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Effectiveness of a Feedback-Based Brief Intervention to Reduce Alcohol Use in Community Substance Use Disorders

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Abstract

Feedback brief interventions for alcohol use problems have been highly effective with undergraduate populations. However, there has been little research on the effectiveness of administering feedback alone to community treatment populations. The goal of the current study was to assess the effectiveness of a feedback brief intervention in a community treatment setting with patients characterized largely by dependence on alcohol and drugs, ethnic diversity, and low socioeconomic status. It was hypothesized that pre-treatment brief individualized feedback would reduce alcohol consumption and increase participation in subsequent treatment for a substance use disorder (SUD). Participants were recruited from a public hospital's SUD clinic. After the intake but prior to entry into the treatment as usual, 121 participants were randomized to receive personalized feedback or a condition without feedback. Eighty-seven participants completed post-intervention follow-up interviews and were included in the final analyses. Repeated measures ANOVAs and MANCOVAs were used to examine variables obtained from the Addiction Severity Index (ASI; McLellan et al., 1992) of drinking quantity and frequency, and motivation for treatment. Results indicated that personalized feedback delivered no benefit beyond that of pre-treatment assessment procedures (phone screening and intake interview) alone. Intervention conditions did not differ on other outcomes at follow-up, including days of heavy drinking, motivation for treatment, or drug use frequency. Therefore, feedback-based brief interventions may be not helpful in reducing the drinking frequency and intensity of individuals presenting to community-based substance use treatment.

Keywords

brief intervention; feedback; substance use; community care

In the past 30 years, there has been substantial research reinforcing the efficacy of brief interventions for alcohol use disorders. Meta-analytic reviews suggest that brief interventions can be highly effective for individuals with AUDs (Moyer et al., 2002; Bien, et al., 1993). For example, Bien et al. examined clinical trials comparing brief interventions to treatment-as-usual for AUDs and reported that in 11 of 13 reviewed trials, participants given a brief intervention showed as much or more reduction in drinking as participants in more extended interventions. Effect sizes for brief interventions typically range from small to medium, comparable to effect sizes found with longer treatments (Neighbors, Lewis,

Bergstrom, & Larimer, 2006). Some studies suggest symptom improvements are lasting, up to three (Aalto et al., 2001) to four years (Fleming et al., 2002).

Bien et al. (1993) suggested six factors that are common to successful brief interventions: feedback, responsibility (encouraging the client to recognize control over the problem), advice, menu (providing a range of options), empathy, and self-efficacy. According to this model, the provision of feedback is an element common to successful brief interventions for alcohol use disorders. Dismantling larger brief interventions and examining these elements alone may begin to elucidate which aspects are necessary and sufficient for change.

One of these elements, feedback, has taken several forms in brief intervention research but typically involves review of the client's alcohol consumption, comparing it with that of similar individuals in the general population. Presumably, descriptive norms feedback compels high-drinking individuals to reduce their drinking to be more in line with peers (Borsari & Carey, 2003). Some studies (e.g., Osberg et al., 2011, Prince & Carey, 2010) have used injunctive norms, which involve providing the individual with information about peers' norms for drinking.

Although descriptive normative feedback is by far the most common form of feedback, other types of feedback can be used including information on risk for the development of problematic alcohol use or risk of alcohol-related consequences such as intoxicated driving or health problems. Feedback also may incorporate informative calculations, such as computing alcohol-related caloric intake, peak and average blood alcohol level (BAL), and the average amount of money spent on alcohol per week or per month. Thus, although "feedback" may cover a range of information shared with the client, the content is based on the provision of personalized information to the client with the goal of increasing the individual's awareness regarding his/her problem behavior (Riper, van Straten, Keuken, Smit, Schippers, & Cuijpers, 2009).

Provision of nothing more than personalized descriptive feedback is a minimal, yet powerful, intervention. For example, Neighbors et al. (2006) assessed the drinking of 214 heavy-drinking college students, then randomized these students to either receive personalized feedback ($n = 108$) or assessment only ($n = 106$). Students in the feedback condition viewed the feedback for 1–2 minutes, and then were given the feedback to take home. In comparison with the assessment-only group, the feedback resulted in a significant reduction in drinks consumed per week. In another example, Cunningham et al. (2010), examined the impact of an internet-based feedback intervention, using 185 adults from the general population recruited through telephone surveys. Cunningham et al. found that at three months those who had received the intervention had reduced their drinking by about six to seven drinks per week. Walters et al. (2000) found that the addition of psychoeducation and skills training to simple feedback did not provide additional benefit beyond feedback alone for college students. In addition, brief interventions that do not involve feedback tend to be less effective than those that do (Walters & Neighbors, 2005; Walters et al., 2000; Riper et al., 2009). One recent meta-analysis (Riper et al., 2009) of personalized feedback effects found a combined small to medium effect size ($d = .22$) for brief personalized feedback interventions, which the authors note is significant given the brief, easily disseminable nature of the intervention.

Nearly all of the feedback-based brief intervention research has been conducted with college-age populations (e.g., LaBrie et al., 2009; Lojewski et al., 2010; Martens et al., 2010; Neighbors et al., 2010). Norms-based feedback has been successful with undergraduate populations, possibly because of certain characteristics of this population that make them more able to be influenced by normative information, such as high

overestimations of peer alcohol use (Neal & Carey, 2006) and a high desire to conform to peers. Given that most of the research on feedback-only brief interventions has been conducted on undergraduates or with non-alcohol dependent patients seen in primary medical settings, it is unclear whether feedback creates change in other populations, and if it does, by what mechanism. Problem drinkers in community treatment programs tend to be quite different from most undergraduate populations - they tend to be older (and therefore more chronic) drinkers, have higher levels of psychiatric comorbidity and problem severity, and often are of much lower socioeconomic status and have less education than undergraduates (e.g., Hingson et al., 2005; Schulenberg et al., 1996).

While several studies have used feedback within a larger brief intervention or treatment program, limited research has examined the impact of feedback alone (i.e., without other components such as motivational interviewing or direct advice) with a non-undergraduate, clinical population.

Therefore, the current study had two objectives. The primary objective was to test whether the provision of personalized feedback regarding alcohol use would result in decreased drinking quantity and frequency for a community-based, treatment-seeking population. Specifically, the current study sought to determine whether giving feedback alone after an intake assessment would result in additional benefit beyond any symptom reductions that might occur after intake assessment alone. It was predicted that participants who received the feedback would show superior outcomes in terms of lower quantity and frequency of drinking and higher motivational ratings at follow-up, compared to participants receiving assessment alone.

Method

Participants

Procedures were reviewed and approved by the hospital's institutional review board (IRB) and the primary investigator's university IRB. Participants came from the substance use disorders treatment clinic of a large public hospital in central New Jersey. The clinic serves an urban clientele, with a lower socioeconomic status than the state's average. All participants entering the clinic between March–August 2008 and meeting entry requirements were asked to participate. Of the 195 incoming patients who were alcohol use positive, 150 were study eligible. Of these, 121 participants were randomized to intervention condition. Data are reported in the current study for the 87 participants who provided follow-up data. While treatment completion data and other information would ideally be gleaned from clinic data to examine participants who did not complete the follow-up, clinic treatment records were not available to study staff due to clinic policies and confidentiality concerns. Participants were given a \$10 gift card to a local grocery or department store as compensation for participation in study follow-up.

Participant flow for the study is illustrated in Figure 1. Prior to scheduling an intake, patients completed a brief telephone screening. Potential participants needed to have endorsed “alcohol” as having been a substance of use in the past month on the brief screening. For a small number of participants, a case manager called in the screening information and therefore the patient did not have contact with the clinic before the appointment.

A chi square indicated that participants included in the final analyses ($n = 87$) did not differ in gender from the participants who were eligible for the study but who did not participate (due to reasons such as refusing the clinic's treatment, refusing study participation, being deemed inappropriate for clinic treatment, or research interviewer unavailability) identifying as alcohol use positive and attending the clinic intake; $\chi^2(1, n = 150) = 1.48, p = .23$. Other

comparisons between the larger sample of eligible individuals ($n = 195$) and those who entered the study could not be made, as data on demographic and alcohol use quantity/frequency variables were not available for participants who did not complete the clinic intake.

Approximately half of the final sample (47 participants, 54.0%) had current legal involvement, including a pending case, drug court, parole status, Division of Youth and Family Services (DYFS) or family court involvement, or Driving While Intoxicated (DWI)-related license suspension. Participants came from a variety of referral sources, with the largest categories being county corrections programs (35 participants, 40.2%), self-referred/voluntary (29 participants, 33.3%), and Welfare/Social Services (13 participants, 14.9%). (See Table 1 for continuous and Table 2 for baseline categorical descriptors of the final sample).

Of the participants who completed follow-up, 37 (42.5%) had been randomized to the feedback module and 50 (57.5%) were randomized to no feedback. A chi-square test indicated that of all participants randomized (121), participants in both intervention conditions (feedback or not) were equally likely to complete follow-up assessment at 30 days.

Patients were not screened out of the study based on drug use status or comorbid psychopathology unless participants were actively psychotic or intoxicated/high at intake. Participants were also queried as to what he/she perceived as their primary problem substance; alcohol was considered the primary problem substance by 40 participants (46.6%), with the rest of the participants reporting a primary drug problem of marijuana/hashish (21, 24.1%), crack cocaine (11, 12.6%), heroin (9, 10.3%), and cocaine powder (6, 6.9%). The two intervention conditions did not differ in the frequency of individuals reporting alcohol as the primary problem substance, $\chi^2(1, n = 87) = .00, p = 1.0$. Participants were included even if they did not report alcohol as their primary problem substance as it was hypothesized that the feedback intervention would reduce alcohol use independent of level of motivation for changing one's alcohol problem, and independent of other drug use. Recent findings on the likely mechanisms of change in feedback-based interventions have suggested that the feedback may function by reducing overestimations of what peers drink, possibly motivating the individual to reduce his/her drinking to be more in line with peers (LaBrie, Hummer, Neighbors, & Pedersen, 2008, Neighbors et al., 2006). Therefore, we inferred that the intervention should work as long as there was an overestimation of the quantity/frequency of peers' drinking, which we anticipated would occur for most, if not all of the sample. Finally, a primary goal of the present study was to test the effectiveness of a feedback brief intervention with a clinical population; individuals presenting to community-based substance use treatment often have both alcohol and drug problems.

Measures

Addiction Severity Index—Primary outcome variables came from the Addiction Severity Index (ASI; McLellan et al., 1992), a semi-structured interview. The number of drinking days in the past 30 days (NDD) and the number of heavy drinking days (NHD) in the past 30 days were primary outcome variables. Heavy drinking days are defined by the ASI as days that the respondent “felt the effects” of alcohol; if further clarification is needed (e.g., the participant may have tolerance or seems to be minimizing use), heavy drinking may be defined by three or more drinks per drinking occasion (University of Pennsylvania/Veterans Administration Center for Studies of Addiction, 1990). In addition to the alcohol use variables, motivation for change was measured by the ASI alcohol subscale, which asks the participant “how important to you now is treatment for your alcohol problem?”

Participants can answer on a 5-point scale, where 1 = not at all, 2 = slightly, 3 = moderately, 4 = considerably, and 5 = extremely. Finally, treatment entry was used as a primary outcome to serve as a proxy motivational measure, measured as a binary variable of whether the participant entered the treatment post-intake or not.

Both research interviewers used the ASI self-training manual available online (Treatment Research Institute, 2006). All other intake clinicians at the hospital substance use clinic had prior training in the ASI. The test-retest reliability for the alcohol use subscale of the ASI is high, with an intraclass correlation coefficient of .86 (Drake et al., 1995). The ASI alcohol subscale has been shown to have consistently high internal consistency, with alphas ranging from .74–.92 in 12 separate study samples (Gibbs, 1983; O'Brien, 2008).

The clinic staff used the ASI as an intake interview, thus providing intake ASI data as a study baseline measure. The ASI took approximately one hour to complete and involved questions about the patient's demographics, medical status, employment status, drug and alcohol use, legal problems, family and social relationships, and psychiatric status. Participants were contacted by research study staff at follow-up 30 days after this first ASI, and were administered the drug and alcohol portion of the ASI only. The follow-up ASI was completed in-person if the participant was still in treatment at 30 days, but if the participant had completed treatment or had dropped out, the participant was contacted by phone to complete the assessment module. The developers of the instrument report that the ASI can be "reliably and validly" administered via phone (University of Pennsylvania/Veterans Administration Center for Studies of Addiction, 1990). The two conditions did not differ in the use of phone versus in-person interviews, $\chi^2(1, n = 87) = .89, p = .34$.

Procedure

Informed consent procedures were conducted before the clinical intake interview. Participants met with one of the study interviewers and were asked to participate in research that would help determine which interventions work for persons with alcohol use disorders. All participants completed the consent procedure and brief intervention with one of two research interviewers. Both interviewers were master's level graduate students and had experience working with patients with substance dependence and abuse.

All participants at the clinic were breathalyzed prior to the intake interview and were breathalyzed at random sessions thereafter. Participants with a blood alcohol level (BAL) greater than .05 (50 mg%) at intake were not allowed to participate in the study. If a participant was intoxicated, he or she was managed appropriately by clinic staff with clinic procedures (e.g., detoxification or retaining patient until his or her BAL was low enough for dismissal). The consent procedure was conducted again at a later date if the participant attended a rescheduled intake with a 0.00 BAL.

All participants were then administered the ASI as the clinic intake assessment. This intake interview was administered by treatment center staff who were blind to intervention condition. Two intake interviewers were licensed social workers (LSWs); one was a licensed clinical social worker (LCSW), and two of the three had certification in alcohol and drug counseling (CADC). Participants were then randomized to condition by a random number list. If the participant was randomized to the feedback condition, he or she then received the feedback intervention immediately after the intake interview. The feedback intervention was administered by research staff who were not involved in the participant's clinical care other than administration of the feedback.

All participants were then placed in substance treatment deemed appropriate by clinic staff. Programs to which participants were assigned in the current study included the Women's

IOP (5 days per week), intensive evening program, standard IOP (either 3 or 5 days per week), partial hospitalization, or once per week outpatient treatment. All of the programs, aside from weekly outpatient therapy, consisted of group treatment loosely based on a twelve-step orientation, with the goal of abstinence from alcohol and drugs. Treatment was generalized and not substance-specific. Patients at the clinic often entered treatment quickly, typically within a few days of the intake interview. There were 14 clinicians who conducted therapy at the clinic, all whom had experience in treating SUDs.

Follow-up was conducted 30 days after completion of the intake and feedback module, regardless of whether the participant had remained in treatment. All follow-up interviews were conducted by the same two study interviewers who administered the feedback. Whenever possible the follow-up was completed by the study interviewer who did not conduct the feedback module. The majority of participants (60; 69.0%) did the follow-up by phone. A chi square test (using SPSS continuity correction) indicated that the two intervention conditions were equally likely to do the follow-up by phone versus in-person, $\chi^2(1, n = 87) = 1.39, p = .34$.

Feedback procedure—The feedback intervention was based on feedback modules from several other brief interventions, primarily the Drinker's Check-Up (DCU; Squires and Hester, 2004) and the BASICS program (White et al., 2006). Feedback included a comparison of the participant's drinking to other Americans of that age range and gender, based on the results of a large ($n = 42,706$) national survey of adults (National Alcohol Survey on Alcohol and Related Conditions, [NESARC], 2001), reported in Chan et al., (2007). The feedback also gave participants an estimate of the amount of money they would spend on alcohol per week and per year should they continue to drink in the same pattern as reported at baseline, and an approximate caloric intake/week based on this same pattern. Feedback on drug use was not given. The feedback also included a brief review of alcohol-related negative consequences endorsed on the ASI. Tables for calculation of percentiles were taken directly from Chan et al., who provide normative data calculation tables derived from the NESARC survey results. The feedback module lasted approximately 10–15 minutes.

Feedback was given in person by one of two clinically trained, master's-level students. The feedback was a template script for which the feedback provider simply entered in the patient's information (which was obtained during the intake assessment) in relevant blanks. The research assistant hand-calculated any necessary calculations and transposed all other pertinent information from the patient's intake ASI. The feedback was then delivered in a neutral, informational manner by the feedback provider by simply reading the script to the participant. Typical motivational interviewing (Miller & Rollnick, 2002; Moyers, Martin, Catley, Harris, & Ahluwalia, 2003) or motivational enhancement therapy (Miller et al., 1992) techniques such as providing advice, providing information other than personal feedback, using specific questioning/communication styles (e.g., double-sided reflections, reframing), and discussing a plan for change were not used and explicitly excluded from the feedback script. Both interviewers role-played feedback several times prior to the start of the study to ensure additional consistency in procedure.

Results

Primary analyses on NDD and NHD were conducted using multivariate analyses of covariance (MANCOVA) with baseline NDD score as a covariate. Mediation was tested with a regression model following the methods outlined by Frazier et al. (2004).

The distributions of the dependent variables of the number of days drinking (NDD) alcohol in the past 30 days, number of heavy drinking days in the past 30 days (NHD), number of alcohol-related problem days, and the participant ratings of importance of treatment were all significantly non-normal, $p < .001$, therefore analyses of these variables were conducted using logarithmic-transformed data.

Drinking Behavior

A MANCOVA compared intervention condition (feedback vs. no feedback) NDD and NHD at follow-up, using baseline NDD score as a covariate. Only baseline NDD score was used as a covariate in this analysis as baseline NDD and NHD were highly correlated, $r = .68$. Preliminary tests were conducted to ensure that there was no violation of the assumptions of homogeneity of variances, or homogeneity of regression slopes. Results for the MANCOVA indicated that there was no effect of intervention condition on a linear combination of NDD and NHD at follow-up, when controlling for baseline NDD, $F(2, 83) = 1.5$, $p = .22$. Untransformed means are shown in Table 3. Untransformed and transformed means are shown in Table 3.

Motivation

The first analysis of motivation for treatment examined whether the intervention was associated with an increase over time in participants' self-reported motivation for treatment, using the ASI variable that asked participants how much they felt they needed alcohol treatment at present, rated on a 1–5 scale (1 = not at all, 5 = extremely). A repeated-measures ANOVA, with time (baseline and follow-up) as the within-subjects variable, and intervention condition as the between-subjects variable found no significant condition, time, or interaction effects.

To test whether the feedback had an impact on the number of participants who entered treatment following the intake, a chi-square test was conducted. This test was nonsignificant, suggesting that the intervention conditions did not differ in rates of entering therapy subsequent to the intake interview. Of the 87 participants who completed the follow-up, 21 (24.14%) did not attend any sessions of treatment, including 7 of 37 (18.9%) participants in the feedback condition, and 14 of 50 (28%) participants in the non-feedback condition. In addition, participants who were mandated to treatment were equally likely to attend treatment as those who were voluntary, $\chi^2(1, n = 79) = .00$, $p = 1.0$ (with SPSS continuity correction), with 78–80% of participants entering treatment. Mandated status did not differ by condition, as indicated in Table 2.

Analyses also were conducted to examine whether participants in the feedback condition were likely to attend more treatment than those in the no feedback condition. Based on the modality of treatment that the patient was assigned to, a percentage was calculated of how many days of treatment the participant attended out of how many they were expected to attend. Table 4 shows the breakdown of therapeutic assignment and the percentages of treatment attended. If a participant left the program at the hospital to attend a substance use treatment program elsewhere, treatment completed at the other facility was counted towards completion of the treatment recommendations made by the study clinic. Participants who received feedback completed 61.91% of scheduled treatment days; those in the assessment only condition completed 50.43% of scheduled treatment days; this difference was not significant.

Combining Dependent Variables as an Index Measure of Outcome

On nearly all outcome variables (including alcohol use measures, motivational variables, drug use, and alcohol-related consequences) participants in the feedback condition

consistently appeared to have a more improved score at follow-up compared to those in the non-feedback condition. To further assess whether this directionality was meaningful, the dependent variables of NDD, NHD, treatment importance ratings (as a measure of motivation), and number of alcohol-related problem days were z-transformed. The variable of perceived treatment importance rating was reversed so that directionality was similar to the other outcome variables (i.e., a higher score indicative of a worse outcome). These z-scores were then summed to provide a summary index of outcome variables. The intervention conditions differed in this index score at baseline, with the feedback condition having a higher mean value ($M = .57$, $SD = 2.52$) than the non-feedback condition ($M = -.42$, $SD = 1.80$), $t(85) = 2.14$, $p = .035$. Therefore, the baseline index score was used as a covariate.

Results indicated that when controlling for baseline index score, the feedback condition had a lower index score ($M = .41$, $SD = 2.67$) than the non-feedback condition ($M = -0.55$, $SD = 1.9$), $F(1, 86) = 4.09$, $p = .046$. Partial eta squared was .046. These results suggest that participants in the feedback condition had better outcomes at follow-up than the non-feedback condition, as indexed by a combination of NDD, NHD, treatment importance ratings, and number of alcohol problem days.

Treatment Attendance as a Mediator

Because participants entered treatment shortly after participation in the feedback module, participating in treatment may have obscured the effects of the feedback alone. In addition, prior studies have suggested that some brief interventions administered prior to treatment may function by increasing motivation for treatment and treatment compliance and/or attendance (Brown & Miller, 1993; Miller and Sovereign, 1989). To examine this possibility, an exploratory analysis was conducted to determine if the feedback intervention may have exerted effects by increasing motivation for treatment. NDD at follow-up was regressed on the number of days of treatment attended, controlling for NDD at baseline. It was expected that participants who attended more treatment would show fewer days of drinking at follow-up. The model was significant, $F(2, 86) = 5.56$, $p = .005$; baseline drinking days and number of treatment days attended were both significant predictors in the model, explaining 27% and 26% of the model variance, respectively (see Table 6).

Given that more treatment attendance was related to a lower NDD at follow-up, the role of treatment as a mediator of the effect of the feedback brief intervention on NDD was examined. Preliminary analyses were conducted using SPSS tests for multicollinearity for condition and percent of treatment attended. Tolerance was high (.98), suggestive of a lack of multicollinearity. NDD data were log transformed; significance tests were similar with transformed and untransformed data.

To test for mediation, NDD at follow-up first was regressed on intervention condition. This regression was not significant, $p = .20$. Then percentage of treatment attendance was regressed on intervention condition and was nonsignificant, $p = .38$, when percent of treatment attended was controlled for. The coefficient associated with the relationship between percentage of treatment attended and NDD was significant, $p = .002$. Therefore, while percentage of treatment attended was associated with drinking outcomes (NDD), feedback intervention condition was not predictive of the percentage of treatment attended. Thus, the percent of treatment attended was not shown to mediate the relationship between intervention condition and NDD at follow-up.

Discussion

The purpose of the current study was to examine whether a feedback-based brief intervention would result in reduced drinking and increased motivation for treatment in individuals presenting to a community-based SUD clinic. The neutral, informational feedback was delivered by a one of two trained researchers who read a script to the participant. Results suggested that receiving the feedback-based intervention was not associated with less frequent drinking at follow-up. The feedback did not specifically impact the number of days participants drank or the number of days that participants drank heavily. Both those who received the feedback and those who did not were also similar on follow-up indicators of motivation, including their ratings of importance of treatment at baseline and follow-up, their likelihood of entering treatment after the intake, and the percentage of treatment attended. Although percentage of treatment attended was associated with a lower number of drinking days at follow up, the percent of treatment attended was not shown to mediate the relationship between intervention condition and NDD at follow-up, suggesting that the feedback intervention did not increase treatment attendance.

The current study is the first study to examine personalized feedback as a pre-treatment intervention for patients in a community treatment setting. Results suggest using brief feedback as a stand-alone pre-treatment intervention to reduce the frequency of alcohol use may not be sufficient to impact alcohol use behavior or treatment attendance with community-based substance use disorder patients. As feedback has been an element proposed to be common to successful brief interventions, a primary goal of the current study was to isolate the impact of feedback by delivering it without other components (e.g., motivational interviewing, direct advice). Some research (e.g., Epstein et al., 2005; Sobell et al., 2003), has suggested that even pre-treatment screening processes or assessments can be followed by substantial reductions in drinking, suggesting that assessment in itself may be a brief intervention. This study suggests that personalized feedback delivered no benefit beyond that of pre-treatment assessment procedures (phone screening and intake interview) alone.

While investigating feedback as a pre-treatment intervention is the most ethical option at present for investigating the effects of brief feedback-based interventions in individuals who show a high rate of chronic alcohol dependence, it does not allow for inferences about the effectiveness of the feedback intervention if delivered without an intake assessment or subsequent treatment. Within certain populations, continuing contact with a therapist may not be necessary for brief intervention effects to be seen. Some brief interventions that include feedback as a substantial component (e.g., the Drinker's Check-up; Miller and Sovereign, 1989; Miller et al., 1988) have shown decreases in drinking by patients who did and did not enter treatment subsequently. However, some studies (e.g. Miller et al., 1988) have suggested that motivational interventions that incorporate feedback, such as the Drinker's Check Up (Miller and Sovereign, 1989) result in significantly higher rates of treatment engagement when administered before the start of treatment. It may be that these interventions work more by enhancing treatment motivation and engagement (Brown and Miller, 1993), and this goal may be more appropriate to particular patient populations. It may be that for more severe populations, feedback is more effective when delivered when delivered with motivational interviewing. This would be consistent with findings such as that by Walters, Vader, Harris, Field, & Jouriles (2009), who found that MI and feedback presented together created significant reductions in the drinking of undergraduates, while either MI or feedback presented alone did not reduce drinking.

Importantly, the current results suggest that feedback-only interventions may be not be effective with alcohol-dependent community treatment populations, despite having been

shown to be an impactful stand-alone intervention for undergraduate populations. This has implications for understanding the potential mechanisms behind this feedback process for undergraduates. Reductions in perceived drinking norms have been shown to be a mediator of reductions in drinking for undergraduates (Neighbors, Larimer, & Lewis, 2004; Neighbors et al., 2006). Interestingly, participants in the current study also showed highly distorted drinking norms, on average estimating that their peers drank 4.89 ($SD = 7.90$) more drinks per occasion than they themselves. Unfortunately, this could not be tested as potential mediator in the current study as drink discrepancy information was only obtained for individuals who completed the feedback module ($n = 36$). Future studies should examine whether reductions in distorted perceived drinking norms mediate reductions in drinking for more highly dependent populations.

The current study has several limitations, including use of self-report as a primary outcome measure. The NHD variable may be particularly problematic, as the ASI definition ("feeling the effects" of alcohol) may result in an over- or underestimate of the true number of heavy days. In many, if not most instances, participants completed their follow-up assessment with the same interviewer who completed their baseline assessment. While this procedure was initially deemed ideal as the authors felt that it would lead to more consistent symptom reporting on the part of the interviewee, it may have also led to more socially desirable responding. Measurement of motivation would have ideally been immediately after completion of the feedback intervention, rather than solely at baseline and follow-up. In addition, there were nonsignificant but noticeable differences between the conditions at baseline; such as twice as many females in the feedback condition, and more unemployed people in the non-feedback condition. In addition, there was a somewhat high dropout rate in the present study; however, the follow-up completion rate (72%) was high given the nature of the population (e.g., high rates of treatment discontinuation, high rates of homelessness). While study sample size was relatively small, power analyses suggested a sample size of 70 or more would provide sufficient power for primary analyses, as effect sizes for brief interventions tend to be in the medium to large range (Bien et al., 1993). Recruitment rates were high, with only 7 out of 150 (4.7%) eligible participants presenting to treatment refusing study participation. However, the sample was likely underpowered for secondary analyses. Finally, in the current study there was no way to determine participants' cognitive ability, and there was no formal screening for psychiatric comorbidity. However, participants were referred out by the clinical program staff if active psychotic symptoms were observed or reported, and participants needed to be deemed capable of participating in and benefiting from treatment in order to enter the clinic's program. Future research should examine the extent to which participants process the feedback, and the extent to which the processing contributes to reductions in drinking.

In conclusion, results suggest that a feedback-based brief intervention lasting no more than 15 minutes may not be sufficient to reduce drinking frequency in individuals presenting to an intake for community-based treatment. It is likely that this complex population may need more substantial interventions to create significant, lasting effects on drinking behavior. These interventions will likely need to incorporate several of the "common ingredients" of brief interventions, including personalized feedback but also utilizing strategies such as direct advice, establishing a goal and corresponding change plan, and fostering self-efficacy through general support and encouragement (Bien et al., 1993; Darker et al., 2012; Pal et al., 2007; Shakeshaft, Bowman, Burrows, Doran, & Sanson-Fisher, 2002).

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Figure 1.
Participant Flow

Table 1

Demographic Characteristics of Sample at Baseline

	Minimum	Maximum	Mean (SD) Total	Mean (SD) Feedback	Mean (SD) Non-Feedback	<i>p</i>
Age	19	63	37.05 (11.17)	39.30 (11.08)	35.38 (11.06)	.07
Years of education completed	7	20	11.85 (1.94)	12.06 (1.94)	11.70 (1.95)	.41
Annual income	\$0.00	\$62,500	\$1,488 (6,913)	\$2,785 (10,478)	\$528 (1,008)	.20
# of days used alcohol in past 30 days	1	30	9.35 (8.40)	11.41 (9.46) ^a	7.82 (7.24) ^b	.06
# of days used drugs in past 30 Days	0	30	6.00 (9.32)	4.59 (8.25)	7.04 (9.99)	.23
# of prior treatment episodes (alcohol)	0	10	1.01 (1.74)	1.19 (2.08)	0.89 (1.44)	.41
# of prior treatment episodes (drugs)	0	18	1.27 (2.61)	1.48 (3.55)	1.11 (1.63)	.54
# of years using alcohol	1	46	20.17 (11.90)	20.89 (13.34)	19.64 (10.82)	.63
Motivation rating for alcohol treatment ^a	1	5	2.33 (1.51)	2.66 (1.68)	2.08 (1.32)	.07
# of days of psychological problems in past 30 days	0	30	7.20 (11.32)	6.41 (11.24)	7.78 (11.45)	.58
# of prior psychiatric treatment episodes	0	13	0.91 (2.24)	0.89 (2.29)	0.92 (2.23)	.95

Note. $n = 87$ for all variables except for lifetime number of times treated for drug problems; for this variable $n = 77$ as data were missing for 10 participants. "Previous treatment episodes" includes any period of treatment sought for alcohol or drug problem, including AA or NA attendance. "Days of psychological problems" and "prior psychiatric treatment episodes" include only psychiatric problems participants considered to be not alcohol-related. Raw data prior to transformation and removal of outliers are reported. Only the variable of "number of days used alcohol in past 30 days" was significantly different between intervention conditions, $t(85) = 2.0$, $p = .05$, as marked by superscript.

^aMotivation for treatment could be rated by the participant on a 1–5 scale, with 1 being "not at all," and 5 being "extremely."

Table 2

Categorical Frequencies of Sample Baseline Characteristics (n = 87)

Baseline Variable		<i>n</i> (% total sample) Feedback	<i>n</i> (% total sample) Non-feedback	<i>n</i> (%) Total
Race/Ethnicity	Married	3 (8.1)	6 (12.0)	9 (10.3)
	Female	12 (32.4)	8 (16.0)	20 (23.0)
	Mandated to treatment	21 (56.8)	29 (58.0)	50 (57.5)
	Employed	12 (32.4)	20 (40.0)	30 (34.5)
	Black	22 (59.5)	25 (50.0)	47 (54.0)
	White	9 (24.3)	11 (22.0)	20 (23.0)
	White Hispanic	6 (16.2)	10 (20.0)	16 (18.4)
	Hawaiian/Pacific Islander	0 (0.0)	2 (4.0)	2 (2.3)
	Multiethnic	0 (0.0)	2 (4.0)	2 (2.3)

Note: Chi-square tests indicated no significant differences between intervention conditions in likelihood of belonging to subcategories.

Table 3

Pre- and post- means of primary outcome variables

	Feedback		No Feedback	
	Time 1 (BL)	Time 2 (FU)	Time 1 (BL)	Time 2 (FU)
Number of drinking days (NDD)	11.41 (9.46)	1.07 (2.07)	7.63 (7.20)	2.02 (3.93)
Number of heavy drinking days ^a (NHD)	8.05 (9.97)	.81 (1.94)	4.59 (6.55)	1.39 (3.37)
Rating of importance of alcohol treatment	2.68 (1.68)	3.08 (1.81)	2.08 (1.32)	2.62 (1.70)
Number of days of drug use	4.59 (8.25)	1.14 (5.20)	5.08 (10.05)	2.43 (7.36)
Number of days experiencing alcohol-related consequences	10.78 (13.60)	2.14 (7.00)	7.04 (9.99)	1.43 (4.17)

Note. BL = baseline assessment, FU = follow-up at 30 days. All variables were measured over the past 30 days. While untransformed means are reported, analyses were conducted on logarithmically transformed data.

^aHeavy drinking was defined as “feeling the effects of alcohol” or greater than three drinks per occasion.

Table 4

Days of Treatment Attended by Program

Treatment Program	Feedback <i>n</i> (%)	Non-Feedback <i>n</i> (%)	Total <i>n</i> (%)	Mean % treatment attended (SD)
IOP 5-days/week	4 (10.8)	7 (14.0)	13 (14.9)	57.69 (41.76)
IOP 3-days/week	10 (27.0)	12 (24.0)	22 (25.3)	62.69 (38.41)
IEP	9 (24.3)	12 (24.0)	21 (24.1)	60.58 (36.86)
Partial Hospitalization	5 (13.5)	8 (16.0)	14 (16.1)	57.32 (42.52)
Women's IOP 5 days/week	4 (10.8)	4 (8.0)	5 (5.7)	75.00 (42.42)
Outpatient (1×/week)	2 (5.4)	1(2.0)	3 (3.4)	58.33 (38.19)
Not assigned	3 (8.1)	6 (12.0)	9 (10.3)	6.48 (16.55)

Note. IOP = Intensive Outpatient Program, IEP = Intensive Evening Program. Unassigned participants were those who were not assigned to a therapy modality for various reasons (e.g., case needed to be reviewed before assignment, patient was considering treatment elsewhere).

Table 5
Summary of Multiple Regression Analysis for Mediation of NDD by Percent of Treatment Attended

	<i>B</i>	<i>SE B</i>	β	Sig. (<i>p</i>)
Step 1				
NDD on intervention condition	-.100	.078	-.171	.113
Step 2				
Percent of treatment attended on intervention condition	.002	.001	.141	.192
Step 3				
NDD on intervention condition	-.067	.075	-.092	.375
NDD on percent of treatment attended	-.003	.001	.326	.002

Table 6

Summary of Hierarchical Regression Analysis for Moderator Variables Predicting NDD

	<i>B</i>	<i>SE B</i>	β
Step 1			
NDD at baseline	.365	.116	.390
Gender	.116	.248	.052
Intervention condition	-.369	.202	-.196
History of alcohol treatment	-.056	.082	-.074
Motivational rating at baseline	-.193	.115	-.206
Step 2			
NDD at baseline	.391	.117	.418
Gender	-.308	.359	-.139
Intervention condition	.187	.445	.099
History of alcohol treatment	-.002	.123	-.003
Motivational rating at baseline	-.204	.116	-.218
Gender X condition	.683	.513	.367
Treatment history X condition	-.193	.172	-.189
Motivation X condition	-.013	.134	-.010

Note. Intervention condition was dummy coded into 0 (no feedback) and 1 (feedback).