color, and volume. All three participants poured inaccurately during baseline. Following BST with the first trained cup, all three poured accurately into the trained cup, reproducing results from previous studies (Hankla et al., 2018; Schultz et al., 2019). During follow up, two participants poured accurately in all three

cups, and one participant poured accurately in one cup. This suggests, pending further data collection, that the skill of pouring standard servings of beer might maintain over time and generalize across untrained cups.

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| | |
|---|---|
| Oz | Ounces |
| ABV | Alcohol by volume |
| BST | Behavioral skills training |
| P-BST | Post behavioral skills training |
| Round | 18-oz round-bottomed red Solo ® cups |
| Square | 18-oz red square-bottomed Solo ® cups |
| Clear | 24-oz clear round-bottomed cups |
| IOA | Interobserver agreement |
| NIAAA | National Institute on Alcohol Abuse and Alcoholism |
| ACHA | American College Health Association |
| P | Participant |

# CHAPTER 1: INTRODUCTION

College students are at risk of engaging in binge drinking and excessive alcohol consumption, and these behaviors are associated with significant negative consequences (White & Hingson, 2019). For example, injuries most often associated with this type of drinking include being hit by a car, drowning, falling, and alcohol poisoning (Thompson & Huynh, 2017). Other risk factors associated with college student drinking include increased occurrences of sexual assault, sex without knowledge of consenting (Hingson, Zha, & Weitzman, 2009), development of alcohol use or abuse disorders, and negative effects on neurodevelopment and neurocognitive functioning (White & Hingson, 2019). Moreover, approximately 1,500 college students in the U.S. die each year due to alcohol-related injuries (NIAAA, 2018).

Binge drinking is defined as "five or more standard drinks for males and four or more standard drinks for females consumed within two hours," raising the Blood Alcohol Content (BAC) level above 0.8% (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2004, p. 3). In the U.S., a standard serving of alcohol contains 14 grams of pure ethyl alcohol, which is equivalent to approximately 12 ounces of beer (5% alcohol by volume), 1.5 oz of liquor (40% alcohol by volume), and 5 oz of wine (12% alcohol by volume). When surveyed, nearly 60% of college students reported drinking alcohol in the last 30 days, and of those, 40% reported binge drinking in the last 30 days (NIAAA, 2018). Survey research suggests college students who count drinks and set drink limits are less likely to engage in binge drinking (American College Health Association [ACHA], 2014). However, to successfully use these tactics, college students likely need to identify and pour standard servings of alcohol. Unfortunately, the data indicate these skills are not typically in a college student's repertoire (Furtwängler & de Visser, 2017;

Schultz et al., 2017; White et al., 2003, 2005), and the use of group designs have further clouded our understanding of this issue (Kohn et al., 2017).

BST has been effectively used to teach college students to identify and pour standard servings of beer (Hankla et al., 2018; Metz et al., 2016; Strickland & Kohn, 2020), and this skill appears to remain even in the presence of inaccurately pouring peers (Hankla, et al., 2018). However, BST is time-consuming and effortful, and little is known about whether skills acquired with training with one cup generalize to other untrained cups. A logical next step is to examine whether college students trained using one type of cup will demonstrate generalization of accurate pouring in untrained cups.

## Current Study

We used a concurrent multiple baseline across participants design with generality assessments across cups to examine whether skill generalization across untrained stimuli occurs without the need for further training. That is, we used a "program for generalization" method described by Stokes and Baer (1977). We first assessed for pouring in all three cups during baseline, presenting cups from most to least similar to the Round cup. Next, we trained college students to pour a standard serving of beer into one type of cup. Next, we examined if they required additional BST to accurately pour into two untrained cups or if their accurate pouring generalized to one or both untrained cups which differed along one or several physical dimensions from the trained cup.

Our choice of cups was based on the literature and an informal survey. College students are most likely to report drinking beer (DeVos-Comby & Lange, 2008) and least likely to pour beer inaccurately compared to other types of alcohol (Schultz et al, 2017). Additionally, Red Solo® party cups have been reported to be the most commonly used vessel present at college

parties (Silverman, 2011). We also informally asked 15 undergraduates at our university which types of cups were most common at the parties they attended, and they indicated the same Red Solo® party cups. Based on this information and published papers, we opted to use a round 18-oz Red Solo® party cup (e.g., Hankla et al., 2018; Metz et al., 2016; Schultz et al., 2019) and included a square 18-oz red Solo® party cup and a round 24-oz plastic cups to assess for generalization across untrained stimuli (cups) and time.

# CHAPTER 2: METHOD

## Participants and Setting

Although we intended to enroll a minimum of nine participants, five undergraduate students with an average age of 20.2 years (range 19–22 years) participated in the study. COVID-19 campus closures caused data collection to be cut short. We conducted the study in a laboratory room on the campus of the University of the Pacific.

We enrolled participants in the study if they met the inclusion criteria of being at least 18 years of age and a college student. Participants were excluded if they poured accurately into at least two cups during baseline.

## Materials

Materials included 18-oz round-bottomed red Solo ® (Round) cups, 18-oz red square-bottomed Solo ® (Square) cups, 24-oz clear round-bottomed (Clear) cups, a Taylor ® digital scale, plastic pitchers filled with tea to simulate beer, an iPhone for photographing measurement read outs, grab bag items worth $5, for example, colored gel pens, Starbucks gift cards, and notebooks, and an alcohol informational sheet outlining the risks of drinking (NIAAA, n.d.).

## Measurement and Interobserver Agreement (IOA)

The dependent measure in this study was poured volumes of water, dyed with tea to simulate beer, measured in fluid ounces (oz) and converted into a percentage deviation from the standard serving of beer (Hankla et al., 2018; Metz et al., 2016; Schultz et al., 2017). A standard serving of beer is 12 oz (5% ABV; NIAAA, n.d.). As in previous studies (Hankla et al., 2018; Metz et al., 2016, Strickland & Kohn, 2020), we defined accurate pours of beer as pours within

+/- 10% deviation from the standard serving, or between 10.8 oz and 13.2 oz; we defined inaccurate pours as those less than 10.8 oz or greater than 13.2 oz.

Each experimenter independently recorded the pour volumes of each participant's pour during baseline, BST, post-BST (P-BST), and follow-up phases. We compared 100% of both experimenters' recorded volumes and scored the recorded data as an agreement (i.e., the recorded volumes matched) or a disagreement (i.e., the recorded volumes do not match). To calculate IOA, we divided the number of agreements by the total number of agreements plus disagreements, yielding an IOA of 96.86%. One experimenter also took digital photos of the scale readout to serve as permanent product of pour volume and resolve any IOA discrepancies. After calculating IOA we compared the 4 disagreements to the photos to resolve them.

## Experimental Design

We used a multiple baseline across participants design and assessed for generality. We staggered baselines for each participant and introduced BST at different timepoints for each participant. We examined change in volume (oz) of each participant's free-pours of standard servings of beer after receiving BST. The general methodology for the free-pour component of the study are reviewed in the *General Procedures* section below.

## General Procedure

Participants began their first sessions by reading the consent form. The primary and secondary experimenters documented vocal consent from each participant. After consenting to participant, they each completed a demographics form (see Appendix B). Following completion of the form, the experimenter told each participant that they would be asked to pour into three different cups many times, and that the number of pours they would be asked to complete did not reflect the accuracy of the pours. We informed participants that sometimes they would receive

feedback and sometimes they would not. We described each item at the pour station, including pitchers filled with colored water to simulate beer, an 18 oz round-bottomed red Solo ® cup, an 18 oz square-bottomed red Solo ® cup, a 24 oz round-bottomed clear cup, a digital measuring tool with the readout facing the experimenters (i.e., out of view from the participant), and a phone to take photos of the digital readout. We informed participants that no part of them would be included in the photos.

To identify eligible participants, we asked each participant to provide a minimum of three baseline pours of a standard serving of beer into the three cups, always in the following order: an 18 oz round-bottomed red Solo ® cup (Round), then an 18 oz square-bottomed red Solo ® cup (Square), and lastly a 24 oz round-bottomed clear cup (Clear). We conducted sessions with individual participants only; we conducted no group sessions.

In total, five participants (Ps) provided baseline pours and three met inclusion criteria (P1, P2, and P3). P1 provided three baseline pours into each cup, P2 provided five baseline pours into the Round and Square cups and seven baseline pours into the Clear cup, and P3 provided seven baseline pours into each cup. Although P3 indicated previous free-pour training and bartending experience, we did not exclude P3 because P3 overpoured three times into the round cup, and five times into the clear cup during baseline. We excluded P4 and P5 because they poured accurately into two (P5) or all three (P4) cups during baseline.

The three eligible, consenting participants then received BST for the first cup. BST is described in more detail in the sections below. Directly following completion of BST, participants moved on to the first post-BST (P-BST) phase. In the first P-BST phase, participants poured a standard serving into the trained cup three times and we did not provide feedback. Once participants provided three, consecutive accurate pours in the trained cup, they

provided a minimum of three pours into the second and then third untrained cups (sequentially). Once we observed stable pouring for both untrained cups, participants received BST for the second untrained cup. We then repeated the same procedure with the second cup. No participant required BST for the third cup. However, if participants had poured inaccurately into the third cup, they would have received BST with this cup. Although this did not occur with the three current participants, it will remain part of the protocol when data collection resumes in Fall 2020 or Spring 2021.

The session ended once the participants poured accurately into all three cups during the final P-BST phase. Participants then completed a survey asking them to indicate which strategies, if any, they used to pour accurately. Following this, the experimenter thanked them for their time, provided a copy of the consent form (see Appendix C), and asked them to choose an item from the grab bag worth $5. The two excluded participants (P4 and P5) also completed the survey, were thanked for their time, given a debriefing form outlining the reason for their exclusion, provided an informational sheet (see Appendix D) and a copy of the consent form (see Appendix C), asked to choose an item from the grab bag worth $5, and excused from the study. The first session took between 30 and 45 min for each participant.

We asked the three eligible participants (P1, P2, and P3) to return for a follow-up session one week later at an agreed upon date and time. We also sent emails to remind participants of their follow-up appointments. During the follow-up session, we asked participants to pour a standard serving of beer three times into each of the cups in the same order used in baseline. P2 underpoured into the Square cup three times and received an additional round of BST. P1 and P3 poured accurately into all three cups during the follow-up session. After completing the follow-up pours, participants again described in writing any strategies they used to pour

accurately. Participants chose another item from the gift grab bag (items worth $5), received an alcohol informational sheet outlining the risks of drinking (NIAAA, n.d.) (see Appendix D), and were thanked for their time and participation. All participants attended their follow-up appointment; if they had not, they would have been emailed the information sheet. The follow-up session took between 10 and 20 min for each participant.

## Specific Procedures

### Behavioral Skills Training (BST)

Participants received BST after they completed their baseline pours into first the Round, then the Square, and then the Clear cups. Each participant stood at a table containing the first training cup. BST included four phases: instruction, modeling, rehearsal, and feedback (Hankla et al., 2018; Himle et al., 2004; Miltenberger et al., 2004). During the instruction phase, the experimenter informed each participant that the purpose of the BST is to aid the participant's ability to recognize and pour standard servings of beer, and that a standard serving of beer is 12 oz if that beer contains 5% alcohol by volume (ABV). During the modeling phase, the experimenter poured a standard serving of beer into the cup; the participant examined the pour while the cup remained on the table. During the rehearsal phase, we removed the cup from the table and then asked the participant to pour a standard serving of beer into the same, empty cup. During the feedback phase, the experimenter emptied the contents of the participant's cup into the measuring scale. Following this, the experimenter provided verbal feedback to the participant about his or her pour volume by stating that the pour was over, under, or accurate (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"). In order for participants to complete BST mastery criteria, we required that participants pour accurately three, consecutive times

during the rehearsal phase of BST (Casey & McWilliams, 2011; Hankla et al., 2018). If participants poured inaccurately during the rehearsal phase of BST, they immediately received an additional round of BST. Both P2 and P3 received an additional round of BST immediately following the first BST session and both provided three accurate rehearsal pours during the second round of BST.

**Procedural Integrity**

During all BST sessions, the secondary experimenter scored the primary experimenter's integrity of implementing BST (see Appendix E for the integrity checklist). We scored integrity 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 three and four until the participant(s) pour accurately across three consecutive pour trials or experimenter repeated group and individual BST as needed. We scored BST sessions for all participants and obtained an integrity score of 100%.

**Posttraining Survey**

Following BST, we asked participants to write "the strategies they used to pour accurately into untrained cups."

# CHAPTER 3: RESULTS

Figure 1 depicts results for participants who received BST on the left (P1, P2, and P3) and results for excluded participants on the right (P4 and P5). During baseline, P1 overpoured into all cups. During the P-BST phase, P1 poured accurately three consecutive times into the Round cup, followed by three consecutive underpours into the Square cup. In the Clear cup, P1 poured accurately three times with pour volumes trending downward; beginning with the fourth pour, P1 underpoured three times into the Clear cup. P1 next received BST with the Square cup and during the P-BST phase, P1 poured accurately into all three cups. At follow-up, P1 provided three accurate pours into each of the three cups and did not require additional BST.

During baseline, P2 over-poured five consecutive times into the Round cup, followed by five consecutive over-pours into the Square cup. P2 initially provided four accurate pours into the Clear cup, however, beginning with the fifth pour, P2 provided three, consecutive over-pours into the Clear cup. P2 received BST for the Round cup first; during the rehearsal phase, P2's second pour was an overpour and therefore P2 received an additional round of BST. After this additional round of BST, P2 poured accurately during the rehearsal phase and we moved on to the P-BST phase. During the P-BST phase, P2 provided three accurate pours into both the trained Round cup and the untrained Square cup and provided three underpours into the untrained Clear cup. After receiving BST with the Clear cup, during the P-BST phase, P2 poured accurately into all three cups. At the follow-up session, P2 provided three consecutive accurate pours into each of the three cups and did not require additional BST.

P2 provided seven baseline pours into each cup. P3's baseline pours into the Round and Clear cups fluctuated between over-pours and accurate pours; all seven of P3's baseline pours

into the Square cup were accurate. Because of the similarities between the Square and Round cups (i.e., same height, color, and volume), we decided to start BST with the Clear cup. During rehearsal with the Clear cup, P3 poured inaccurately and we provided an additional round of BST. During the second rehearsal, P3 poured accurately three consecutive times into the Clear cup and we moved on to the P-BST phase. During the P-BST phase, P3 poured accurately into all three cups. During the follow-up session, P3 provided three consecutive accurate pours into the Clear cup. P3 poured accurately twice in the Square cup, followed by three, consecutive, underpours of less than 0.25 oz, which were still considered "accurate", meaning P3 did not receive BST for the Square cup[1]. However, P3's pours into the Round cup hovered between accurate and slightly higher than our definition of an accurate pour and we decided to provide BST. During the rehearsal phase of BST for the Round cup, P3 poured three, consecutive, accurate pours. During the P-BST phase, P3 poured three consecutive, accurate pours into the Round and Clear cups. P3's pours into the untrained Square cup fluctuated between accurate and under pours, ending on accurate pours.

**Summary of Free-Pour Results**

P1 and P2 received BST first with the Round cup, after which P1 poured accurately into the untrained Clear cup and P2 poured accurately into the untrained Square cup; however, both provided inaccurate pours in their remaining untrained cup. P3 received BST first with the Clear cup, after which P3 poured accurately into the untrained Round cup without receiving BST, but

[1] During a research meeting held prior to the start of the study, we determined that pours which were with 0.25 oz of the lower end of accurate (i.e., 10.55 zo instead of 10.8 oz) would be considered accurate and BST would not be provided. We anticipated this issue based on Strickland's (2020) thesis data. We decided this would be acceptable for underpours only, as drinking slightly under a standard serving is far less consequential than drinking over a standard serving, and additional rounds of BST make it less appealing to participants.

not the Square cup. Thus, all three participants poured accurately into one but not both untrained cups after receiving BST for only one cup.

During follow-up, P1 and P2 provided three, consecutive, accurate pours into all three cups. P3 provided three, consecutive, accurate pours into the Clear cup, and two accurate pours into the Square cup, followed by three consecutive underpours. P3's pours into the Round cup hovered between accurate and slightly over our definition of an accurate pour, so we decided to provide BST. Following BST for the Round cup, P3 provided three consecutive accurate pours into the Round and Clear cups; P3's pours in the Square cup fluctuated between under pours and accurate pours, ending on accurate pours.

## Survey Responses

After completing BST and P-BST pours in the first session, we asked participants to describe in writing the strategies they used to pour accurately into untrained cups. All three participants reported that they visualized a line on the inside of the Round cup and pictured where that line would be in the Square and Clear cups. Additionally, one participant reported they also used the weight of the standard pour in the Round cup to estimate what the weight of a standard serving would be when pouring into the different cups. The two excluded participants also completed this survey after completing their baseline pours. Both of these participants also reported that they visualized where the line of an accurate pour in the Round cup would be in the Square and Clear cups to help them pour accurately into those cups.

# CHAPTER 4: DISCUSSION

We used a multiple baseline across participants design with generality assessments to examine the effects of Behavioral Skills Training (BST) on the acquisition, maintenance, and generalization of college students' accurate pouring of standard servings of beer. All three participants poured inaccurately during baseline. After receiving BST for the first cup, all three participants poured accurately into at least one, but not both untrained cups. During the follow-up sessions, P1 and P2 poured accurately into all three cups, and P3 poured accurately into one cup. Our results show that college students can pour accurately into untrained cups, at least to some extent, without programming for generalization.

## Generality and Generalization

In generalization across stimuli, or stimulus generalization, the response stays the same but the stimulus conditions change (Vladescu et al., 2020). Although participants showed some generality of skills across untrained cups, no participants' skills generalized across both cups without additional training. Based on these results, it may be helpful to determine the stimulus features of the cups that control responding. For example, Jones et al. (2005) trained college students to react (i.e., press a key) to one type of stimuli and then assessed how they would react when presented with two novel stimuli. Their data showed that the more dimensions along which the novel stimulus differed from the original stimulus, the less their participants exhibited stimulus generalization. Largely based on their data, we chose to present cups in baseline in order from most to least similar to the round red cup. First, we presented the Round cup, then the Square cup, and finally the Clear cup. We expected college students to demonstrate a greater degree of generalization with the untrained cup that differed along only one physical dimension

(e.g., shape; Round vs. Square) compared to the cup that differed along several dimensions (e.g., color, volume, and shape; Square vs. Clear). P2 followed this pattern, suggesting that the shape of cup, dimension of the cup, or details of the cup such as lines on the inside in order control accurate pouring across untrained cups. This shows that some stimulus generalization occurred. In order to program for greater stimulus generalization, it will be necessary to assess the specific dimensions to which participants are responding.

Moreover, when asked what, if any, strategies they used to pour accurately into the trained and untrained cups, all participants reported that they visualized a line on the inside of the each of the cups. It appears that participants' reported use of an imaginary line may have been somewhat effective; however, all three participants still required BST for a second cup, and no clear pattern emerged regarding the cup for which participants' accurate pouring generalized and the cup which required additional training. Because some skill generalization did occur, it may be that use of BST is time well spent. However, we will need to collect more data using the same procedures in order to draw firm conclusions.

**Program for Further Generalization**

Based on the results of the current study, a next step is to train for generalization in each untrained stimulus. For example, Vladescu et al. (2020) implemented skills training to teach healthy adults to provide accurate estimates of portion sizes of different foods, using equivalence training. Researchers trained participants to portion foods using a training plate, and measured portioning across a variety of vessels that were not used in training, such as a small plate, a bowl, and a plastic bag. All participants were able to provide more accurate portion sizes following training with both the trained and untrained vessels. An equivalence-based instruction, similar to that used by Vladescu et al. (2020) may lend itself to a study in which researchers teach college

students to pour accurate standard servings of alcohol in one cup, and program for generalization across different cups. In such a study, standard servings of alcohol in a measuring cup would serve as the A stimuli, the B stimuli would be the standard servings of alcohol in 12-oz round-bottomed Red Solo ® cup, and the C stimuli would be an 18-oz round-bottomed Red Solo ® cup. During baseline, participants would pour standard servings into an 18-oz round-bottomed Red Solo ® cup, an 18-oz red square-bottomed Solo ® cup, and a 24-oz clear round-bottomed cup. During training, participants would be taught AB and BA relations, then AC and CA relations. Then BC and CB relations would be tested. Following equivalence training, researchers would then assess pour volume in the untrained 18-oz red square-bottomed Solo ® cup, and the untrained 24-oz clear round-bottomed cup. Although equivalence training may increase accuracy in pouring standard servings of beer across different cups, this type of training may be impractical due to the time required to train and test for different relations. It may be more useful to train participants using BST for multiple cups and assess for pouring across more untrained cups in order to increase generalization across cups.

## Mediating Behaviors

Then again, stimulus generalization may not accurately capture why participants' behavior changed. Based on participants' reports of visualizing a line it is also possible that participants were engaging in covert verbal mediating responses in order to pour accurately. Mediating behavior or responses are defined as "behavior occurring between two instances of the response being studied...which is used by the organism as a controlling stimulus in subsequent behavior" (Ferster & Skinner, 1957, p. 729) and might have play a role in the transfer of accurate pouring to untrained cups. For example, Clough et al. (2016) studied vocal-blocking procedures and whether vocal-blocking would interfere with participants' ability to complete matching and

vocal response tasks. Blocking resulted in an interruption of covert vocal response behaviors while participants completed matching tasks, greatly reducing their ability to complete the task accurately. This suggests that mediating behaviors in the form of covert verbal responses assist in the completion of some tasks and when blocking procedures are introduced, these tasks will be disrupted (Clough et al., 2016). Therefore, if college students are using some type of covert verbal behavior to pour accurate standard servings of beer (e.g., counting, singing a specific song to mark time passing, or some other behavior that requires covert verbal behavior), having an interruption might lead to inaccurate pouring.

There are environmental stimuli present in drinking settings that might evoke or occasion competing private verbal responses, for example, music to which an individual sings along, or interruptions from other party goers. Therefore, it is important to know if pouring accurately in trained and untrained cup is a result of mediating behaviors, as it may be helpful to teach individuals specific strategies to pour accurately to decrease disruption of mediating behaviors. Researchers should work to identify whether stimulus generalization, mediating behaviors, or both are functionally related to students accurate pouring following into untrained cups. This will be helpful as we can more accurately determine what strategies to implement to increase the generality of pouring skills across cups and settings, such as teaching individuals to covertly sing part of a song to signify the time it takes to pour a standard serving of beer.

## Limitations

### Additional Data Collection

One limitation of this study is that our data was a bit inconsistent across participants, making it difficult to see clear experimental control, and we obtained only one clear replication of treatment effects (P1 and P2). Data collection for this study was cut short due to campus

closures caused by the COVID-19 outbreak. In order to determine if the trends in data seen between and within subjects would hold up across a wider sample, data collection will be continued in the fall 2020 semester using the same procedures. If additional data collection shows patterns that resemble the data we collected, and pouring behavior changes when and only when treatment is implemented, it may be concluded that BST is effective in teaching college students to pour standard servings of beer and that the accurate pouring behavior will translate to other, untrained cups.

**Reactivity and Setting**

P1 and P2 overpoured in all three cups during baseline. Following training in the Round Cup, both participants overcorrected and began under pouring into one of the untrained cups, perhaps as a reaction to being observed. This type of reaction is termed reactivity, defined as the "effects of an observation and measurement procedure on the behavior being measured" and a reaction that is most likely to occur "when measurement procedures are obtrusive, especially if the person being observed is aware of the observer's presence and purpose." (Cooper et al., 2020, p. 14). A small laboratory setting, such as the one used in the current study, might contribute to the occurrence of reactivity. Conducting pour assessments in a more naturalistic setting such as their fraternity or sorority houses (e.g., Strickland et al., 2020), or a bar setting in a laboratory (e.g., Schultz et al., 2019) might help reduce reactivity. Training college students to pour standard servings in one setting, and then measuring pouring across multiple settings would allow us to see if participants exhibit generalization across settings. Measuring pouring across untrained settings is also a way to measure social validity (Kennedy, 2002). Again, due to the time and resource requirements for conducting BST, it is important to know if this skill will generalize across settings, because if it does not, training students to pour standard servings of in

a laboratory setting may not be an effective use of time. Another way to address this would be to program stimuli into the training environment that are present in party settings. As self-report is an unreliable method to gather data on alcohol use, it is necessary to develop methodologies that include observation of actual behavior (Silvestri et al., 2014). For example, a realistic environment to accurately study behavior related to drinking games (Silvestri et al., 2014), or a bar setting in a laboratory room (Schultz et al., 2019). This will allow researchers to closely approximate drinking in a naturalistic environment and observe behavior instead of measuring self-report behavior.

**Type of Liquid**

In the current study, we used water colored with tea to simulate beer. One problem with this method is that the water does not foam the same way beer does, so the skill of pouring accurate servings of colored water may not translate directly to the skill of pouring accurate servings of foaming beer (Schultz et al., 2017). For example, Hausmen et al. (2014) found that college students who learned to portion one type of food could not accurately portion untrained foods of different shapes and types. Additionally, we only assessed beer pouring in the current study, which college students may be less likely to pour inaccurately (White et al., 2003; 2005), although that finding may be a misleading biproduct of aggregated data (Kohn et al., 2017). With increasing ABV in beer, it is becoming increasingly important to teach college students to pour beer accurately. A future direction based on the data collected in this study would be to measure pours of non-alcoholic beer, compared to dyed water, and examine the extent to which one or both types of liquids improve skill generalization. If use of water does not facilitate generalization of pouring actual beer, training students to pour standard servings of beer using water as a training liquid may not be an effective use of time.

**Generality Across Time**

We only collected follow-up data one week after the first session, meaning we do not know if accurate pouring would generalize across a longer period time. This is important because BST was somewhat time-consuming; if the skill of pouring accurately into multiple cups does not maintain, the time spent implementing BST may not be very useful. To date, no studies have assessed pouring or portioning skill maintenance over long periods of time (Vladescu et al., 2020). Some evidence exists that skills learned via BST do maintain over time. For example, Miltenberger et al. (2005) implemented BST to improve safety skills to decrease gun play in children and children's safety skills maintained three months after they received training. Therefore, a future direction based on the data collected in this study would be to measure follow up pours across a greater amount of time.

**Application**

Research suggests college students who count drinks and set drink limits are less likely to engage in excessive or risky drinking (ACHA, 2014). In order to successfully use these tactics, college students must know how to identify and pour standard servings of alcohol. Unfortunately, the data indicate these skills are not typically in college students' repertoires (Furtwängler & de Visser, 2017; Schultz et al., 2017; White et al., 2003, 2005). Some research suggests that in addition to lacking the ability to adhere to drink limit recommendations (i.e., inability to recognize or pour a standard serving of alcohol), college students also lack the motivation to adhere to these recommendations (Furtwängler & de Visser, 2017). However, before motivation can be assessed, the first step is to see if the skills are teachable and generalizable. The results of previous research, as well as the current study, suggest that college students can be taught to pour standard servings of beer (Hankla et al., 2018; Strickland & Kohn,

2020), and when taught, training can generalize to untrained cups. Based on our results, the next step in encouraging the use of protective drinking strategies is to see if once taught to pour standard drink servings, if college students utilize pouring skills to count drinks and adhere to drink limits. If not, it may be necessary to implement motivational interviewing in order to motivate students to utilize accurate pouring skills to use protective drinking strategies.

## Final Summary

Despite these limitations, the results of this study are promising. Based on these data BST has the potential to be a strategy to teach college students to pour accurate standard servings of beer. As we collect more data, and these same trends are seen across more participants, we may see that BST is in fact an effective use of time, as participants' accurate pouring can generalize to untrained cups, making the time investment of BST worthwhile.

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APPENDIX A: FIGURE 1

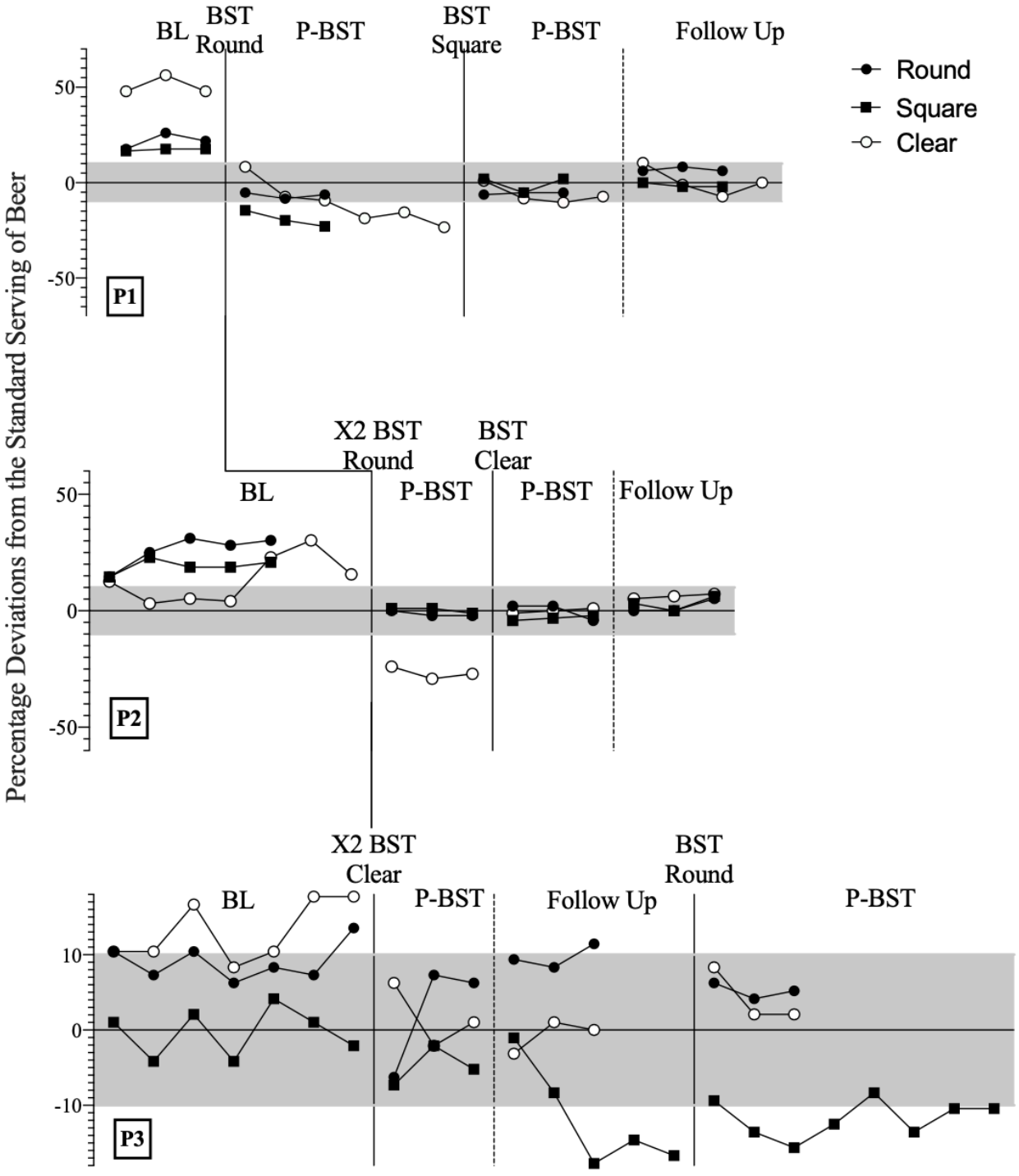

*Figure 1.* The graphs depict a multiple baseline across participants, with a multiple probe across cups. These graphs represent data for one group of three participants. The x-axis represents the free-pours within and across phases for a single participant. The y-axis represents the percent deviation from a 12 oz standard serving of beer. The grey bar represents accurate pours within a 10% deviation of an accurate standard serving of 12 oz. Each data point depicts a single free-pour of a standard serving of beer. The pours above the grey bar represent over pours exceeding 13.2 oz. The pours below the grey bar represent under-pours less than 10.8 oz. Each round of BST is indicated by a vertical line. BL refers to the baseline phase, X2 BST refers to two rounds of BST completed in a row, and P-BST refers to the post BST phase. For P3, the two round data points and the three clear data points resting on the gray bar in baseline were overpours.

# APPENDIX B: DEMOGRAPHICS SURVEY

## Demographics

**Age**: _____

**Ethnicity**: _____

**Gender**: _____

**Year in School**:
- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior
- ☐ Graduate

---

**What is your drink of choice? [choose all that apply]**
☐ Beer ☐ Wine ☐ Liquor ☐ Mixed Drinks ☐ Other _____ ☐ I do not drink alcohol

**Have you ever been a bartender?**
☐ Yes ☐ No

---

**Do you have any previous alcohol training?**
☐ Yes ☐ No

**If yes, what course(s) have you taken?**
☐ University Alcohol Training ☐ e-CHUG ☐ Greek EDU ☐ Level 1

☐ Alcohol Pour Training ☐ Other: _____

**Please briefly describe what you learned in this course:**

| | | | |
|---|---|---|---|
| How many ounces are in a single (standard) serving of **beer**? | | How many ounces are in a single (standard) shot of **liquor**? | |
| How many ounces are in a single (standard) serving of **wine**? | | How many ounces of liquor are in a single (standard) **mixed drink**? | |

---

**In the past <u>6 months</u>, have you consumed beer, wine, shots, or mixed drinks?**

☐ Yes ☐ No

**IN THE PAST <u>2 WEEKS</u>:**

| | | | |
|---|---|---|---|
| How many single (standard) servings of **beer** did you consume? | | How many single (standard) shots of **liquor** did you consume? | |
| How many single (standard) servings of **wine** did you consume? | | How many single (standard) servings of **mixed drinks** did you consume? | |

APPENDIX C: INFORMED CONSENT

**INFORMED CONSENT**

*Evaluation of behavioral skills training (BST) to teach college students to pour a standard serving of alcohol: Skill acquisition and generality across time and cups*

My name is Margaret Brock and I am a graduate student working under the supervision of Dr. Carolynn Kohn, my research supervisor and a faculty member in the Department of Psychology at the University of the Pacific. You are invited to participate in a research study aimed at gaining a better understanding of students' ability to pour a standard serving of beer. You are eligible to participate in this study because you are a college student at least 18 years of age.

The purpose of this research study is to teach college students to pour accurate standard servings of beer, and to see if that training will transfer to other, untrained cups. If you decide to participate, you will be asked to pour water tinted with tea into three different plastic cups. Your pours will be measured using a digital scale and the readout on the digital scale will be photographed to ensure accurate data collection; photos will be taken only of the digital readout. Your participation in this study will include the session today and a follow-up session in approximately a week. Today's session should take about 45 minutes. The follow-up session should take 10-30 minutes.

The risks associated with participation in this study are minimal and no more than would be experienced in everyday life. Steps will be taken to minimize these risks by providing a positive learning environment and keeping any information obtained in connection with this study and that can be identified with you confidential and will be disclosed only with your permission. Measures to ensure your confidentiality will be our first priority. The data and information you provide will be identified using a participant number that will never be linked with your name, and all data collectors are all trained to fully uphold confidentiality laws and will not reveal data collected to any unauthorized persons. The data obtained will be maintained in a safe, locked location and will be destroyed after a period of five years after the study is completed. All digitial material will be maintained in a password protected database.

There also may be some benefits to this research, particularly that you have a chance to increase your knowledge of standard servings of beer and your skills to pour appropriate serving sizes, as well as gain beneficial health information about alcohol consumption. As a small compensation for your time, we will provide you with a "grab bag" of inexpensive items and you will have the opportunity to choose an item at the end of each session.

Your participation is entirely voluntary and your decision on whether or not to participate will involve no penalty or loss of benefits to which you are otherwise entitled. If you do decide to participate, you are free to discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

If you have any questions about the research at any time, please contact me at m_brock1@u.pacific.edu, or my faculty advisor Dr. Carolynn Kohn at (209) 946-7316. If you have any questions about your rights as a participant in a research project please call Human Subjects Protection, University of the Pacific (209) 946-3903.

Your name below indicates that you have read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent at any time and discontinue participation at any time, that you will receive a copy of this form, and that you are not waiving any legal claims, rights or remedies, and that you are at least 18 years old.

# APPENDIX D: ALCOHOL FACTS 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 Alochol**

In accordance with the National Institue 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

# APPENDIX E: EXPERIMENTER INTEGRITY RATING

Behavioral Skills Training

Experimenter: _____

Rater: _____

P#: _____

Cup # and type: _____

Date:_____

| **Step** | **Description** The Experimenter: | **First round (Y/N)** | **Repeat 1 (Y/N)*** | **Repeat 2 (Y/N)*** |
|---|---|---|---|---|
| Instruction | • Provides rationale for learning the skill<br>• States a standard serving of beer is 12 oz (5% ABV) | YES NO | YES NO | YES NO |
| Modeling | • Pours a standard serving<br>• Asks P to approach the cup and examine the pour | YES NO | YES NO | YES NO |
| Rehearsal 1 | • Asks the participant to pour a standard serving | YES NO | YES NO | YES NO |
| Feedback 1 | • Provides comparative feedback for the pour | YES NO | YES NO | YES NO |
| Rehearsal 2 | • Asks the participant to pour a standard serving | YES NO | YES NO | YES NO |
| Feedback 2 | • Provides comparative feedback for the pour | YES NO | YES NO | YES NO |
| Rehearsal 3 | • Asks the participant to pour a standard serving | YES NO | YES NO | YES NO |
| Feedback 3 | • Provides comparative feedback for the pour | YES NO | YES NO | YES NO |
| Repeat | • Repeats BST if P does not pour 3 consecutive accurate rehearsal pours | YES NO | YES NO | YES NO |

*Complete if BST is repeated