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Decisional balance: Alcohol decisional balance intervention for heavy drinking undergraduates

Abstract

Background—This study evaluated a decisional balance intervention among heavy drinking undergraduates and compared a non-weighted decisional balance proportion (DBP; Collins, Carey, & Otto, 2009) to a participant-weighted DBP with weights based on relative importance of items. We expected: 1) the intervention to decrease drinking compared to control; 2) the weighted intervention to be more effective compared to the non-weighted or control in reducing drinking; and 3) intervention efficacy to be moderated by initial DBP.

Method—Participants (N =162, Mean age = 24.37, SD = 6.81, 27% male) were randomly assigned to an alcohol intervention wherein they were either asked to assign weights of importance to pros and cons (weighted intervention), or not (non-weighted intervention), or to control. Participants completed web-based questionnaires at baseline and again during a one month follow-up assessment.

Results—Consistent with expectations, the non-weighted intervention was associated with reduced follow-up weekly drinking, and the weighted intervention was associated with reductions in drinking frequency. Results further indicated that initial decisional balance did not moderate intervention efficacy.

Discussion—Findings suggest that the decisional balance procedure can reduce drinking but there was not compelling evidence for the addition of weights. This study lays the groundwork for enhancing future interventions by increasing empirical knowledge of the role motivation plays in heavy alcohol use.

Keywords

drinking; motivation; decisional balance; alcohol

Compared to non-college peers, undergraduate students are at increased risk for heavy episodic drinking (more than five drinks in a row during the past two weeks; Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). Problematic drinking and related consequences among undergraduates remains prevalent (Johnston, O'Malley, Bachman, & Schulenberg, 2012) with estimates indicating that 80% of undergraduate students drink, 67% drink at least once per month, and 40% frequently drink several

Contributors

The lead author designed the study, wrote the protocol, conducted statistical analysis, and worked with other authors to develop the manuscript. The second author helped conceptualize theoretical bases for the study and supported the analytic plan and manuscript development. The third author supported project management and data collection, conducted literature searches, and assisted with manuscript development. All authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

alcoholic beverages on a single occasion (Johnson et al., 2006). Research further shows that college students who drink experience undesired alcohol-related consequences that range in severity including poor class attendance, trouble with authorities, hangovers, injuries, (Hingson, 2010; Hingson, Hereen, Winter, & Wechsler, 2005; Wechsler, Davenport, Dowdall, & Moeykens, 1994; Wechsler, Kuo, Lee, & Dowdall, 2000;), depression (Geisner, Larimer, & Neighbors, 2004), eating disorders (Dunn, Larimer, & Neighbors, 2002), risky sexual behavior, and sexual assault (Abbey, Buck, Zawacki, & Saenz, 2003; Kaysen, Neighbors, Martell, Fossos, & Larimer, 2006; Koss & Gaines, 1993; Larimer, Lydum, Anderson, & Turner, 1999). Morbidity and mortality trends related to college drinking indicate that almost 20% of undergraduates meet DSM-IV criteria for alcohol dependence or abuse (NIAAA, 2007), yet less than 5% seek alcohol treatment or counseling. Existing alcohol interventions for college alcohol misuse are widely available; however, many undergraduates do not perceive any need to change their drinking behavior (Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Larimer & Cronce, 2002). Innovative intervention strategies that encourage students to consciously consider reasons for changing problem behaviors by increasing motivation to change (MTC) may provide unique benefit (e.g., Collins, Carey, & Otto, 2009).

Decisional balance

Decisional balance (DB), a method which has been widely applied, is a way of representing the benefits (pros) and costs (cons) of alternative behavioral choices and has been used to facilitate decision-making and MTC (e.g., Morgen & Gunneson, 2008). MTC, described as a state of readiness or eagerness to change, is a dynamic, multidimensional, and fluctuating state, and as it can be influenced by both internal and external conditions, it is a significant factor to consider in alcohol intervention (Miller, 1999; Miller & Rollnick, 1991). DB assumes that effectual decision-making involves careful consideration of relevant factors, such as potential gains (benefits) and losses (costs). As such, DB facilitates a comprehensive and realistic assessment of the net gain of a current or potential behavior. Data generated during a DB may serve as a proxy for MTC as it reflects an individual's resolve to enter into a course of action (Janis & Mann, 1977). Engaging in DB allows for the examination of ambivalence regarding current behavior to determine whether the weight of the evidence accumulates towards a need for behavior change (Miller, 1999). The development of the DB construct over the course of history demonstrates its potential to not only reflect but also to enhance motivational states, and thus, it can be used as an assessment tool as well as an intervention procedure (e.g., Collins & Carey, 2005). Alcohol-related interventions incorporating a DB component are generally associated with favorable outcomes including decreased drinking levels or increased motivation for reducing drinking (LaBrie, Cail, Pedersen, & Migliuri, 2011; LaBrie, Lamb, Pedersen, & Quinlan, 2006; LaBrie, Pedersen, Earleywine, & Olsen, 2006; LaBrie, Thompson, Huchting, Lac, & Buckley, 2007; Talpade et al., 2008; Walton et al., 2010). DB literature suggests that an open-ended, comprehensive response format is preferred with respect to DB measurement (Collins & Carey, 2005). As such, a four-field DB worksheet that prompts participants to report the pros and cons for each behavior alternative (specifically, current drinking and reducing drinking) has been applied (e.g., Carey et al., 2006). In filling out the worksheet, the individual becomes more

aware of conflict between behaviors and goals, and understands and works through awareness-induced ambivalence.

One of the methodological limitations of existing brief intervention research related to alcohol is that the interventions typically involve multiple components. Although these alcohol interventions have generally been associated with favorable outcomes (e.g., Share, McCrady, & Epstein, 2004), as DB has largely been applied in the context of multi-component alcohol programs, evaluation of DB as a unique contributor has been somewhat prohibited. Only a few published studies have evaluated DB as a stand-alone alcohol intervention, and they have revealed mixed findings. One study provided support for the use of DB as a stand-alone intervention, indicating that DB favorably affected alcohol-related variables (e.g., decreased drinking; LaBrie et al., 2006). In contrast, two studies did not find support for a stand-alone DB intervention (Collins & Carey, 2005; Carey et al., 2006). Thus, although alcohol interventions that incorporate a DB component tend to have favorable outcomes, research assessing DB's unique effects show mixed findings.

A recently proposed measure for decisional balance

A new measure for DB, termed the decisional balance proportion (DBP), has recently been proposed (Collins et al., 2009), and evaluates the *ratio* of pros and cons (see Figure 1 for an example). The DBP utilizes the traditional DB worksheet, which is an open-ended generation of pros and cons that integrates a comprehensive, four-field DB: pros and cons of drinking and reducing drinking. Collins and colleagues (2009) converted the number of pros and cons in each field of the DB worksheet into a DBP (that is, counts of pros and cons were obtained by summing filled-in lines) and tested its predictive validity with respect to drinking (see Collins et al., 2009 for specific details regarding DBP calculation). Drinking outcomes were significantly and consistently predicted by DBP models. Further, changes in DBP from pre- to post-treatment predicted drinking for up to six months following the brief intervention (Collins et al., 2009). This DBP study was replicated by Collins, Eck, Torchalla, Schroter, and Batra (2010) in the context of a smoking intervention to test whether the predictive effects of the DBP were generalizable beyond alcohol use. The development of MTC as measured by the DBP over the course of the intervention was an effective predictor of smoking outcomes including longer abstinence and less smoking on smoking days (Collins et al., 2010). Thus, the DBP seems to be a valid and intuitively interpretable measure of MTC (Collins et al., 2009; Collins et al., 2010) and represents a step forward in DB measurement and applicability. Further research is needed to explore whether extensions and alterations of the DBP increase its predictive utility.

Current study

The current study implemented an alcohol intervention among heavy drinking undergraduate students. The present work compares an original, non-weighted intervention comprised of a non-weighted DBP calculated according to details specified by Collins et al., (2009) with a weighted intervention comprised of a participant-weighted DBP wherein participants assign weights of relative importance to pros and cons. Although the non-weighted DBP has demonstrated predictive validity (Collins et al., 2009), it is calculated

based on a simple count of the number of pros and cons for changing and the number of pros and cons for not changing, and as such, it implicitly assumes that all pros and cons are equally weighted (Figure 1). It seems reasonable to assume that some motivations for or against change (e.g., fear of losing friends or desire to keep a significant relationship) may carry greater weight than others (e.g., liking the taste of beer or desiring to reduce calories). Furthermore, it is important to note that what is highly valued or carries great weight to some individuals (e.g., being healthy or employed) may be of less importance to others. Incorporating weights into the DBP seems like an important and innovative advance for alcohol interventions to consider, and the weights of items may provide significant information (see Figure 1 for an example). Research involving participant-weighted measures (e.g., Pyne et al., 2008) may be more sensitive to aspects of substance use relative to clinical measures or symptom checklists. Moreover, it is possible that specific items will be differentially weighted over time as they become more salient and more important, or less salient and less important. Here, a weighted DBP would not only be able to distinguish changes in the pro-con *proportion* (the original DBP), it would further be able to extricate changes in the *relative importance* of specific items that affect overall MTC. Strengths of a weighted DBP may include increased predictive ability for drinking behavior and identification of items likely to affect MTC. Therefore, a weighted DBP may have potential utility in alcohol brief intervention among college students and may represent a significant leap forward in DB research.

The aim of the present research was to evaluate associations between the DBP and drinking and to evaluate a weighted versus non-weighted alcohol DB. Our first hypothesis was that heavy drinkers who receive the weighted intervention, comprised of a weighted DBP, will report significant decreases in drinking and problems compared to the non-weighted intervention or control. Additionally, the present research sought to evaluate initial DBP as a moderator of intervention efficacy. As such, we expected that heavy drinkers entering the intervention already motivated to reduce drinking would report significant decreases in alcohol use relative to heavy drinkers who enter the intervention not yet ready to change their drinking behavior. In other words, the weighted and non-weighted DBP exercises are expected to reduce drinking most for participants with higher initial DBP scores (i.e., higher motivation to change) relative to those with lower initial DBP scores.

Method

Participants

One hundred and sixty-two heavy drinking undergraduate students (Mean age = 24.37, SD = 6.81, 27% male) from a large (total student body N = 39,820 in 2011) urban university participated in this research. The sample was ethnically diverse, consisting of 53.33% Caucasian, 10.91% Black/African American, 10.91% Asian, 0.61% Native Hawaiian/Pacific Islander, 9.70% Multi-Ethnic, and 14.54% Other. Additionally, 33.73% of the sample self-identified as Hispanic/Latino. Participants were recruited via flyers placed around the university and concentrated in buildings wherein Psychology courses were offered. Participants were also recruited via brief informational presentations by study personnel to Psychology courses and emails sent to students currently enrolled in Psychology courses.

Interested students (N = 1159) were provided with a link to the online survey and were eligible for the longitudinal study if they met heavy drinking criteria (4 or 5 drinks on one occasion in the past month for females and males respectively). Of the 1159 interested students, a total of 210 met heavy drinking criteria, were invited to the longitudinal study, and provided informed consent. Of these heavy drinkers, 180 (86%) completed both the baseline and the follow-up assessment roughly 30 days after baseline. Missing data were identified for 18 cases and thus were removed from analyses. The final sample included 162 heavy drinking undergraduates.

Study Design

Participants were randomly assigned to a weighted alcohol intervention (weighted DBP), non-weighted alcohol intervention (non-weighted DBP), or control. Participants in the non-weighted intervention received a DBP computed in accordance with procedures outlined by Collins and colleagues (2009). Participants in the weighted intervention received a weighted DBP that incorporated the relative importance of each pro and con. Participants in the control condition were asked to complete DBP related to physical activity. All participants completed assessments at baseline and at a one month (roughly 30 days) follow-up. Thus, the present study implemented a stand-alone DB intervention among heavy drinking undergraduates and used a weighted and non-weighted DBP to predict drinking outcomes.

Procedure

Prior to study commencement, the research team obtained approval from the institutional review board (IRB) at the study site. Participants were informed that the purpose of the study was to examine health behaviors in college students and were recruited on a rolling basis in Psychology classrooms, via email, and by flyers placed in Psychology buildings. Students had to be at least 18 years or older and provide informed consent in order to participate. This study provided participants with extra credit compensation. Individuals who met heavy drinking criteria (4 or 5 drinks minimum during one occasion in the past month for females or males respectively) were invited to the longitudinal portion of the study and were asked to complete a follow-up assessment roughly one month (30 days) following the initial assessment.

Time 1—Participants were randomized to either the weighted intervention condition, the non-weighted intervention condition, or control, and all participants completed self-reported demographic items and assessments of drinking behavior. Those randomized to the weighted intervention condition then completed an alcohol DB and assigned personalized weights of relative importance ranging from 1 (*not at all important*) to 7 (*extremely important*) to each item that they listed. Each item's weight was included in the calculation of an alcohol-related weighted DBP (Figure 1), a composite score that incorporated weights of importance. Those randomized to the non-weighted DBP intervention completed an alcohol DB and a subsequent non-weighted alcohol DBP was calculated for these participants, using procedures detailed by Collins and colleagues (2009; Figure 1). Those randomized to the control condition were asked to complete a physical activity DB. This involves a similar balance worksheet used in the alcohol DB conditions with the main difference being that instead of listing the pros and cons of drinking and reducing drinking,

participants were asked to list the pros and cons of current physical activity and increasing physical activity.

Time 2—Participants were then invited via email or phone to complete a follow-up assessment approximately 30 days following the baseline assessment. Procedures for the follow-up assessment were similar to the baseline assessment. Participants were asked to complete a one hour (60 minute) follow-up assessment online, and similar to the baseline assessment, participants filled out measures on a computer at the location of their choice. Participants completed either an alcohol or physical activity DB sheet and either assigned weights to each pro and con or not, according to the condition to which they were previously assigned. This allowed for the evaluation of whether changes in the weighted or non-weighted DBP were associated with changes in drinking or physical activity outcomes. Participants received compensation in the form of course extra credit in exchange for completing the study assessments.

Measures

Demographics—Participants reported demographic information such as age, gender, racial background, and year in school.

The Quantity/Frequency Scale (Baer, 1993; Marlatt et al., 1995) is a five-item measure assessing the number of drinks and the number of hours spent drinking on a peak drinking event within the past month, number of drinks consumed on a typical weekend in the past month, as well as the number of days out of the month that alcohol was consumed (0 = *I do not drink at all*, 1 = *about once per month*, 2 = *two to three times a month*, 3 = *once or twice per week*, 4 = *three to four times per week*, 5 = *almost every day*, 6 = *I drink once daily or more*). Scores represent peak drinking.

The Daily Drinking Questionnaire (Collins et al., 1985; Kivlahan et al., 1990) asks participants to estimate the standard number of drinks consumed on every day of a typical week (Monday-Sunday) within the last month. Drinks on each day of the week are added in order to derive the average number of drinks that are consumed over the course of each week and as such, scores represent weekly drinking. Compared with alternative drinking measures, weekly drinking has been shown to be a reliable index of problems related to alcohol among college students (Borsari, Neal, Collins, & Carey, 2001).

Rutgers Alcohol Problem Index—The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) is a 23-item measure that was used to assess alcohol related negative consequences in the last month, and responses ranged from *never* (0) to *10 times or more* (4). Items were rated based on how many times each problem had occurred while consuming alcohol, such as “went to work or school high or drunk” and total summed scores for the RAPI ranged from 0 to 100 (White & Labouvie, 1989). Thus, scores represent the number and magnitude of alcohol problems experienced by respondents. Cronbach α for the RAPI was .93.

Decisional Balance Sheet—The Decisional Balance (DB) sheet is a free recall task that evaluates the accessibility of alcohol expectancies. Participants were asked to record each

advantage and disadvantage of "continuing to drink as you are now" and "drinking less than you do now." Participants in weighted conditions were asked to assign weights of relative importance to each pro and con listed, ranging from *not at all important* to *extremely important* on a 7-point Likert scale. The non-weighted original DBP was scored in accordance with Collins and colleagues (2009; see Figure 1 for non-weighted DBP formula). To calculate the weighted DBP, reported weights were summed and added to total pros and cons prior to computing the DBP formula (see Figure 1 for weighted DBP formula). Should MTC for a participant in any condition have been very low such that no items were listed for reducing drinking and no cons were listed for current drinking (e.g., the numerator in the above formula is zero), the corresponding DBP was made equal to zero. Additionally, as previously noted, "W" in the weighted formula is arrived at by summing the weights for that particular field. Higher scores on DBP indicate stronger motivation to reduce drinking.

Analysis plan

All analyses were conducted using SAS 9.3. Descriptive statistics including standard deviations, means, and distribution statistics were computed. Pearson correlation analysis was conducted to examine the associations among variables. Group differences were tested where two dummy codes were created indicating membership in the weighted DB group (1, 0) and the non-weighted DBP group (1, 0). Thus, the control group served as the reference category. Hypotheses were tested hierarchically wherein the model at Step 1 included covariates and the two intervention contrasts. Covariates were the dummy-coded gender variable (males received a 1 and females a 0) and baseline drinking variables. At Step 2, the interaction terms between baseline DBP and the two intervention contrasts were added into the model. Dependent variables were follow-up drinking outcomes (follow-up peak drinks, drinks per week, drinking frequency, and problems). To address multicollinearity concerns, continuous independent variables were standardized (i.e., mean of zero) prior to inclusion in analyses.

Results

Descriptives

Means, bivariate correlation coefficients, and standard deviations for all variables of interest are presented in Table 1.

Correlations between alcohol variables—Baseline alcohol-related consumption and problems were positively correlated with each other and with follow-up drinking and problems (all p's <.01), with the exception of follow-up drinking frequency which was marginally and positively correlated with baseline peak drinks (r = .13, p <.10). Follow-up drinking variables were positively correlated with each other (all p's <.01).

Correlations between DBP variables—Baseline weighted DBP was positively correlated with baseline non-weighted DBP (r = .97, p <.001). Follow-up non-weighted DBP was marginally and positively correlated with baseline non-weighted DBP (r = −.16, p <.10) and baseline weighted DBP (r = .17, p <.10). Follow-up weighted DBP was positively correlated with baseline non-weighted DBP (r = .23, p <.01), baseline weighted DBP (r = .

26, p <.01), and follow-up non-weighted DBP (r = .94, p <.001). The categorical follow-up weighted and non-weighted intervention variables were positively correlated (r = .53, p <. 001), and both were negatively correlated with baseline non-weighted DBP (r = −.22, p <.01 and r = −.22, p <.05) respectively.

Correlations between DBP and alcohol variables—Baseline non-weighted DBP and baseline weighted DBP were both marginally and negatively correlated with baseline alcohol problems (r = −.15, p <.10 and r = −.20, p <.05 respectively). Follow-up peak drinks was marginally and negatively correlated with baseline weighted DBP (r = −.16, p <.10). Follow-up drinking frequency was negatively correlated with baseline non-weighted DBP (r = −.17, p <.05) and baseline weighted DBP (r = −.17 p <.05). Follow-up drinks per week was negatively correlated with baseline weighted DBP (r = −.19, p <.05). Follow-up problems was marginally and negatively correlated with baseline non-weighted DBP (r = −. 14, p <.10) and with baseline weighted DBP (r = −.15, p <.10). Follow-up non-weighted DBP was negatively correlated with baseline weekly drinking (r = −.16, p <.05). Follow-up weighted DBP was negatively correlated with baseline peak drinks (r = −.20, p <.05) and baseline drinks per week (r = −.19, p <.05), but was marginally and negatively correlated with drinking frequency (r = −.15, p <.10). Follow-up weighted DBP was marginally and negatively correlated with follow-up weekly drinking (r = − .16, p <.10). The alcohol intervention (weighted and non-weighted) was marginally and negatively correlated with follow-up weekly drinking (r = −.13, p <.10) and follow-up non-weighted DBP (r = −.14, p <.10).

Correlations with gender—Gender was positively correlated with baseline peak drinks (r = .23, p <.01), baseline drinks per week (r = .24, p <.01), baseline problems (r = .20, p <. 05), and follow-up peak drinks (r = .18, p <.05). Gender was marginally and positively correlated with baseline drinking frequency (r = .13, p <.10) and follow-up drinks per week (r = .15, p <.10), but was negatively correlated with the intervention condition (r = −.16, p <.05).

Primary analyses

Results of regression analyses are presented in Table 2. Results at step 1 revealed that relative to control, the non-weighted intervention predicted significant reductions in weekly drinking (β = −.15, p <.05) and marginal reductions in alcohol problems (β = −.11, p <.10). The weighted intervention wherein participants assigned relative weights of importance to each pro and con led to significant reductions in drinking frequency (β = −.13, p <.05). Findings did not reveal significant two-way interactions at Step 2 between baseline DBP and the weighted intervention. Thus, evidence did not support expectations that participants entering the program already motivated to reduce their drinking would receive greater benefit from the weighted intervention relative to participants not yet ready to change. There was, however, a significant interaction between baseline DBP and the unweighted intervention for follow-up peak drinks indicating reductions for those who were higher in baseline DBP (β = −.21, p <.05). All variance inflation factors ranged from 1.04 to 2.06.

Additional analyses following the same approach as described above, were conducted replacing the weighted intervention contrast with a dummy coded contrast representing the control participants (1, 0). This allowed for direct comparison between the two intervention groups. There were no significant differences on any outcome between the two intervention groups. There also were no interactions between baseline DBP and differences between the two intervention groups.

Discussion

The present study replicates and extends previous research by providing an examination of a weighted decisional balance proportion (DBP) and comparing it with the previously used non-weighted DBP (Collins et al., 2009). This research was conducted among a sample of heavy drinking undergraduate students. DBP data were generated from responses to an open-ended DB worksheet which assesses the pros and cons of current drinking and reducing drinking – designed to reflect the extent to which the individual's DB was tipped towards making a change.

We predicted that the weighted and unweighted DB interventions would reduce drinking relative to control, and results provided some support for these expectations, demonstrating that the alcohol intervention was associated with reductions in drinking levels and frequency. Findings from the present study further emphasize the importance of encouraging heavy drinkers to consciously consider reasons for changing their drinking through strategies such as DB. We further predicted that the weighted intervention would be more effective in reducing heavy drinking relative to the non-weighted intervention or control. We did not find substantial support for this. Relative to control we saw more evidence for reduction in the unweighted intervention (i.e., drinks per week and problems), whereas the weighted intervention was associated with reduced frequency. Thus, it is not clear that adding weights to the procedure provides significant benefit.

Additionally, we predicted that decisional balance would be most effective among heavy drinkers entering the intervention already motivated to reduce drinking, relative to heavy drinkers who enter the intervention not yet ready to change their drinking behavior. It was expected that the weighted intervention would be most effective for participants with higher motivation to reduce drinking at baseline, as individuals already motivated to drink less will consume less alcohol following the intervention compared to individuals not motivated to make a change in their drinking. In other words, we predicted that initial DBP would moderate the effect of the intervention on drinking outcomes, however findings did not provide sufficient evidence to support this expectation. In contrast, there was an interaction with baseline DBP and the unweighted intervention for peak drinks, suggesting that a standard decisional balance (i.e., without weighting) may have more benefit for those who are more motivated to change.

In sum, these findings can be considered in light of two main questions; 1) *does decisional balance work?* and 2) *does weighting matter?* Overall, with respect to the question of whether the intervention worked, findings from the present study indicate that the decisional balance (DB) procedure may be effective in reducing alcohol use and harmful problems.

However, it is important to note that the present data suggest that intervention efficacy may depend on specific outcome. For these data, the decisional balance intervention showed some evidence of impact on drinks per week, frequency, and a marginal effect for problems. Additionally, intervention efficacy appeared to depend on whether the DBP was weighted or not weighted. Furthermore, the method by which the weighted DBP was calculated for the present data may have differential result in terms of predicting follow-up drinking variables, and it is not yet clear whether a better weighted DBP formula exists. Therefore, it appears that the DB intervention was effective for specific outcomes (drinking frequency), and it is possible that this is true only when the DBP is weighted a certain way.

With respect to the question of whether weighting matters, the weighted DBP differs little from the traditional non-weighted DBP, mean scores at baseline being non-significantly different (0.67 and 0.69 respectively). Additionally, as expected, the correlation between the two scores is high (0.96). Thus, it does not appear at first glance that assigning weights to items adds much to the traditional approach of the DB intervention. However, our findings indicate that weighting items during the DB procedure does indeed matter with respect to frequency of consumption. As such, there are two considerations regarding weighting in an alcohol intervention. The first is whether the intervention incorporates weighting at all, and the second relates to how the weights are scored. As stated above, the present study scored weights by summing weights prior to including them in the composite DBP score. It is possible that scoring weights differently and comparing predictive validity of differentially calculated weighted DBP might determine which of these best predicted follow-up drinking. A follow-up question to whether weighting matters is the question of why the weighted intervention worked. To this end, it seems that it is the *process* of weighting that is of importance and less so the *actual* weights of items. It is likely that the assignment of weights might cognitively reinforce the significance or extremity of each reason to reduce drinking. This might in turn tip the balance towards making a change by enhancing the resolution of ambivalence regarding drinking. It is possible that assigning weights to items encourages individuals to explore ambivalence. Considering weighted items might enhance the exploration of ambivalence and may provide an internal search for inspiration to change. This might be a significant process in the resolution of ambivalence, and the resulting increase in motivation to change behavior might be greater than had the individual not undergone the process of assigning weights.

The initial DBP was found to moderate intervention efficacy of the unweighted intervention for peak drinks, suggesting that decisional balance may be more effective for those who are more motivated to change their peak drinking levels. This may be related to severity of consequences at higher BAC's. There were not interaction effects of baseline DBP with the weighted interaction. Additional research is needed to elucidate whether other moderators might be identified. Individual differences to be considered might include factors related to motivation such as intrinsic versus extrinsic elements or incentives that might influence an individual's motivation to engage in or reduce drinking. One potential avenue for future research is to use a coded (or categorized) DBP to identify the most common reasons heavy drinking college students list for drinking and reducing drinking. This may provide some insight regarding factors that most influence undergraduates to drink or reduce drinking. In

addition to identifying most *common* reasons why undergraduates drink, a coded DBP may help alcohol researchers to better understand specifically what factors are most important to take into account or make salient during intervention.

Limitations

The strengths of the study must be considered in light of the limitations. First, it is important to note that to an extent, the DBP (weighted or non-weighted) is a relative measure that assesses the proportion of one behavioral alternative (current drinking) relative to the other (reducing drinking). Thus, if a participant's DBP score changes over time it would not be possible to determine which preference of behavior option had changed relative to the other option (other strategies must be used for this, such as evaluating the number of pros listed at baseline compared to the number listed at follow-up). Additionally, as the DBP can only be interpreted as motivation to engage in a behavior relative to other, however should an individual weigh three or more alternatives (e.g., current drinking, reducing drinking, and abstinence), results may be confounded. Furthermore, related to the weighted DBP, there is an implicit assumption that weight anchors of items are evenly spread between "*not at all important*" and "*extremely important*." However, it is likely that the scale anchors are not in fact uniformly distributed. In fact, the difference between the lowest anchor "*not at all important*" (which translates to a weight of zero), and the next, "*somewhat important*" (which translates to a weight of one), might represent a significant "jump" compared to the difference between "*somewhat important*" and the adjacent anchor, "*very important*" (which translates to a weight of two).

Theoretical predictions involving the DB procedure suggest that it is designed to facilitate the exploration and resolution of ambivalence. It is possible that this procedure may not be beneficial for individuals whose ambivalence is low compared to individuals whose ambivalence is high. Additionally, participants were recruited from psychology courses, and traditionally, psychology is a female-dominated discipline. Thus, study population consisted of a disproportionate male to female ratio, with only 27% of the sample being male. The literature suggests that the rate incidence of harmful use of alcohol in college students would be as high if not higher in males relative to females, and thus, this characteristic of the population is a limitation with respect to generalizability of results.

It is notable that the pattern of results was not consistent and findings differed depending on which outcome was considered. The evaluation of multiple outcomes raises the possibility of making a type 1 error and results should be interpreted with some caution. Finally, while the heavy drinking sample meets criteria for harmful use of alcohol in most jurisdictions, the population may include a range of patterns of use, ranging from once per month heavy drinking up to daily heavy consumption. Further research is needed to elucidate whether individuals engaging in these different patterns of use respond differently to the DB exercise.

Conclusion

This paper described a DB intervention and findings, and proposed strategies for improving DB with respect to alcohol brief interventions for heavy drinking college students. The

present study replicates and extends previous research by providing an examination of weighted and non-weighted DBP as a measure of MTC among a sample of heavy drinking undergraduate students. Findings provided support for hypotheses in that the DBP intervention resulted in decreased drinks per week and drinking frequency; however, initial DBP was not found to moderate the intervention. There was not consistent support for an advantage of a weighted versus unweighted decisional balance intervention. This research lays the groundwork for enhancing future interventions by increasing empirical knowledge of the role motivation plays in heavy alcohol use and factors in predicting drinking.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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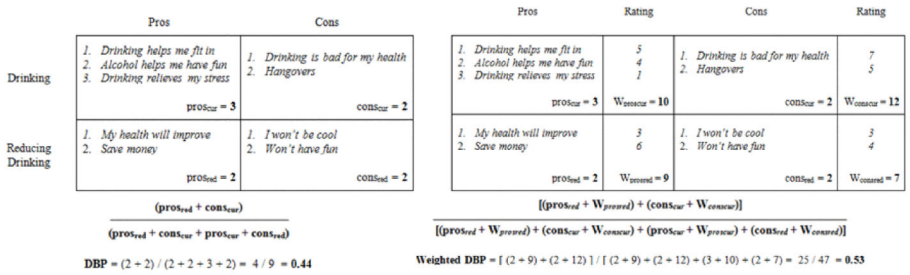

Figure 1.

The four-field decisional balance worksheet and non-weighted DBP calculation is shown on the left. The worksheet on the right shows a weighted DBP using the same items.

Table 1

Means, Standard Deviations, and Correlations among Variables

		Baseline/Intervention							Follow-Up						
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Baseline / Intervention	1. Peak Drinks	-														
	2. Drink Frequency	0.21**	-													
	3. Drinks per week	0.45***	0.52***	-												
	4. Problems	0.25**	0.20**	0.51***	-											
	5. DBP - no weight	−0.04	−0.07	−0.07	−0.15†	-										
	6. DBP - weight	−0.05	−0.05	−0.10	−0.20*	0.97***	-									
Follow-Up	7. Peak Drinks	0.39***	0.27***	0.41***	0.25**	−0.12	−0.16†	-								
	8. Drink Frequency	0.13†	0.67***	0.47***	0.22**	−0.17*	−0.17*	0.46***	-							
	9. Drinks per week	0.24**	0.41***	0.55***	0.30***	−0.13	−0.19*	0.63***	0.64***	-						
	10. Problems	0.20*	0.25**	0.45***	0.71***	−0.14†	−0.15†	0.21**	0.29***	0.36***	-					
	11. DBP - no weight	−0.06	−0.07	−0.16*	−0.07	0.16†	0.17†	−0.03	−0.06	−0.10	−0.05	-				
	12. DBP - weight	−0.20*	−0.15†	−0.19*	−0.08	0.23**	0.26**	−0.08	−0.14	−0.16†	−0.09	0.94***	-			
	13. Intervention	0.04	−0.05	0.01	0.06	−0.10	−0.22*	−0.03	−0.09	−0.13†	−0.02	−0.14†	−0.22**	-		
	14. Weighted Intervention	−0.01	0.04	0.01	0.08	0.00	−0.21*	−0.07	−0.01	−0.11	−0.03	−0.06	−0.11	0.53***	-	
	15. Gender	0.23**	0.13†	0.24**	0.20*	0.02	−0.04	0.18*	0.05	0.15†	0.02	−0.03	−0.10	−0.16*	−0.04	-
	Mean	7.05	5.62	8.62	31.51	0.69	0.68	4.77	4.76	7.23	30.01	0.65	0.66	0.45	0.19	0.27
	Std. Dev.	3.49	1.99	6.50	8.66	0.17	0.16	3.43	2.53	6.58	7.18	0.17	0.14	0.50	0.39	0.45

Note. N = 162

Correlations, means, and standard deviations presented are from non-standardized data.

Gender was dummy coded such that males received a 1 and females a 0.

The weighted intervention variable was dummy coded; those receiving the weighted intervention received a 1 and others, a 0.

The non-weighted intervention variable was dummy coded; those receiving the non-weighted intervention received a 1 and others, a 0.

*** $p < .001$

** $p < .01$

* $p < .05$

† $p < .10$

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Table 2

Hierarchical regression results

		Predictor	B	SE B	*t*	*p*	β	VIF	R^2
Follow-up Peak Drinks	Step 1	Gender	0.40	0.57	0.69	0.49	0.05	1.13	0.2477
		Baseline Peak Drinks	0.87	0.27	3.16	0.002	0.25**	1.28	
		Baseline Drinks Per Week	0.76	0.35	2.19	0.03	0.22*	2.06	
		Baseline Drinking Frequency	0.15	0.29	0.51	0.61	0.04	1.41	
		Baseline Alcohol Problems	0.28	0.29	0.97	0.33	0.08	1.41	
		Baseline DBP	−0.03	0.59	−0.05	0.96	−0.004	1.16	
		Non-Weighted Intervention	−0.66	0.65	−1.02	0.31	−0.08	1.11	
		Weighted Intervention	−0.29	0.25	−1.16	0.25	−0.08	1.04	
	Step 2	Baseline DBP * Weighted Intervention	−0.37	0.62	−0.59	0.55	−0.05	1.56	0.2738
		Baseline DBP * Unweighted Intervention	−1.34	0.58	−2.31	0.02	−0.21*	1.71	
Follow-up Drinks Per Week	Step 1	Gender	−0.08	1.02	−0.08	0.94	−0.01	1.13	0.3557
		Baseline Peak Drinks	−0.05	0.49	−0.11	0.92	−0.01	1.28	
		Baseline Drinks Per Week	2.99	0.62	4.83	<.0001	0.45***	2.06	
		Baseline Drinking Frequency	0.31	0.51	0.61	0.54	0.05	1.41	
		Baseline Alcohol Problems	1.01	0.51	1.99	0.048	0.15*	1.41	
		Baseline DBP	−1.34	1.04	−1.29	0.20	−0.09	1.16	
		Non-Weighted Intervention	−2.51	1.16	−2.18	0.03	−0.15*	1.11	
		Weighted Intervention	−0.59	0.45	−1.31	0.19	−0.09	1.04	
	Step 2	Baseline DBP * Weighted Intervention	0.59	1.12	0.53	0.60	0.04	1.56	0.3660
		Baseline DBP * Unweighted Intervention	−1.21	1.03	−1.17	0.25	−0.10	1.71	
Follow-up Drinking Frequency	Step 1	Gender	−0.39	0.35	−1.13	0.26	−0.07	1.13	0.4958
		Baseline Peak Drinks	−0.18	0.17	−1.11	0.27	−0.07	1.28	
		Baseline Drinks Per Week	0.50	0.21	2.36	0.02	0.19*	2.06	
		Baseline Drinking Frequency	0.05	0.17	0.31	0.75	0.02	1.41	
		Baseline Alcohol Problems	1.46	0.17	8.42	<.0001	0.58***	1.41	
		Baseline DBP	−0.41	0.35	−1.15	0.25	−0.07	1.16	
		Non-Weighted Intervention	−0.42	0.39	−1.07	0.29	−0.06	1.11	
		Weighted Intervention	−0.33	0.15	−2.15	0.03	−0.13*	1.04	
	Step 2	Baseline DBP * Weighted Intervention	0.11	0.38	0.30	0.77	0.02	1.26	0.4962
		Baseline DBP * Unweighted Intervention	0.08	0.35	0.23	0.82	0.02	1.72	
Follow-up Alcohol Problems	Step 1	Gender	−2.56	0.93	−2.76	0.01	−0.16*	1.13	0.5510
		Baseline Peak Drinks	0.02	0.44	0.05	0.96	0.003	1.28	
		Baseline Drinks Per Week	0.75	0.56	1.33	0.19	0.10	2.06	

		Predictor	B	SE B	*t*	*p*	β	VIF	R^2
		Baseline Drinking Frequency	4.88	0.46	10.56	<.0001	0.68^{***}	1.41	
		Baseline Alcohol Problems	0.55	0.46	1.19	0.24	0.08	1.41	
		Baseline DBP	−0.77	0.95	−0.82	0.42	−0.05	1.16	
		Non-Weighted Intervention	−2.03	1.05	−1.93	0.06	$-0.11^{\dagger}$	1.11	
		Weighted Intervention	−0.16	0.41	−0.40	0.69	−0.02	1.04	
	Step 2	Baseline DBP * Weighted Intervention	0.81	1.02	0.80	0.43	0.05	1.56	0.5535
		Baseline DBP * Unweighted Intervention	−0.13	0.95	−0.14	0.89	−0.01	1.72	

Note. N = 162

$^{***}p < .001$

$^{**}p < .01$

$^{*}p < .05$

$^{\dagger}p < .10$