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Evaluating the Effects of Feedback on College Students' Self-Reports of Alcohol Consumption and Standard Drink Free-Pours

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By

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Abstract

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Excessive alcohol consumption is a widespread concern among many college campuses. Most of the data on the prevalence and adverse consequences associated with college drinking are gathered from self-report surveys, which require respondents to have a knowledge of standard drink sizes. Unfortunately, the reliability and validity of these data are questionable because college students are typically unable to define or pour standard drinks. Efforts to improve college students' self-reported alcohol consumption are warranted. Some researchers suggest that we can improve self-reports of alcohol consumption by providing college students with feedback on the accuracy of their standard drink free-pours (White et al., 2005). However, the evidence supporting the use of feedback to improve the validity of self-report is limited by aggregate data, lack of repeated measures, evaluation of only one type of beer, and no evaluation of the effects of feedback on observable behavior (e.g., free-pour). The current study replicated White et al. (2005) using a single-case design and repeated measures to examine the effects of feedback on college students' self-report as well as their free-pours. Results showed feedback improved the accuracy of college students' free-pours of standard servings of beer containing 5% alcohol by volume (ABV); however, this skill did not generalize to pouring standard servings of a higher ABV (8%) beer. Unlike White et al. (2005), the feedback had little effect on college students' self-reported alcohol consumption. Future researchers should use a similar single-case

design to evaluate if feedback on various types of alcohol (such as beer, wine, and liquor) systematically affects college students' self-reports. If so, this feedback could potentially be used as a method to improve the reliability or validity of college students' self-reported alcohol consumption, and potentially lead to more accurate evaluations of alcohol reduction interventions.

Keywords: self-report, alcohol consumption, standard drink, college students

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CHAPTER 1: INTRODUCTION

Alcohol consumption among college students is a major public health concern. Each year, an estimated 1,500 college students die from alcohol-related injuries, over 600,000 college students are assaulted by another person who had been drinking, and 97,000 college students experience alcohol-related sexual assault (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2023a). In addition, excessive drinking is strongly associated with college students' reports of poor academic performance, including missing class, low test grades, and low overall course grades (White & Hingson, 2013).

To reduce the prevalence of excessive drinking, college administrators and researchers often enroll high-risk students in alcohol education courses or interventions. These interventions include educating students about standard drink sizes (e.g., Hustad et al., 2010; Lovecchio et al., 2010; Paschall et al., 2011), providing students with personalized feedback on the alcohol content of their standard drink free-pours (e.g., de Visser, 2015), and providing normative feedback informing students that they overestimated the amount of alcohol their peers regularly consume (e.g., Agostinelli et al., 1995; Alfonso et al., 2013; Doumas & Andersen, 2009).

Although these interventions are often described as successfully reducing college students' subsequent alcohol consumption, there are reasons to be skeptical about these data. First and foremost, the effectiveness of these interventions is determined primarily from self-report data. Typically, college students are prompted to complete an alcohol consumption survey before and after receiving the intervention in order to assess changes in their self-reported drinking behavior. College administrators and researchers who use these surveys rely on the assumption that college students can first identify a standard drink, and subsequently accurately

report the number of standard drinks they consumed within a certain time frame (Schultz et al., 2017). However, college students typically are unable to identify or pour a standard drink (Bauer et al., 2021; Carruthers & Binns, 1992; de Visser, 2015; de Visser & Birch, 2012; Hankla et al., 2017; Metz et al., 2017; Mian et al., 2021; Schultz et al., 2017; Strickland & Kohn, 2022; White et al., 2005; Zandy et al., 2013). Moreover, there is relatively low correspondence between college students' definitions and free pours of standard servings (Kohn et al., 2017). College students' inability to accurately define and pour standard servings of alcohol significantly compromises the reliability and validity of self-report surveys that are used to evaluate intervention outcomes and gather data on college drinking.

Although self-report measures have significant limitations, researchers and college administrators continue to rely on them. Therefore, it seems worthwhile to focus on methods to improve the accuracy of college students' self-report. The free-pour assessment, an observable behavioral measure, might be a promising method to improve their accuracy. During a free-pour assessment, college students are prompted to pour one standard serving of alcohol (known as a "knowledge of standard drink volume" assessment) or to pour the drink that they would typically pour for themselves (known as a "typical consumption" assessment). Although there is an abundance of literature on using the free-pour assessment to assess college students' ability (or lack thereof) to pour standard drinks (e.g., Bauer et al., 2021; de Visser, 2015; de Visser & Birch, 2012; Hankla et al., 2017; Kohn et al., 2017; Metz et al., 2017; Mian et al., 2021; Schultz et al., 2020; Strickland & Kohn, 2022; White et al., 2003; Zandy et al., 2013), there is limited research on using free-pour tasks to examine, or potentially improve, the accuracy of self-report.

White et al. (2005) conducted one of the few studies incorporating the free-pour assessment in conjunction with self-report surveys to examine the effect of corrective feedback

on college students' self-reports of drinking. Participants first reported how much alcohol they consumed during the previous 2 weeks and then free-poured what they considered to be a standard serving of beer, wine, liquor, and mixed drinks into three cups of differing volumes (e.g., 16 oz, 20 oz, and 32 oz cups during the beer free-pour task). Following the free-pours, half the participants read an information sheet regarding the consequences of underage drinking (i.e., the "control" group) while the other half received feedback on the accuracy of their standard drink free-pours (i.e., the "feedback" group). This feedback consisted of a researcher defining a standard drink for each of type of alcohol, showing the participant an empty cup with a line indicating a standard drink for each alcohol in each cup, and informing the participant of the actual number of standard servings in their free-pours (e.g., stating that their 16 oz free-pour of beer is equivalent to 1.33 standard servings). Immediately after reading the information sheet or receiving feedback, all participants completed the same alcohol use survey that was administered during baseline. Overall, the feedback group's self-reported alcohol consumption increased by 12.4% after receiving feedback, whereas the control group did not change their self-report (White et al., 2005). White et al. (2005) suggested these results indicate we can reduce the discrepancy between college students' self-reported alcohol consumption and their true alcohol consumption by educating them about standard drink sizes.

Although this study demonstrates that college students' self-report can be influenced by feedback, there are some important limitations related to the methodology. First, as with much of the free-pour assessment literature (e.g., Bauer et al., 2021; de Visser, 2015; de Visser & Birch, 2012; Mian et al., 2021; Schultz et al., 2017; White et al., 2003; Zandy et al., 2013), White et al. (2005) took a single measure of participants' pours during the free-pour task. Without the use of repeated measures, the reliability of the data is questionable because one free-pour may not be

representative of an individual's actual pouring behavior (e.g., Hankla et al., 2017; Strickland & Kohn, 2022). Relatedly, White et al. (2005) did not examine the effect of feedback on free-pours; that is, they only compared changes in self-report, but not changes in something more observable and possibly more valid, such as changes in free-pour volumes.

Second, White et al.'s (2005) conclusions are limited by the type of alcohol used during the free-pour tasks. To date, most (if not all) of the free-pour assessment literature defines an accurate standard serving of beer as 12 oz (e.g., Bauer et al., 2021; Hankla et al., 2017; Kohn et al., 2017; Metz et al., 2017; Schultz et al., 2017; Strickland & Kohn, 2022; White et al., 2005; Zandy et al., 2013), but this definition only applies if the beer contains 5% alcohol by volume (ABV). Beers with higher alcohol content have become increasingly popular (Bernot, 2022), yet despite this growing preference for beers with higher ABV, to our knowledge, there are no research studies published in which participants are prompted to pour a standard serving of beer containing a higher alcohol content.

Third, and perhaps most important, White et al (2005) reported their data as averages, which is a common practice in much of the free-pour assessment literature (e.g., Agostinelli et al., 1995; Brunk et al., 2020; de Visser 2015; Schultz et al., 2017; White et al., 2003; Zandy et al., 2013). Averages or aggregate data often mask important variability (e.g., Hankla et al., 2017; Kohn et al., 2017) and may not even be representative of any individual data points (e.g., Fischer et al., 2023). This is problematic because the purpose of most interventions is to reduce an individual's excessive drinking practices (e.g., Agostinelli et al.,1995; Alfonso et al., 2013; Doumas & Andersen, 2009; Hennessy et al., 2019; Hustad et al., 2010). If these limitations can be addressed, the free-pour assessment might be a useful method for improving the reliability, and possibly the validity, of self-report measures.

Therefore, the purpose of this study was to replicate the method of White et al. (2005) and extend it using repeated measures and a single-case experimental design. We examined the effects of feedback on college students' self-reported alcohol consumption and on their subsequent free-pours, in terms of both individual and group data. Additionally, we assessed whether the skill of pouring accurate standard servings generalized to a higher ABV beer.

CHAPTER 2: METHOD

Participants and Setting

We recruited participants via word of mouth, email announcements in undergraduate psychology courses, and paper flyers posted around campus. To be included in the study, participants had to be at least 18 years old, enrolled in a college or university in Northern California, and report consuming alcohol during the previous 2 weeks. Participants were excluded from the study if they were under 18 years old, poured accurate standard drinks during baseline, or reported zero alcohol consumption during the previous 2 weeks. We defined an accurate standard drink as pouring within a 10% deviation from a standard serving (de Visser, 2015; Kohn et al., 2017; Metz et al., 2017; Strickland & Kohn, 2022).

Initially, 26 undergraduate college students contacted us about participating in the study. However, three participants failed to show up for their session and another 11 participants were ultimately excluded for the following reasons: they reported no alcohol consumption in the previous 2 weeks (n = 6), they poured accurate standard drinks (n = 4), or they incorrectly completed the alcohol consumption questionnaire (n = 1). Ineligible participants were thanked for their participation, completed a pour influence survey, given a $5 gift card or small prize, and then dismissed from the study. This resulted in a total of 12 participants (7 females and 5 males). All participants reviewed, signed, and were given a copy of the consent form prior to the start of the experiment.

Participants ranged in age from 18 to 24 years old (M = 20.42 years old, SD = 1.44 years) and reported their class standings as freshmen (n = 1), sophomore (n = 4), junior (n = 3), and senior (n = 4). Participants were asked to report their ethnicity in an open-ended self-described

format, and they reported the following: White (*n* = 3), Caucasian (*n* = 1), Latino (*n* = 1), Hispanic (*n* = 3), Mexican (*n* = 1), Filipino (*n* = 1), Vietnamese (*n* = 1), and mixed (*n* = 1). Participants were also asked to report their gender in the same open-ended self-described format, and they reported the following: male (*n* = 5) and female (*n* = 7). No participants reported any previous experience working as a bartender, but three participants reported previous alcohol training. This training consisted of GreekLifeEdu (Everfi, n.d.), alcohol pour training, or an online alcohol education course that was provided to undergraduate students. Despite participating in these trainings, all three participants poured inaccurately during baseline and were therefore eligible for the study.

Sessions took place in a laboratory room located in the Psychology department which was devoid of distracting stimuli. The room was furnished with a table, chairs, and the study materials described below. All sessions lasted between 25 to 35 min. At the conclusion of the session, participants were given a $5 gift card or a small prize of similar value (e.g., pencils, pens, small notebook).

Materials

The materials used in this study included a demographics survey, alcohol consumption questionnaire, 18 oz round red Solo® cups (with square bottoms), digital scale measuring cup, plastic pitchers filled with water, tea bags to color the water, and a smartphone camera used to take pictures of the digital pour readout. Although White et al. (2005) used three different cup sizes (i.e., 16 oz, 20 oz, and 32 oz) during the beer free-pour tasks, we only used 18 oz red Solo® cups because this is the cup and volume most commonly used at college parties (Silverman, 2011), and using three different cups would have added substantially to the time commitment for each participant because of the repeated measures component of our study. Participants in prior

research noted that being asked to provide repeated measures for multiple cups was aversive (Strickland & Kohn, 2022).

Demographics Survey

Participants completed a demographics survey at the beginning of the study to gather basic information about their ethnicity, gender, age, undergraduate or graduate status, prior training related to pouring alcohol or experience working as a bartender, and whether they had consumed alcohol during the previous 2 weeks.

Alcohol Consumption Questionnaire

We provided participants a calendar of the previous 2 weeks, akin to the Timeline Followback calendar (Sobell et al., 1996; Sobell & Sobell, 2004), and asked them to indicate the number of drinks of each type of alcohol (i.e., beer, seltzers, wine, shots, mixed drinks, and other) they consumed each day. At the end of this questionnaire, we asked participants to report the number of ounces contained in a standard serving of 5% ABV and 8% ABV beer. We chose to use 5% ABV beer because it is the most commonly used beer in the free-pour assessment literature (e.g., Bauer et al., 2021; Hankla et al., 2017; Kohn et al., 2017; Metz et al., 2017; Schultz et al., 2017; Strickland & Kohn, 2022; White et al., 2005; Zandy et al., 2013). We also included 8% ABV beer because in recent years there has been an increasing demand for beer containing higher alcohol content (Bernot, 2022), yet there is little research using beers with higher alcohol concentrations. Similar to White et al. (2005), participants also reported the number of ounces in standard servings of hard seltzers, wine, shots, and mixed drinks to examine if participants revised these definitions after being provided with feedback on their free pours. All participants completed this questionnaire using paper and pencil three times throughout the

course of the experiment: once during baseline, once after reading an NIAAA information sheet, and once after receiving feedback on their free-pours.

NIAAA Information Sheet

All participants read an information sheet published by the NIAAA regarding underage drinking (NIAAA, 2023b). The information sheet was five pages long and took participants about 5 min to read. The information contained on this sheet included statistics about the prevalence of underage drinking, the consequences of underage drinking, and how to prevent underage drinking. At the time of data collection, the most recent version of this information sheet had been published in 2021, but this sheet was updated in March 2023. Although the statistics have been updated to reflect more recent years, the content and facts have remained the same.

Feedback Sheet

After delivering verbal feedback about the accuracy of their free-pours, we gave participants a sheet that contained written information similar to the verbal feedback they received, and included illustrations published by the NAAA depicting various types of drinks (e.g., beer, wine, malt beverage) and definitions of standard drink sizes for each illustrated drink (NIAAA, n.d.). On the second page, the researcher wrote the volumes that participants poured during their baseline free-pours for the 5% ABV beer and the ratio of their free-pour volumes to standard drink sizes. This feedback sheet took participants about 3 min to read.

Post-Pouring Survey

At the end of the session, we asked participants to complete a written survey regarding what, if anything, influenced their pouring during the free-pour assessments, how often they pour their own drinks, the types of drinking vessels from which they typically consume alcohol, and

how likely they would be to use the skills they learned during the study during future drinking episodes. After the eighth participant, we modified the survey to include two questions asking the remaining four participants to report the definition of "ABV" and how ABV affects standard drink sizes. We added these questions because we observed several participants pouring larger volumes for the 8% ABV beer than the 5% ABV beer, even after receiving feedback and reading the information sheet on standard drink sizes.

Research Design

We evaluated the effects of the information sheet and feedback on participants' free-pours and self-report using a nonconcurrent multiple-baseline across participants design (Ledford, 2022; Slocum, Joslyn, et al., 2022; Slocum, Pinkelman, et al., 2022; Smith et al., 2022). We assigned participants to baseline groups of three free-pours, five free-pours, or seven free-pours. Embedded within this multiple baseline design was an ABC treatment design that was implemented for each participant ("A" indicating baseline, "B" indicating post-information sheet, and "C" indicating post-feedback).

Procedure

Pre-Screening Procedure

After reviewing the informed consent form and agreeing to participate in the study, participants completed a demographics questionnaire where they indicated if they recently consumed alcohol in the previous 2 weeks, which would determine their eligibility in the study .

Baseline

Eligible participants completed an alcohol consumption questionnaire using paper and pen. Afterward, they completed free-pour tasks for 5% and 8% ABV beer. To simulate beer, we filled two pitchers with water and colored the water with tea bags to obtain a yellow beer-like

tint. The same two pitchers were used for both 5% and 8% ABV beer free-pours; the purpose of using two pitchers was to ensure that the participant had enough liquid to complete their baseline free-pours, and to reduce the overall session length by allowing the participant to pour from one pitcher while the experimenter poured previous free-pours back into the other pitcher during the information and feedback phases. The two pitchers were placed on the table in front of the participant along with one 18 oz red Solo® cup. The digital measuring scale was placed on the table in front of the experimenter with the digital readout facing away from the participant. Participants were instructed to pour a standard serving of 5% ABV beer until their pours stabilized. We defined stability as at least three consecutive pours that were all overpours, all accurate pours, or all underpours. Each free-pour was labeled with a number corresponding to the order in which it was poured and set aside for future use during the feedback phase (described in more detail below).

We determined each participant's assignment in the multiple baseline design based on their initial free-pours. If a participant's baseline free-pours stabilized at the third, fifth, or seventh free-pour, they proceeded with the next step. If a participant's free-pours stabilized at four or six pours, they were prompted to pour one more time and were assigned to the five or seven baseline pour group, respectively. However, to evenly distribute participants across all three pour groups, we also monitored and assigned participants to baseline pour groups as needed. For example, five participants (P7, P8, P12, P16, and P18) all stabilized at the third free-pour, but they were already assigned to the five or seven baseline pour group prior to the start of their session to ensure the same number of participants across each pour group. After free-pours for the 5% ABV beer stabilized, participants were informed that they would now be pouring an 8% ABV beer and were then prompted to pour a standard serving of 8% ABV beer one time as a

generalization probe. P11 did not provide a generalization probe for the 8% ABV beer during baseline due to experimenter error.

NIAAA Information Sheet

After completing baseline, we gave participants an NIAAA information sheet (NIAAA, 2023b) regarding the consequences of underage drinking and instructed them to read the information sheet to themselves. All participants finished reading the sheet within 5 min. We then asked participants to complete another alcohol consumption questionnaire. This phase was meant to be a replication of the "information sheet control condition" described by White et. al (2005). Afterward, participants were asked to pour a standard serving of 5% ABV beer three times. If their free-pours stabilized after three free-pours, they were prompted to pour a standard serving of 8% ABV beer one time. If their pours were not stable after the third free-pour, they were allowed up to two more free-pours. We used this limit of five free-pours to minimize the amount of time the participant spent practicing inaccurate pouring. P2 was the only participant to pour more than three times. P2's free-pours reached stability after the fourth free-pour, after which they were asked to pour a standard serving of 8% ABV beer.

Feedback

We delivered feedback to participants regarding their baseline free-pours. This feedback consisted of three components. First, the researcher placed an empty cup with a solid black line on the inside of the cup in front of the participant, informed the participant that the line indicated a standard serving of 5% ABV beer, and instructed the participant to examine the cup. Next, the researcher placed the participant's last three baseline pours on the table in front of them. Only the participant's last three stable free-pours were used during the feedback phase because this was the criterion used to determine the stability of their pours and their eligibility to remain in

the study. This also standardized the calculation across participants. The researcher verbally defined an accurate standard serving of 5% ABV beer (i.e., 12 oz) and stated how much the participant poured. The researcher also stated whether the participant underpoured or overpoured a standard serving. Lastly, the researcher gave the participant an information sheet (NIAAA, n.d.) regarding accurate definitions of standard servings of alcohol. This information sheet also listed the volumes that the participant poured during their last three free-pours and the ratio of their poured drinks to standard drinks. For example, if a participant poured 14.5 oz, the researcher recorded this amount on the feedback sheet and converted this amount to 1.21 standard servings of 5% ABV beer. Participants only received feedback regarding the accuracy of their free-pours for 5% ABV beer, and not 8% ABV beer, to allow for some assessment of generalization of feedback across a beer with a different ABV.

Immediately after receiving feedback, participants completed the same alcohol consumption questionnaire. The purpose of completing the questionnaire again was to see if participants changed their self-report after receiving feedback but not after reading general information about the harmful effects of underage drinking (e.g., White et al., 2005). Participants were then prompted to pour a standard serving of 5% ABV beer three times. If the participant provided three accurate pours, they were prompted to pour a standard serving of 8% ABV beer one time. Participants were then informed that they poured accurate standard servings of beer if that beer contains 5% ABV, asked to fill out a post-pouring survey, thanked for their participation, given a choice of a $5 gift card or a small prize of similar value, and given a copy of the consent form and the two NIAAA information and feedback sheets.

Model Stimulus Training

If participants provided one or more inaccurate pours after receiving feedback, they received model stimulus training (Metz et al., 2017; Strickland & Kohn, 2022), consisting of instruction, modeling, and rehearsal. During the training, the researcher poured one standard serving of 5% ABV beer into a red Solo® cup and stated that this cup contains one standard serving of beer (i.e., 12 oz). Participants were then allowed to hold and examine the cup. Next, participants were prompted to pour a standard serving of beer while the model cup was placed next to their cup to use as guidance during the free-pour task (Metz et al., 2017; Strickland & Kohn, 2022). During model stimulus training, participants poured the 5% ABV beer three times. Next, the model cup was removed, and participants were prompted to pour the 8% ABV beer one time.

Four participants (P6, P12, P14, and P16) received model stimulus training. After receiving feedback on their 5% ABV free-pours, P6 provided one overpour followed by two accurate pours, therefore we provided them with model stimulus training because their first free-pour was inaccurate. We later modified the procedure and allowed participants (P12, P14, and P16) a total of four free-pours after feedback. This allowed us to better examine experimental control because it is unclear if model stimulus training had any effect on P6's pouring behavior because they had already provided two accurate pours prior to receiving model stimulus training. In other words, P6 received model stimulus training but this training may not have been necessary because they demonstrated the ability to pour accurately during their second and third free-pours after feedback. Participants 12, 14, and 16 all received model stimulus training because they were unable to consistently pour accurate standard servings of 5% beer after feedback.

Interobserver Agreement (IOA)

A second experimenter was present during all sessions and recorded participants' pour volumes during the free-pour task. The secondary experimenter also took photos of the digital pour read-out. IOA was calculated by dividing the number of agreements by the number of agreements and disagreements on pour volumes between the two experimenters. If both experimenters disagreed on a participants' pour volume, the volume from the digital pour read-out would have been scored, but this never happened. IOA between the two experimenters was calculated for all pour volumes and was 100%.

CHAPTER 3: RESULTS

Free-Pours of Beer

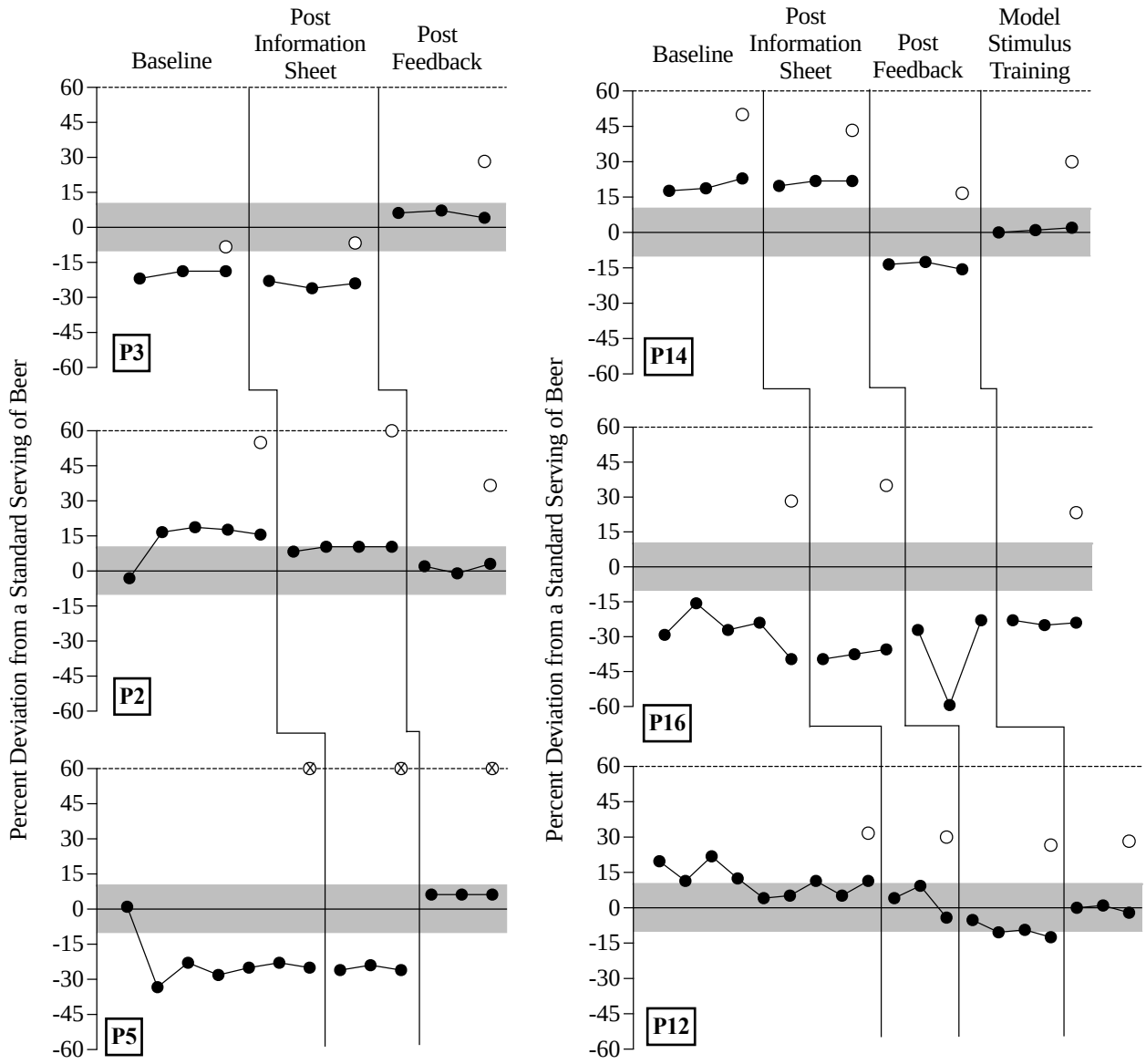
Figure 1 depicts participant's free-pours for standard servings of 5% ABV and 8% ABV beer during baseline, after reading an information sheet, after receiving feedback on the accuracy of their 5% ABV beer free-pours, and, if applicable, during model stimulus training. During baseline, five participants underpoured a standard serving of 5% ABV beer; three of these participants poured an accurate serving of 8% ABV beer, and two overpoured the 8% ABV beer. Seven participants overpoured a standard serving of 5% ABV beer, and six of these participants also overpoured a standard serving of 8% ABV beer. Due to experimenter error, one participant (P11) did not provide an 8% ABV pour during baseline. After reading the information sheet, with the exception of P12 who poured 5% ABV beer accurately, most participants' free-pours remained inaccurate and similar to their baseline pours. Pours for P2 and P8 were closer to 12 oz but were still overpours.

After receiving feedback, 8 of 12 participants poured three consecutive accurate standard servings of 5% ABV beer. Among those who poured accurately, only one participant (P7) poured an accurate standard serving of 8% ABV beer. After feedback, P6 provided one overpour followed by two accurate pours, therefore they received model stimulus training because their first free-pour was inaccurate. Another three participants (P12, P14, and P16) underpoured a standard serving of 5% ABV beer, therefore they also received model stimulus training. During model stimulus training, three participants (P6, P12, and P14) provided three consecutive accurate pours for a standard serving of 5% ABV. One participant (P16) continued underpouring

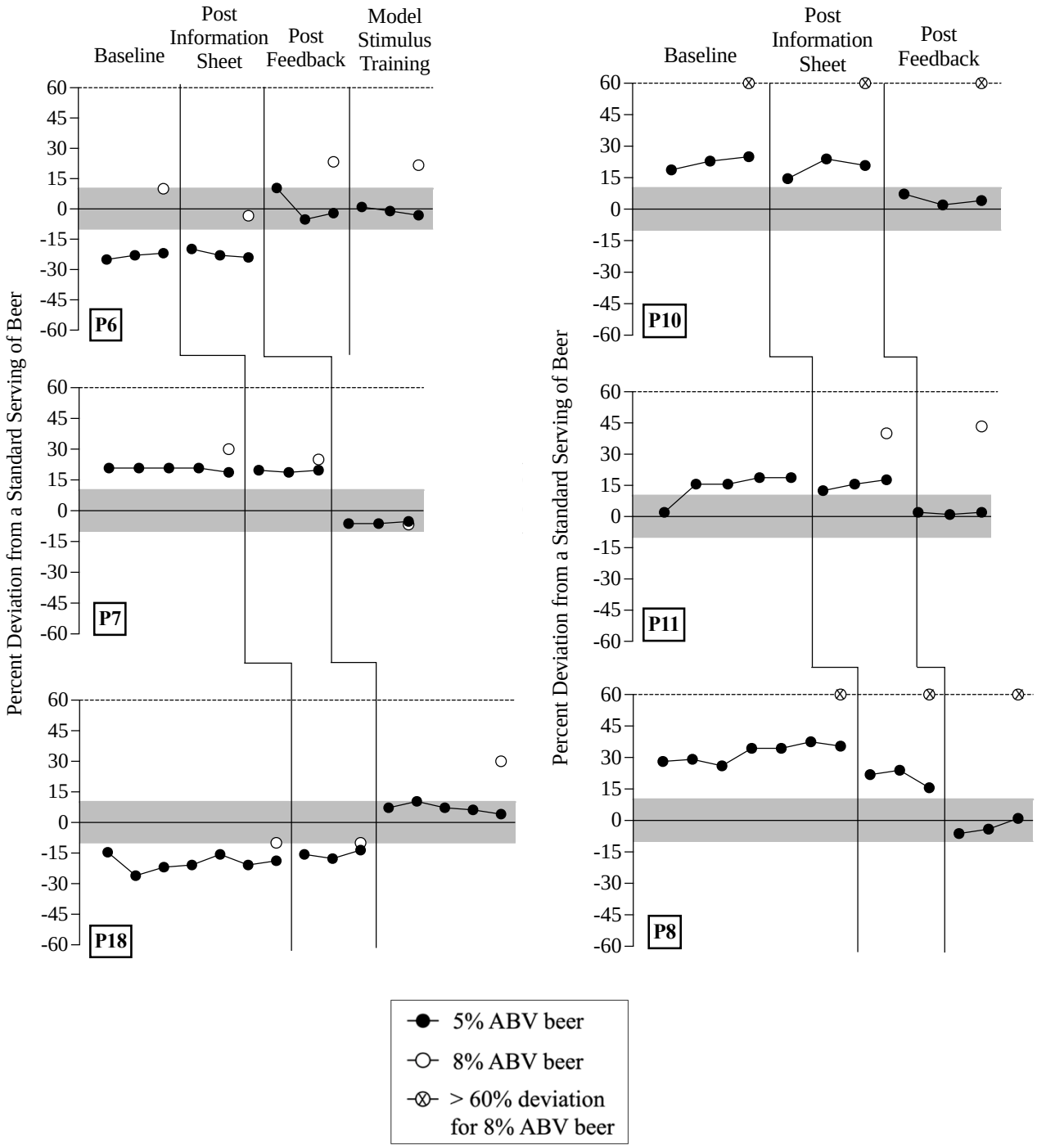
even when they were allowed to use the model cup as guidance during the free-pour task. No participants who received model stimulus training poured 8% ABV beer accurately.

Figure 1

Individual Data of Free-Pours of Standard Servings of Beer



(Figure 1 Continued)



(Figure 1 Continued)

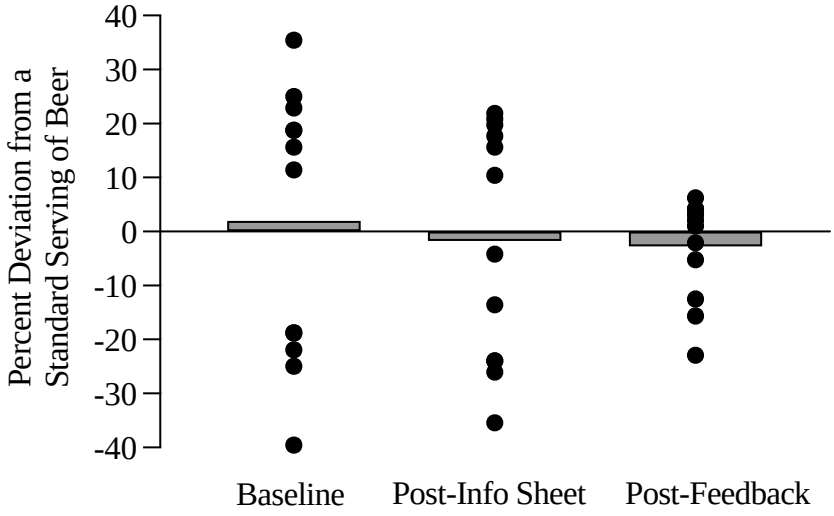
Note. Each individual data point represents one free-pour converted into a percent deviation from a standard serving of beer (12 oz if that beer contains 5% ABV; 7.5 oz if that beer contains 8% ABV). The gray shaded range indicates an accurate standard serving defined as a +/- 10% deviation from a standard serving volume. The dashed line represents the percent deviation for a free-pour volume of 12 oz if that beer contains 8% ABV beer.

Free-Pours of Beer: Comparison of Single and Group Level Data

Figure 2 depicts a comparison of individual data and group means. When examining the group means, which is how data are typically presented in the free-pour assessment literature, (e.g., Agostinelli et al., 1995; Brunk et al., 2020; de Visser 2015; Schultz et al., 2017; White et al., 2003, 2005; Zandy et al., 2013), the data suggest that participants poured accurate standard servings of 5% ABV beer during baseline, after reading an information sheet, and after receiving feedback. However, the data depicted by the group means are misleading and contrary to the individual data points. During baseline, no participants poured an accurate standard drink of 5% ABV beer; seven participants overpoured a standard drink and five participants underpoured a standard drink. After reading an information sheet, only one participant provided an accurate pour; six participants continued overpouring and five participants continued underpouring. After receiving personalized feedback, 9 of 12 participants provided an accurate pour, and three participants underpoured.

Figure 2

Individual and Group Data of Free-Pours of Standard Servings of Beer



Note. Individual data points represent a participant's last free-pour of a standard serving of 5% ABV beer during each phase. Dark gray bars represent this same data depicted as group means. The light gray shaded range indicates an accurate standard serving defined as a +/- 10% deviation from a standard serving volume.

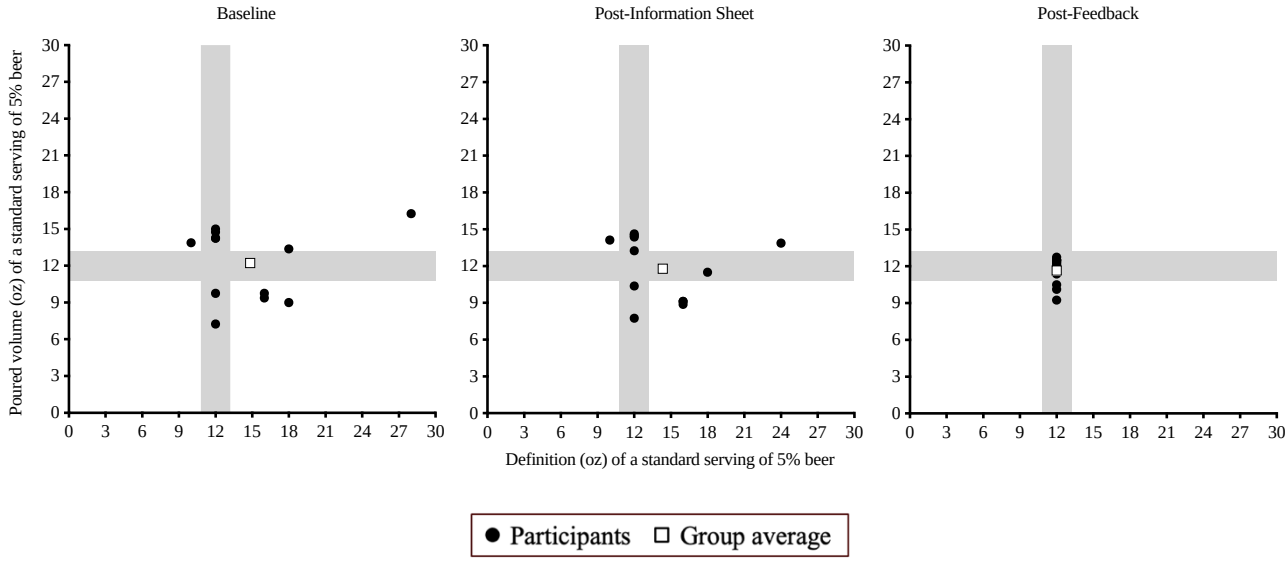
Correspondence Between Definitions and Free-Pours

Figure 3 depicts the correlation between participants' definitions and their last free-pour of a standard serving of 5% ABV beer in each phase. During baseline, six participants (P7, P10, P11, P14, P16, and P18) accurately defined a standard serving of beer as 12 oz, but none provided accurate free-pours. Seven participants (P3, P5, P6, P8, P12, P16, and P18) provided definitions that were greater than their free-poured volume, and five participants (P2, P7, P10, P11, P14) provided definitions that were less than their free-poured volume. No participants' pours matched their definitions. After reading an information sheet, there remained little correspondence between participants' definitions and last free-pours. Seven of the participants

(P3, P6, P7, P10, P14, P16, and P18) provided definitions and free-pours that were very similar to their baseline responses. The other five participants (P2, P5, P8, P11, P12) revised their definitions and/or free-pours, which resulted in a slightly lower discrepancy between their definitions and free-poured volume. Despite this slight improvement, all participants' still demonstrated poor correspondence between definitions and free-pours. After receiving feedback, all participants accurately defined a standard serving of 5% ABV beer and all but three participants (P12, P14, and P16) poured accurate servings during their final free-pours.

Figure 3

Correspondence Between Definitions and Free-Pours



Note. Correspondence between participants' definitions and their last free-pour of a standard serving of 5% ABV beer during baseline, after reading an information sheet, and after receiving feedback. The gray shaded range indicates an accurate standard serving defined as a +/- 10% deviation from a standard serving volume. Closed circles represent individual participants and open squares represent this same data depicted as group means.

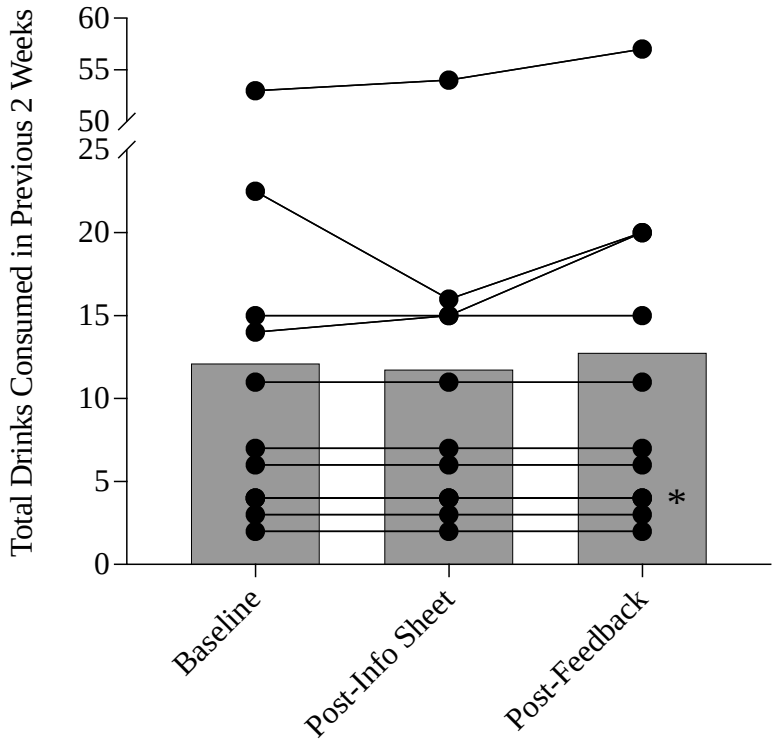
Self-Reports of Alcohol Consumption

Figure 4 depicts participants' self-reported alcohol consumption during each phase. Nine participants reported the same number of standard drinks consumed in the previous 2 weeks across all phases of the study. Of the three participants who did change their self-report (P6, P8, P10), no clear patterns were observed. For example, P6 (who underpoured during baseline) reduced their self-report by 6.5 drinks after reading the information sheet, but then increased this number by four drinks after being provided with feedback. This resulted in a total decrease of 2.5 drinks from baseline to post-feedback. P8 and P10 (who both overpoured during baseline) increased the number of drinks they reported consuming by one drink after reading the information sheet and then increased this number by another three and five drinks, respectively, after receiving feedback.

Changes in group level data from baseline to feedback were minimal. During baseline, participants reported consuming an average of 12.13 standard drinks in the previous 2 weeks. After reading an information sheet, this number slightly decreased to 11.75 drinks. After receiving feedback, the average number of drinks consumed slightly increased to 12.75 drinks, a total increase of 0.62 drinks from baseline, or an overall increase of 5.11%.

Figure 4

Self-Reported Alcohol Consumption



Note. Participants' self-reported alcohol consumption in the previous 2 weeks. A "*" indicates three participants with the same number of drinks they reported consuming. The gray bars represent the group means across each condition.

Definitions of Standard Servings

Table 1 depicts participants' definitions for standard servings of 5% ABV beer (12 oz), 8% ABV beer (7.5 oz), hard seltzer (12 oz), wine (5 oz), shots (1.5 oz), and mixed drinks (1.5 oz). Six participants (P7, P10, P11, P14, P16, and P18) accurately defined a standard serving of 5% ABV beer during baseline. After reading an information sheet, five of these participants (P7, P10, P14, P16, and P18) continued providing accurate definitions, but P11 provided a definition that was less than 12 oz. On the other hand, P2 accurately revised their definition, resulting in a

total of six accurate definitions after participants read the information sheet. After receiving feedback, all participants provided accurate definitions. With regards to defining a standard serving of 8% ABV beer, no participants provided accurate definitions during baseline, after reading an information sheet, or after receiving feedback.

Five participants (P6, P10, P11, P12, and P18) accurately defined a standard serving of a hard seltzer during baseline. After reading an information sheet all five participants continued providing accurate definitions, in addition to P2 accurately revising their baseline definition, resulting in a total of six accurate definitions. After feedback, only four of these participants (P6, P10, P11, and P18) continued reporting accurate definitions. However, P3 accurately revised their definition after feedback, resulting in a total of five accurate definitions after feedback.

Only one participant (P3) accurately defined a standard serving of wine during baseline and after reading an information sheet. After receiving feedback, eight participants (including P3) accurately defined a standard serving of wine. Additionally, only one participant (P11) provided an accurate definition for a standard serving of liquor during baseline and after reading an information sheet. After receiving feedback, eight participants (including P11) provided accurate definitions. Two participants (P11, P12) provided an accurate definition for a standard serving of a mixed drink during baseline. After receiving feedback, only P12 continued providing an accurate definition. After feedback, these same two participants (P11, P12) were the only participants to provide accurate definitions.

Table 1

Participants' Definitions of Standard Servings of Alcohol in Ounces (oz)

Participant	5% ABV Beer (12 oz)	8% ABV Beer (7.5 oz)	Hard Seltzer (12 oz)	Wine (5 oz)	Shot (1.5 oz)	Mixed Drink (1.5 oz)
			Baseline			
2	10	12	8	4	2	2
3	16	12	16	5	1	8
5	18	25	16	10	4	8
6	16	12	12	10	4	11
7	12	10	10	3	1	3
8	28	36	16	40	46	34
10	12	12	12	6	2	6
11	12	8	12	9	1.5	1.5
12	18	18	12	12	4	1.5
14	12	8	8	3	1	5
16	12	6	10	7	5	2
18	12	8	12	8	1	8
			Post-Information Sheet			
2	12	10	12	6	2	4
3	16	12	16	5	1	6
5	16	20	16	10	4	10
6	16	12	12	10	4	12
7	12	10	10	3	1	3
8	24	36	20	36	40	28
10	12	12	12	6	2	6
11	10	7	12	9	1.5	12
12	18	12	12	8	4	1.5
14	12	8	8	3	1	5
16	12	16	8	9	2	5
18	12	8	12	8	1	5
			Post-Feedback			
2	12	10	8	4	1.5	2
3	12	9	12	5	1.5	6
5	12	16	10	5	4	10
6	12	10	12	5	1.5	8
7	12	9	10	5	1	4
8	12	20	4	5	10	6
10	12	12	12	8	1.5	6
11	12	9	12	5	1.5	1.5
12	12	12	8	4	1.5	1.5
14	12	8	8	5	1.5	3
16	12	5	5	4	2	3
18	12	8	12	5	1.5	5

Responses to Post-Session Survey

Table 2 depicts participants' responses to the post-session survey that was completed after completing all the free-pour tasks. Participants were asked to report how often they pour their own drinks using a Likert scale (1 – Never, 2 – Rarely, 3 – Sometimes I pour, Sometimes others pour for me, 4 – Most of the time, 5 – Every time). No participants reported that they "Never" or "Rarely" pour drinks for themselves. Three participants (25%) reported that they sometimes pour their own drinks, six (50%) reported that they pour their own drinks most of the time, and three (25%) reported that they pour their own drinks every time.

Participants were also asked to report what drinking vessel they most often consume alcohol from using an open-ended format. Eight participants (67%) reported they consume alcohol from Red-Solo cups, 10 participants (83%) reported they consume alcohol from cans or bottles, and one participant (8%) reported that they consume alcohol from glass cups. Due to the open-ended format, there were more responses than participants because many participants reported consuming out of several types of vessels.

Table 2

Participants' Responses on the Post-Session Survey

Question	Response	*n*	*%*
How often do you pour your own drinks?	1 (Never)	0	0%
	2 (Rarely)	0	0%
	3 (Sometimes I pour, Sometimes others pour for me)	3	25%
	4 (Most of the time)	6	50%
	5 (Every time)	3	25%
What drinking vessel do you most often consume alcohol from?	Red-Solo cups	8	67%
	Cans or bottles	10	83%
	Glass cups	1	8%

Note. The number of responses to the second question totals more than 12 participants because this question was presented as a free-response, therefore many participants reported consuming out of several drinking vessels.

CHAPTER 4: DISCUSSION

We replicated and extended White et. al (2005) by collecting repeated measures of free-pours within a nonconcurrent multiple-baseline across participants design to examine college students' definitions of standard servings of alcohol, their free-pours for standard servings of 5% and 8% ABV beer, and their self-reported alcohol consumption in the previous 2 weeks. We compared participant definitions, free-pours, and self-reports at baseline, after reading an information sheet about underage drinking, and again after receiving feedback on their standard drink free-pours. We also extended White et al. (2005) by measuring any changes in participants' definitions and free-pours after reading the information sheet and after receiving feedback. Lastly, we compared individual data with group means to examine how well group means reflect individuals' data.

Effects of Feedback on Definitions and Free-Pours

At baseline, most participants were unable to provide accurate definitions of standard servings for 5% and 8% ABV beers, hard seltzers, wine, and shots. Most participants were also unable to pour an accurate standard serving of 5% ABV and 8% ABV beer. Consistent with previous research (Kohn et al., 2017), there was little correspondence between participants' definitions and their free-pours of standard servings of beer. In other words, participants' definitions for standard servings of beer did not match the amount of alcohol they poured, nor was it consistently inaccurate in the same direction. These findings are concerning given the widespread use of alcohol consumption surveys that rely on college students' ability to report their consumption of standard servings of alcohol accurately. This also suggests that there is no

straightforward way to adjust for inaccurate reporting, as there was significant variability regarding participants' free-poured volume with no clear pattern in overpours or underpours.

During the information phase, we provided participants with an NIAAA information sheet that contained facts about underage drinking, which has served as a control condition against which an intervention is compared (White et al., 2005). Despite some revisions in their definitions after reading the information sheet, most participants continued reporting inaccurate definitions for standard servings of 5% and 8% ABV beer, hard seltzers, wine, and a shot. Furthermore, the correspondence between participants' definitions and free-pours remained low, similar to baseline. This suggests that simply providing general information to students about the dangers of underage drinking does not necessarily improve the accuracy of their definitions and free-pours of standard drinks. This aligns with data suggesting that simply providing information is inadequate to promote behavior change (DeJong et al., 2009; Hingson, 2010; Kelly-Weeder et al., 2011; Stockings et al., 2016).

During the feedback phase, we told participants the number of ounces in one standard serving of 5% ABV beer, whether they underpoured or overpoured a standard serving, and we showed them an empty cup with a line indicating the volume for a standard serving. We also provided a feedback sheet that contained the conversion of their free-poured volume to the number of standard drinks, as well as the definitions of a standard serving of various types of alcohol. After receiving this feedback, all participants accurately defined a standard serving of 5% ABV beer as 12 oz. Even though all participants received the same feedback sheet that contained standard drink definitions for different types of alcohol, only 8 of 12 participants provided accurate wine and shot definitions. Additionally, only two participants accurately defined a standard serving of a mixed drink, five participants accurately defined a standard

serving of a hard seltzer, and no participants were able to accurately define a standard serving of 8% ABV beer, which is not surprising given that the feedback sheet did not contain a standard drink definition for this type of beer. Furthermore, most participants' definitions for the 8% ABV beer (range: 8 to 20 oz) were greater than an actual standard serving (i.e., 7.5 oz). These results suggest that college students are unable to accurately define standard servings of alcohol unless the definitions are explicitly taught to them.

At the very least, the feedback did appear to improve the correspondence between their definitions and free-pours, with most participants accurately defining and pouring a standard serving of 5% ABV beer after receiving corrective feedback. Another potential method for improving the correspondence between college students' definitions and free-pours is to use behavioral skills training to teach college students to accurately pour standard drinks. Although BST might be a helpful strategy (Hankla et al., 2017; Strickland & Kohn, 2022), it can be a time-consuming procedure (Strickland & Kohn, 2022). Although no studies have reported the length of time it took to provide individual BST for pouring standard servings of beer, most studies using BST likely require more than 3 min. Our feedback was delivered in less than 3 min, therefore, this might be a more efficient, but still effective, way to teach college students about standard drink sizes and reduce the discrepancy between their definitions and free-poured volume.

Although feedback can be used to improve the accuracy of college students' definitions and free pours of standard servings of 5% ABV beer, this effect does not appear to generalize to higher ABV beer. Only one participant (P7) provided accurate free-pours for both 5% and 8% ABV beers after receiving feedback. At the very least, most participants (n = 11) adjusted their free-pours in the direction that would be expected. In other words, participants who underpoured

the 5% ABV beer during baseline increased the amount of alcohol they poured for the 8% ABV beer after feedback, and participants who overpoured during baseline decreased how much they poured after feedback. Despite this self-correction, all participants (excluding P7) continued pouring inaccurately for the 8% ABV beer. Because generalization across beers of different ABVs was not observed, these results suggests that college students can only pour accurate standard servings of beer if they receive corrective feedback on that specific beer. However, further research is still needed to examine what effect this feedback has on other types of alcohol (e.g., wine, liquor, mixed drinks) at the individual level or if minor adjustments to the feedback might facilitate better generalization (Stokes & Baer, 1977).

Comparison of Individual and Group Data

Our results also highlight the importance of individual data analyses. Currently, the standard practice in the free pour literature, and the alcohol treatment outcome literature more broadly, is to present only group means, sometimes accompanied by standard deviations or standard error bars (e.g., Bauer et al., 2021; Brunk et al., 2020; White et al., 2003; Zandy et al., 2013). If we were only present the group mean of participants' free-pours (as shown in Figure 2), we would assume that participants poured accurate standard drinks of 5% ABV beer during baseline, after reading an information sheet, and after receiving feedback. When looking at the aggregate data of the correspondence between participants' free-pours and definitions (Figure 3), we would inaccurately conclude that, although college students lack the ability to define a standard serving of beer, they can accurately pour a standard serving. However, the individual data points across both graphs reveal that no participant poured accurate standard servings during baseline, and most were unable to pour accurately after reading an information sheet. Our data

further highlights the concern that aggregate data masks any variability within the data set and does not provide an accurate representation of all (or even one) participants' pouring behavior.

College Students' Understanding of ABV Labels

Our results suggest that participants lacked an understanding of ABV percentages and how these affect standard drink sizes, a crucial component of pouring a standard serving. In behavioral terms, the ABV percentage did not appear to function as a discriminative stimulus because it did not evoke a change in participants' pouring behavior. Many participants poured standard servings of 8% ABV beer equal to or higher than their pours of 5% ABV beer. Given the significantly higher alcohol content of 8% ABV beer, this is concerning. Starting with P12, when participants (n = 4) were asked to state the meaning of "ABV" and how ABV percentage affects standard drink sizes, they all provided inaccurate responses. Some participants reported that "ABV" stands for "alcohol beverage vessel" or "alcoholic beverage volume." When asked to explain how the ABV percentage affects standard drink sizes, no participants could correctly explain that drinks with higher ABVs require fewer ounces to constitute one standard serving. For example, one participant reported that a higher ABV requires more ounces to make a standard serving.

Our results are similar to other findings showing that undergraduate students do not understand the meaning of ABV percentages (Brunk et al., 2020). Labeling alcoholic beverages with standard drink labels instead of traditional ABV labels appears to improve the accuracy of a person's alcohol content estimation (e.g., Hobin et al., 2018; Osiowy et al., 2015; Stockwell et al., 1991). For example, when adults in Australia were asked how many standard drinks would be consumed if they finished an entire container of alcohol, participants responded more accurately when the container displayed a standard drink label compared to an ABV percentage

label (Stockwell et al., 1991). Similar studies conducted among Canadian adults have also demonstrated that adults provide more accurate estimations when provided with a standard drink label (Hobin et al., 2018; Osiowy et al., 2015). More recently, Brunk et al. (2020) demonstrated that U.S. college students can more accurately pour one standard serving if they are shown a standard drink label instead of an ABV percentage label. Unfortunately, nearly all alcoholic beverages in the United States are labeled with ABV percentages, not standard servings. Given the potential that standard drink labels have to improve the accuracy of consumers' standard drink free-pours or estimation of alcohol content, U.S. policies should require that all alcoholic beverages be labeled with a standard drink label, similar to how the Food and Drug Administration (FDA) requires and regulates standard serving labels on food and medications (Brunk et al., 2020). Although policy change in alcohol labeling practices in the United States should be pursued, this can be an expensive and time-consuming procedure. Thus, we may want to focus on more immediate changes, such as teaching college students about ABV percentages and examining whether this improves the accuracy of their self-reported drinking.

Effects of Feedback on Self-Report

Although feedback can be an effective method for improving college students' ability to pour standard drinks, it is unclear whether feedback can be used to improve the accuracy of their self-reported alcohol consumption. Contrary to White et al. (2005), all but three participants in our study did not change their self-report after reading an information sheet or after receiving feedback. Three participants changed their self-report by a small amount after reading the information sheet (mean change = 2.8 drinks) and a larger amount after receiving feedback (mean change = 4 drinks), all in the direction of feedback. In other words, participants who underpoured a standard drink during baseline reported less alcohol consumption after feedback,

and participants who overpoured a standard drink during baseline reported more alcohol consumption after feedback.

There may be a variety of factors that contributed to the differences in self-report changes between our study and White et al. (2005). Unlike White et al. (2005), we did not provide participants with feedback across several types of alcohol (i.e., beer, shots, wine, and mixed drinks). Instead, we only provided participants with feedback regarding the accuracy of their free-pours for 5% ABV beer to limit the session length and the amount of time spent pouring. However, only seven participants reported consuming beer in the previous 2 weeks, and only two of these seven participants who consumed beer changed their self-report. These results suggest that feedback for one type of alcohol might not generalize to other alcohol types or even different strengths of beer. Another explanation could be that the instructions on the alcohol consumption questionnaire were not clear or that participants misinterpreted the purpose of the study and therefore responded a certain way. For example, P8 reported they thought the purpose of the study was to evaluate if college students can recall their previous alcohol consumption and examine if they can keep their self-report responses consistent each time they are asked, therefore they tried to report the same number of drinks across all three questionnaires. It is possible that additional participants may have also misinterpreted the purpose of the study and kept their self-reports consistent across phases.

However, our aggregate data were not that different from White et al.'s (2005). Thus, it could be that the means described by White et al (2005) are not representative of most participants, only a few. Our study included fewer participants (N = 12) than their study (N =133, or n = 69 in the feedback group). Without examining the individual data from White et al.'s (2005) study, it is not possible to determine how many participants in their study reported

the same alcohol consumption in each condition. It is possible that a majority of White et al.'s (2005) participants did not alter their self-report even after receiving feedback, and rather a few outliers may have skewed the group average in a direction that would make it appear that the feedback influenced participants' self-report. This is yet another reason to examine both individual data and group means.

Limitations and Future Research

Feedback did not appear to have a meaningful effect on college students' self-report behavior. However, several limitations might account for this. Similar to White et al. (2005), we did not require participants to track their drinking behavior prior to participating in our study. Although the accuracy of participants' self-report in our study may be limited because we did not prompt them to track their alcohol consumption, this is something commonly found in the college drinking literature (e.g., Alfonso et al., 2013; Bauer et al., 2021; de Visser, 2015; de Visser & Birch, 2012; Doumas & Anderson, 2009; Hustad et al., 2010; Mian et al., 2021; Schultz et al., 2020; White et al., 2003, 2005; Zandy et al., 2013). However, because there is some evidence that prompting respondents to track their drinking behavior decreases inaccuracies in self-report responses (Midanik, 1982, 1988), this method should be considered in future research.

To replicate White et al.'s (2005) method as closely as possible, we did not require participants to engage in an observable behavior to ensure that they actually read the NIAAA sheet containing standard drink definitions during the feedback phase (e.g., we did not have participants read the sheet out loud). Therefore, it is possible that not all participants read the definitions because they were not aware that they would be tested on the material contained in this sheet. This possibility is supported by the observation that quite a few participants in our study were not able to accurately define a standard serving of wine or a shot after reading the

material, even though these definitions were provided on this sheet during the feedback phase. Future studies should require participants to read the definitions sheet out loud, or at the very least inform participants that they would be tested on the material so that this statement might act as a discriminative stimulus for reading the definitions sheet.

During the alcohol consumption questionnaire, almost half of our participants did not report consuming any beer in the previous 2 weeks. Thus, it is possible that their self-report was not affected by our feedback because the feedback pertained only to the accuracy of their beer free-pours, and not about the types of alcohol they reported consuming recently. In comparison to our data indicating a 5.11% increase, White et al. (2005) reported a 12.4% increase in the number of standard drinks consumed after participants were provided with feedback. However, because of the group design and aggregate data presented by White et al. (2005), we are unable to determine how many participants in White et al.'s (2005) study also reported the same amount of alcohol consumption before and after receiving feedback. It is possible that most participants in White et al.'s (2005) study did not change their self-report, but a few outliers may have skewed the data and made it appear that the feedback had a more meaningful effect than it actually did. Future studies should use a similar single-case design to examine if feedback on standard drink free-pours for different types of alcohol affects college students' definitions, free-pours, and self-report behavior.

Another limitation is that, similar to the majority of previous studies (e.g., Heatherly et al., 2023; Schultz et al., 2017), we did not use a foaming liquid to simulate beer and instead used flat, tea-colored water. It is not clear how participants' free-pours might have been affected by this deviation because beer typically produces a foamy layer which may obscure the amount of liquid poured into a red-Solo®. Future studies might benefit from adding a foaming component

to their beer simulation by using carbonated water colored with tea or non-alcoholic foaming beer cup (Schultz et al., 2017).

Our sample also contained more females (n = 7) to males (n = 5). However, this does not differ much from the current population of college students. More females are enrolled in college than males, with females making up almost 60% of the entire college population in the United States (National Center for Education Statistics, 2022). At the University of the Pacific, females make up 58% of the population, therefore it is not surprising that more of our participants were females than males. Historically, males have generally consumed more alcohol than females, but in recent years females are consuming more alcohol than males (Substance Abuse and Mental Health Services Administration, 2021). Therefore, it is possible that our female-dominant sample might not be representative of the general college student population. Despite this potential limitation, this is consistent with the free-pour assessment literature in which females generally comprise a greater portion of the sample sizes (see Schultz et al., 2017 for a literature review of free-pour assessments).

Lastly, recruitment challenges limited the number of participants included in our study. Over the course of 7 months, we actively recruited participants by posting flyers around campus, emailing announcement in class, and by word of mouth. During this time, 26 college students contacted us about participating in this study, but only 12 of these students were eligible and completed the study. Thus, it is unclear how representative our participants are of college students in the general research literature.

Overall, our study provides support for the use of corrective feedback to improve the accuracy of college students' standard drink free-pours of 5% ABV beer. Furthermore, this feedback appeared to greatly improve the correspondence between college students' definitions

and free-pours. However, our results did not replicate those of White et al. (2005) because most participants in our study did not change the number of drinks they reported consuming in the previous 2 weeks. This observation could be due to a variety of reasons, including the fact that many participants in our study did not consume any beer in that time period, and our participants did not receive feedback on other types of alcohol that they recently consumed. Future researchers should use a similar single-case design to evaluate if feedback on various types of alcohol (such as beer, wine, and liquor) has an effect on college students' self-report. If so, this feedback might be used as a method to improve the reliability or validity of college students' self-reported alcohol consumption, and potentially lead to more accurate evaluations of alcohol reduction interventions. Additionally, researchers should evaluate potential methods to teach college students about ABV percentages and examine if this knowledge improves their ability to pour standard drinks that vary in alcohol content.

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Appendix A: Informed Consent

My name is Alondra Del Real 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 with the purpose of evaluating college students' ability to pour standard servings of beer. You are eligible to participate in this study because you are a college student at least 18 years of age. If you decide to participate, you will be asked to pour water tinted with tea (to simulate beer) several times throughout the study. Sometimes you will receive feedback on your free-pours, but other times you won't. You will also be asked to read a brief NIAAA informational sheet during the study and complete an alcohol consumption questionnaire. Your pours will be measured using a digital scale and we will take pictures of the digital readout to ensure accurate data collection, but no identifiable body part will be included in the pictures. Your participation in this study will take approximately 25 to 45 minutes.

The risks associated with participation in this study are minimal and no more than would be experienced in everyday life. To maintain confidentiality, the data and information you provide will be identified by only a participant number. All data collectors are all trained to fully uphold confidentiality 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 digital material will be maintained in a password protected database.

The benefits of participating in this study include learning about standard drink sizes and the consequences associated with drinking. As a small compensation for your time, we will provide you with a $5 Starbucks gift card or the choice of one item from a "grab bag" of similar value items. Your participation is entirely voluntary and your decision 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 entitled. If you have any questions about the research at any time, please contact me at a_delreal2@u.pacific.edu, or my faculty advisor Dr. Carolynn Kohn at ckohn@pacific.edu. 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 signature below indicates that you have read and understand the information provided above, that you are at least 18 years old, that you willingly agree to participate, and that you may withdraw your consent at any time and discontinue participation at any time.

Signature: _____ Date:_____

Appendix B: Demographics Survey

Age: _____

Ethnicity: _____

Gender: _____

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

Have you consumed any alcohol in the previous 2 weeks (including beer, hard seltzers, wine, liquor, mixed drinks)?
- ☐ Yes
- ☐ No

Have you ever worked as 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:

Appendix C: NIAAA Information Sheet

National Institute on Alcohol Abuse and Alcoholism

Underage Drinking

Underage drinking is a serious public health problem in the United States. Alcohol is the most widely used substance among America's youth, and drinking by young people poses enormous health and safety risks.

The consequences of underage drinking can affect everyone—regardless of age or drinking status.

Either directly or indirectly, we all feel the effects of the aggressive behavior, property damage, injuries, violence, and deaths that can result from underage drinking. This is not simply a problem for some families—it is a nationwide concern.

Underage Drinking Statistics

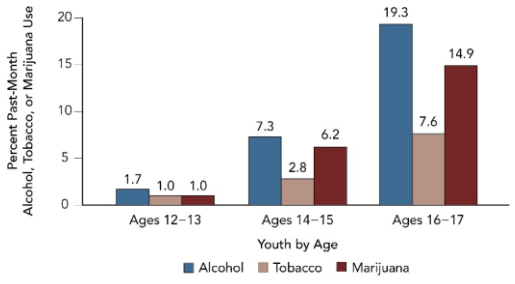
Many young people drink alcohol

- In 2019, about 24.6 percent of 14- to 15-year-olds reported having at least 1 drink.[1]
- In 2019, 7.0 million young people ages 12 to 20 reported that they drank alcohol beyond "just a few sips" in the past month.[2]

Young people often binge drink

People ages 12 to 20 drink 4.0 percent of all alcohol consumed in the United States.[3] Although youth drink less often than adults do, when they do drink, they drink more. More than 90 percent of all alcoholic drinks consumed by young people are consumed through binge drinking[4] (see "What is binge drinking?" box).

- In 2019, 4.2 million young people reported binge drinking at least once in the past month.[2]
- In 2019, 825,000 young people reported binge drinking on 5 or more days over the past month.[2]

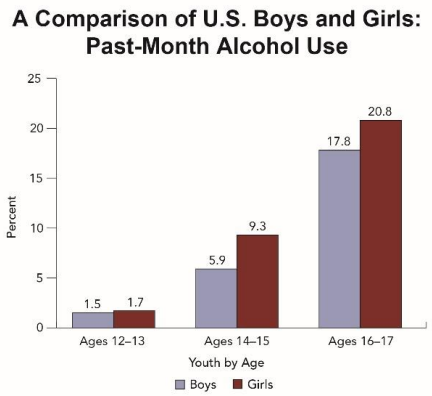


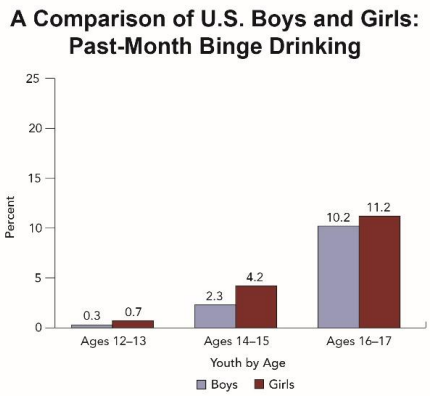
SOURCE: *2019 National Survey on Drug Use and Health.* Tables 2.6B, 2.2B, and 1.7B. Accessed 10/15/20.

Drinking patterns vary by age and gender

Alcohol use often begins during adolescence and becomes more likely as adolescents age. In 2019, almost 2 out of 100 adolescents ages 12 to 13 reported drinking alcohol in the past month and fewer than 1 in 100 engaged in binge drinking. Among respondents ages 16 to 17, fewer than 1 in 5 reported drinking and about 1 in 10 reported binge drinking.[5] It is important to implement prevention strategies during early adolescence to prevent this escalation.

Historically, adolescent boys were more likely to drink and binge drink than girls. Now, that relationship has reversed. Alcohol use has declined more in recent years among adolescent boys than it has in girls. As a result, more adolescent girls report alcohol use and binge drinking than boys.[6,7]





SOURCE: Population prevalence estimates (%) are weighted by the person-level analysis weight and derived from the Center for Behavioral Health Statistics and Quality. *2019 National Survey on Drug Use and Health Public Use File Codebook.* Rockville, MD: Substance Abuse and Mental Health Services Administration, 2020.

NOTE: In NSDUH, binge alcohol use is defined as drinking 5 or more drinks on the same occasion for males or 4 or more drinks on the same occasion for females on at least 1 day in the past 30 days. Any alcohol is defined as a drink of an alcoholic beverage (a can or bottle of beer, a glass of wine or a wine cooler, a shot of distilled spirits, or a mixed drink with distilled spirits in it), not counting a sip or two from a drink.

Underage Drinking Is Dangerous

Underage drinking poses a range of risks and negative consequences. It is dangerous because it:

Causes many deaths

Alcohol is a significant factor in the deaths of people younger than age 21 in the United States each year. This includes deaths from motor vehicle crashes, homicides, alcohol overdoses, falls, burns, drowning, and suicides.

Causes many injuries

Drinking alcohol can cause youth to have accidents and get hurt. In 2011 alone, about 188,000 people younger than age 21 visited an emergency room for alcohol-related injuries.[8]

Impairs judgment

Drinking can lead to poor decisions about taking risks, including unsafe sexual behavior, drinking and driving, and aggressive or violent behavior.

Increases the risk of physical and sexual assault

Underage binge drinking is associated with an increased likelihood of being the victim or perpetrator of interpersonal violence.[9]

Can lead to other problems

Drinking may cause youth to have trouble in school or with the law. Drinking alcohol also is associated with the use of other substances.

Increases the risk of alcohol problems later in life

Research shows that people who start drinking before the age of 15 are at a higher risk for developing alcohol use disorder later in life. For example, adults ages 26 and older who began drinking before age 15 are 5.6 times more likely to report having alcohol use disorder in the past year as those who waited until age 21 or later to begin drinking.[10]

Interferes with brain development

Research shows that young people's brains keep developing well into their 20s. Alcohol can alter this development, potentially affecting both brain structure and function. This may cause cognitive or learning problems and/or increase vulnerability for alcohol use disorder, especially when people start drinking at a young age and drink heavily.[11,12]

Why Do So Many Young People Drink?

As children mature, it is natural for them to assert their independence, seek new challenges, and engage in risky behavior. Underage drinking is one such behavior that attracts many adolescents. They may want to try alcohol but often do not fully recognize its effects on their health and behavior. Other reasons young people drink alcohol include:

- Peer pressure
- Increased independence, or the desire for it
- Stress

In addition, many youth have easy access to alcohol. In 2019, among 12- to 14-year-olds who reported that they drank alcohol in the past month, 96.5 percent reported that they got it for free the last time they drank.[13] In many cases, adolescents have access to alcohol through family members or find it at home.

Preventing Underage Drinking

Preventing underage drinking is a complex challenge. Any successful approach must consider many factors, including:

- Genetics
- Personality
- Rate of maturation and development
- Level of risk
- Social factors
- Environmental factors

Several key approaches have been found to be successful. They are:

Individual-level interventions

This approach seeks to change the way young people think about alcohol, so they are better able to resist pressures to drink.

School-based interventions

These are programs that provide students with the knowledge, skills, motivation, and opportunities they need to remain alcohol-free.

Family-based interventions

These are efforts to empower parents to set and enforce clear rules against drinking, as well as improve communication between children and parents about alcohol.

Community-based interventions

Community-based interventions are often coordinated by local coalitions working to mitigate risk factors for alcohol misuse.

Policy-level interventions

This approach makes alcohol harder to get—for example, by raising the price of alcohol and keeping the minimum legal drinking age at 21. Enacting zero-tolerance laws that outlaw driving after any amount of drinking for people younger than 21 also can help prevent problems.

The Role Parents Play

Parents and teachers can play a big role in shaping young people's attitudes toward drinking. Parents in particular can have either a positive or negative influence.

Parents can help their children avoid alcohol problems by:

- Talking about the dangers of drinking
- Drinking responsibly, if they choose to drink
- Serving as positive role models in general
- Not making alcohol available

- Getting to know their children's friends
- Having regular conversations about life in general
- Connecting with other parents about sending clear messages about the importance of youth not drinking alcohol
- Supervising all parties to make sure there is no alcohol
- Encouraging kids to participate in healthy and fun activities that do not involve alcohol

Research shows that children of actively involved parents are less likely to drink alcohol.[14]

On the other hand, research shows that a child with a parent who binge drinks is much more likely to binge drink than a child whose parents do not binge drink.[15]

Warning Signs of Underage Drinking

Adolescence is a time of change and growth, including behavior changes. These changes usually are a normal part of growing up but sometimes can point to an alcohol problem. Parents, families, and teachers should pay close attention to the following warning signs that may indicate underage drinking:[16]

- Changes in mood, including anger and irritability
- Academic and/or behavioral problems in school
- Rebelliousness
- Changing groups of friends
- Low energy level
- Less interest in activities and/or care in appearance
- Finding alcohol among a young person's things
- Smelling alcohol on a young person's breath
- Problems concentrating and/or remembering
- Slurred speech
- Coordination problems

Treating Underage Drinking Problems

Screening young people for alcohol use and alcohol use disorder is very important and may avoid problems down the road. Screening by a health practitioner (e.g., pediatrician) provides an opportunity to identify problems early and address them before they escalate. It also allows young people to ask questions of a knowledgeable adult. NIAAA and the American Academy of Pediatrics both recommend that all youth be regularly screened for alcohol use.

Some young people can experience serious problems as a result of drinking, including alcohol use disorder, which require intervention by trained professionals. Professional treatment options include:

- Attending individual or group counseling sessions one or more times per week
- Receiving a prescription from a primary care doctor or psychiatrist to help reduce alcohol cravings
- Participating in family therapy to build a supportive foundation for recovery

Appendix D: Feedback Sheet

National Institute on Alcohol Abuse and Alcoholism

Join a Clinical Study | Find Alcohol Treatment | Donate

Search NIAAA

Alcohol's Effects on Health | Health Professionals & Communities | Research | Research Training | Grants & Funding | News & Events | About NIAAA

What Is A Standard Drink?

Home / Alcohol's Effects on Health / Overview of Alcohol Consumption / What Is A Standard Drink?

Many people are surprised to learn what counts as a drink. The amount of liquid in your glass, can, or bottle does not necessarily match up to how much alcohol is actually in your drink. Different types of beer, wine, or malt liquor can have very different amounts of alcohol content. For example, many light beers have almost as much alcohol as r egular beer – about 85% as much. Here's another way to put it:

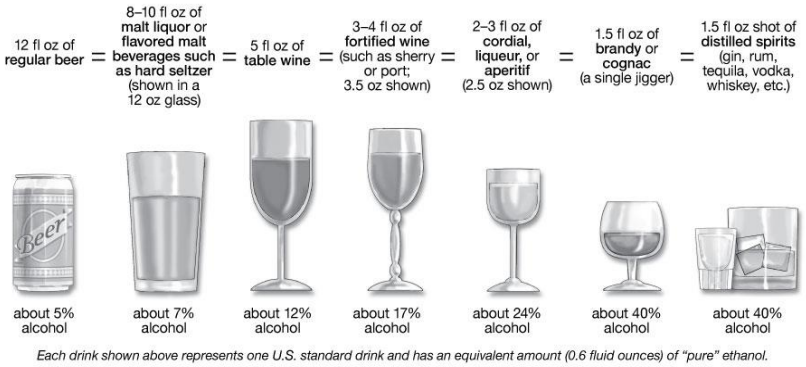
- Regular beer: 5% alcohol content
- Some light beers: 4.2% alcohol content

That's why it's important to know how much alcohol your drink contains. In the United States, one "standard" drink (or one alcoholic drink equivalent) contains r oughly 14 grams of pure alcohol, which is found in:

- 12 ounces of regular beer, which is usually about 5% alcohol
- 5 ounces of wine, which is typically about 12% alcohol
- 1.5 ounces of distilled spirits, which is about 40% alcohol

How do you know how much alcohol is in your drink?

Even though they come in different sizes, the drinks below are each examples of ***one standard drink***:



Each drink shown above represents one U.S. standard drink and has an equivalent amount (0.6 fluid ounces) of "pure" ethanol.

Each beverage portrayed above represents one standard drink (or one alcoholic drink equivalent), defined in the United States as any beverage containing 0.6 fl oz or 14 grams of pur e alcohol. The percentage of pure alcohol, expressed here as alcohol by volume (alc/vol), varies within and acr oss beverage types. Although the standard drink amounts are helpful for following health guidelines, they may not reflect customary serving sizes.

For more information, visit Rethinking Drinking.

The following volumes on the left indicate the volume of alcohol you poured during your last three free pours for a standard serving of 5% ABV beer. The number on the right of the "=" sign indicates the ratio of your poured drinks to standard drinks of 5% ABV beer.

Pour 1: _____oz = _____ standard servings of 5% ABV beer

Pour 2: _____oz = _____ standard servings of 5% ABV beer

Pour 3: _____oz = _____ standard servings of 5% ABV beer

Appendix E: Alcohol Consumption Questionnaire

Please indicate the number of standard servings of each type of alcohol you consumed each day in the previous 2 weeks. If you consumed alcohol other than what is listed, please indicate what you consumed and how many standard drinks of this type of alcohol you consumed on the line labeled "other".

_____ 2023						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other	_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other	_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other	_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other	_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other	_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other	_____ beers _____ seltzers _____ wine _____ shots mixed _____ drinks _____ other
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<u>Examples of alcohol types include (but are not limited to):</u>

- Beer: Bud Light, Modelo, Corona, Blue Moon, Budweiser, Heineken
- Hard seltzers: White Claw, Truly, High Noon, Topo Chico Hard Seltzer
- Wine: Champagne, Chardonnay, Merlot, Pinot Noir
- Shots: Vodka, Tequila, Rum, Whiskey,
- Mixed drinks: Margarita, Martini, Any other combination of hard liquor and other juices or mixers
- Other: Any other type of alcohol that is not covered by beer, hard seltzers, wine, shots, or mixed drinks

- How many ounces are contained in a standard serving of **beer containing 5% alcohol by volume**?

  _____

- How many ounces are contained in a standard serving of **beer containing 8% alcohol by volume**?

  _____

- How many ounces are contained in a standard serving of a **hard seltzer**?

  _____

- How many ounces are contained in a standard serving of **wine**?

  _____

- How many ounces are contained in a standard serving of a **shot**?

  _____

- How many ounces are contained in a standard serving of a **mixed drink**?

  _____

Appendix F: Post-Pouring Survey

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

How likely are you to use the skills and knowledge learned today during future drinking episodes?

How often do you pour your own drinks?

What drinking vessel do you most often consume alcohol from? Examples include red solo cups, tall clear cups, directly from the bottle or can, etc.

What does "ABV" stand for and what does it indicate?

How does ABV affect standard drink sizes?