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Trajectories of In-Session Change Language in Brief Motivational Interventions with Mandated College Students

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Abstract

Objective—Brief Motivational Interventions (BMIs) are currently the most efficacious individual intervention for mandated college students. However, little is known about how BMIs facilitate client language in relation to subsequent changes in alcohol use and problems in mandated student samples.

Method—The current study used the Motivational Interviewing Skills Code (MISC 2.0; Miller, Moyers, Ernst, & Amrhein, 2003) to code BMI sessions ($N = 252$) from two randomized clinical trials that led to significant reductions in alcohol use and alcohol-related problems in mandated student drinkers. A proportion of change language was calculated for each decile (1st to 10th) of the BMI sessions.

Results—Latent class analyses of in-session speech indicated that there were three distinct trajectories of change language over the course of the session: high ($n = 59$), increasing ($n = 122$), and low ($n = 71$). Members of the high trajectory group showed higher rates of alcohol-related problems prior to the BMI and members of the low trajectory group were more likely to be male. Six months following the BMI, members of the high and low trajectory groups demonstrated significant reductions in alcohol use and problems, and members of the increasing trajectory group only reduced alcohol-related problems.

Conclusions—Associations among the three trajectories of client change language and subsequent reductions in alcohol use and problems partially supported the technical hypothesis of MI efficacy. Client factors as well as the nature of the discussion of personalized feedback may determine the link between in-session client language and subsequent behavior change.

Keywords

Motivational Interviewing; therapy process; alcohol use; brief intervention; mandated students

Brief Motivational Interventions (BMIs), often variations of Brief Alcohol Screening and Intervention in College Students (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999), are currently the in-person intervention with the strongest empirical support for reducing alcohol use and related problems in college students who violate campus alcohol policies (Carey, Scott-Sheldon, Garey, Elliott, & Carey, 2016). BMIs are frequently delivered in 1 to 2 individual face-to-face meetings, approximately 50 minutes long (Carey, Scott-Sheldon, Carey, & DeMartini, 2007), and commonly use Motivational Interviewing (MI; Miller & Rollnick, 2013) combined with personalized feedback (PF) to reduce the risk for alcohol-related harm. Mandated students who receive individual BMIs have consistently shown lower alcohol consumption and reduced alcohol-related problems relative to control conditions over follow-up time periods ranging from 6 weeks to 15 months (Carey et al., 2007; Carey et al., 2016; Ray et al., 2014). Despite the evidence supporting BMI's efficacy with mandated students, effect sizes of these interventions are generally small and a substantial proportion of students who complete a BMI continue to drink heavily and experience alcohol-related problems. Therefore, a better understanding of the mechanisms underlying BMI effects could guide future refinements to BMI protocols.

Motivational interviewing (MI) theory posits that post-session behavior change is directly influenced by in-session client language, referred to as *change talk* (“any self-expressed language that is an argument for change,” Miller & Rollnick, p. 159) or *sustain talk* (“the person’s own arguments for *not* changing, for sustaining the status quo,” Miller & Rollnick, p. 7). Specifically, the “technical hypothesis” of MI efficacy (Miller & Rose, 2009) posits that therapist use of specific MI-Consistent behaviors (MICO; e.g., reflections, affirmations) should elicit client change talk, which is posited to lead to subsequent client change in the target behavior. Similarly, therapist use of MI-Inconsistent behaviors (MIIN; e.g., confrontation, directing) should result in client sustain talk, which is expected to result in a lack of subsequent behavior change, or maintenance of the status quo (Miller & Rose, 2009). A recent meta-analysis of 12 trials implementing MI in clinical settings provided partial empirical support for the technical hypothesis. Magill and colleagues (2014) found that therapist use of MICO or MIIN behaviors does consistently elicit change talk or sustain talk, respectively (Magill et al., 2014). While sustain talk predicted poorer outcomes, change talk alone (measured as behavior counts of frequency of occurrence) did not predict outcomes. Instead, a composite measure of change talk that accounted for *both* change talk and sustain talk either by calculating the proportion of their overall occurrence (e.g., change talk/change talk + sustain talk) or calculating the overall strength of change talk (e.g., by summing ratings made on a continuum of +5 [change talk] to –5 [sustain talk]), was positively associated with subsequent healthy behavior change. In a subsequent qualitative review of

37 studies (Romano & Peters, 2015), the technical hypothesis was again supported, namely therapist MICO and MIIN were linked to client change talk and sustain talk, respectively. Furthermore, client change talk was found to be related to outcomes in several studies, the majority of which (10 of 13) examined the overall strength of change talk. In sum, it appears that both change talk and sustain talk are present when the client is discussing and resolving personal ambivalence about changing a behavior during the session (see Madson, Schumacher, Baer, & Martino, 2016), and therefore a composite measure of change talk (representing a balance of pro- and anti-change statements; Magill et al, 2014) may be a more robust indicator of behavioral outcomes than overall counts or subtypes of change talk utterances during a session (see also Arkowitz, Westra, Miller, & Rollnick, 2008, pp. 332–334).

Current MI theory posits that change talk should have a linear, positive slope over the course of the session as the therapist selectively evokes and reflects change talk (Miller & Rollnick, 2013; Miller & Rose, 2009). In the first systematic examination of client change language over the course of an MI session, Amrhein and colleagues (2003) divided MI sessions (which included PF) conducted with treatment-seeking adults in a community clinic into deciles (each decile being 1/10th of the session's length). Change talk was associated with reductions in substance use up to a year following the session; specifically, those who maintained abstinence from drug use showed higher commitment language (a subtype of change talk) at the 7th and 10th deciles of the session. In contrast, clients who demonstrated a decrease in commitment language at the end of the session (10th decile) continued to use substances. Another study examining MI sessions with PF delivered to non-treatment-seeking adults in an emergency department (Bertholet, Faouzi, Gmel, Gaume, & Daeppen, 2010) examined utterance by utterance transitions in change language strength over the course of the session. Findings indicated that change talk at the end of the session significantly predicted reduction in alcohol use 12 months later, highlighting the utility of evoking change talk and not sustain talk at the end of the session. A more recent study with adult drinkers compared MI with PF to a "Spirit only" MI (SOMI) which proscribed therapist MICO skills such as amplified or double-sided reflections (Morgenstern et al., 2012). MI participants exhibited greater change talk and subsequent drinking reductions than SOMI participants following the first session, an effect mediated by the strength of change talk ("I am going to quit") during the 9th and 10th deciles (the only deciles examined). This effect was not replicated following the second (non-PF) session of treatment (perhaps because MI participants had already reduced their drinking), and MI and SOMI participants demonstrated similar reductions in drinking at the end of treatment. Taken together, this research indicates that it appears that client language may meaningfully fluctuate over the course of an MI session and that client language at the end of the session may be especially predictive of change.

Within the college drinking literature, a growing number of studies have linked in-session change talk and sustain talk with subsequent behavior change, even with the non-clinical or preventive focus of most college drinking interventions. One study examining BMI sessions with PF (BMI+PF) revealed that MICO behaviors resulted in more client change talk *and* more client sustain talk, which in turn were each predictive of 3-month drinking outcomes in the expected directions; change talk was linked to lower alcohol use, and sustain talk linked

to higher use (Vader, Walters, Prabhu, Houck, & Field, 2010). In contrast, client language did not predict outcomes in sessions with MI-only. A more recent study with 92 mandated college students (Apodaca et al., 2014) receiving a BMI with PF found that sustain talk predicted poorer alcohol use outcomes following the BMI at 3- and 12-month follow-up assessments (but change talk was not predictive of outcomes).

The inconsistent link between change talk and sustain talk with behavioral outcomes may be due to client utterances not addressing personal alcohol use (termed “follow/neutral” and including questions and general statements). In the adult MI literature, a factor analysis of client utterances coded from the first session (which included PF) of the MI condition of Project MATCH found that follow/neutral utterances loaded on the same factor as commitment language (Martin, Christopher, Houck, & Moyers, 2011). Two explanations were posited by the authors for this finding. First, follow/neutral may reflect several client characteristics such as “trait talkativeness, therapeutic alliance, and the degree to which clients are willing to follow the typical lead of the therapist” (p. 443), all of which may be particularly important in a session in which the therapist reviews PF with the client. Second, clients who have already committed to change may be more talkative during the session. Interestingly, in the Vader et al. (2010) study discussed earlier, follow/neutral client language was significantly and positively correlated with both change talk and sustain talk in BMI + PF sessions, but not in the MI-only session. In sum, other types of client utterances (follow/neutral) may have clinical relevance in BMI sessions in which PF is provided.

In prior research, change talk that occurs during a session has shown mixed predictive value across different populations and modes of MI delivery. The present study offers a unique approach to considering the role of client language as a mechanism of MI-facilitated behavior change. Specifically, we examine BMI process data from two randomized clinical trials with mandated college students that resulted in reductions in alcohol use (Carey, Henson, Carey, & Maisto, 2009) and alcohol-related problems (Borsari et al., 2012). As current MI theory proposes that a linear increase of change language across the session is likely to result in subsequent change, we first conducted inductive analyses to determine whether there are distinct trajectories of change talk. Second, we examined whether individual-level variables predicted trajectory membership. Given recent research that found severity of drinking moderated the relationship between change language and subsequent drinking (Gaume et al., 2016), we examined whether characteristics that have been commonly linked to alcohol consumption in mandated college students (gender, perceived norms) as well as pre-BMI alcohol use and problems were predictive of trajectories of change talk. Third, we linked these trajectories of change talk to subsequent changes in alcohol use and problems over the six months following the BMI. Together, these analyses may provide guidance on who may best benefit from a BMI as well as provide evidence supporting the current recommendation that therapists use MI skills to evoke more client change talk and minimize sustain talk over the course of the BMI session.

Method

Design

This project coded audio recordings of sessions from two randomized controlled trials with college students who received a BMI following an alcohol-related disciplinary violation (Borsari et al., 2012; Carey et al., 2009). Both trials demonstrated within- and between-group reductions across a range of drinking behaviors. We focused on outcomes at 6-months post-BMI, an assessment point common to both trials.

Study 1—Participants were randomly assigned to either a BMI ($n = 99$) or a standard education condition ($n = 99$) that consisted of a session with a CD-ROM program (Carey et al., 2009; Alcohol 101plus; Century Council, 1998). Follow-ups were conducted 1, 6 and 12 months after the interventions. Participation in a BMI was associated with fewer drinks per week and fewer heavy drinking episodes than participation in the standard education. Supplemental analyses documented an overall reduction in alcohol use in both conditions after the sanction and before the intervention; however, the BMI, but not the standard education, produced additional reductions in alcohol use (Carey et al., 2009).

Study 2—The second trial evaluated stepped care with mandated students (Borsari et al., 2012). All participants ($N = 598$) received Step 1: a 15-minute Brief Advice session that included the provision of a booklet containing advice to reduce drinking. Participants were assessed six weeks after receiving the Brief Advice, and those who continued to exhibit risky alcohol use ($n = 405$) were randomized to Step 2, a 45–60 minute BMI ($n = 193$) or an assessment-only control ($n = 194$). Follow-up assessments conducted at 3, 6 and 9 months revealed that the participants in the BMI group significantly reduced the number of alcohol-related problems compared to those in the control group, despite no significant group differences in alcohol use.

Participants and Procedure

Participants in Study 1 and 2 were undergraduate students age 18 years and older, who violated campus alcohol policy at one of two four-year, private liberal arts universities in the Northeast. In both studies, students were referred for mandatory counseling following adjudication by campus judicial affairs staff. Students who declined to participate in the project received treatment as usual. University Institutional Review Boards of both studies approved all intervention study procedures.

Brief Motivational Intervention

Interventionist training and supervision has been described extensively elsewhere (Borsari et al., 2015; Borsari et al., 2012; Carey et al., 2009). Briefly, interventionists delivering the BMI were trained in MI; this training specifically addressed style (e.g., empathy), technique (e.g., reflective listening), and delivery of the intervention content. The format of sessions in both studies was very similar: participants met with interventionists in private rooms, and the BMI was designed to last approximately 45–60 minutes. At the beginning of the BMI, all participants received a personalized feedback form populated with information provided by the student during the baseline assessment, which helped structure subsequent discussion

about quantity and frequency of drinking, Blood Alcohol Content (BAC), drinking games, and tolerance. Both interventions concluded with discussion of harm reduction strategies and, for those students who were interested, goal setting to reduce alcohol use and problems.

Follow-up Assessments

For both studies, participants received telephone or email reminders to complete web-based follow-up assessments. Participants in both studies completed follow-up assessments 6 months after the BMI (Study 1 = 73%, Study 2 = 89%); attrition analyses did not find evidence of selective attrition in either study (Borsari et al., 2012; Carey et al., 2009).

Self-Report Measures

Demographic information—Participants provided information regarding their gender, age, weight, year in school, and race/ethnicity.

Alcohol use—In both studies, alcohol use outcome variables were obtained using an adaptation (Borsari & Carey, 2005) of the *Alcohol and Drug Use Measure* (Collins, Parks, & Marlatt, 1985). Drinks per week were derived from a 7-day grid representing typical drinking week in the last month. Heavy episodic drinking was measured using a gender-specific question that asked participants to report the number of times that they consumed five or more drinks for males (4+ for females) in the past month. This measure also recorded the amount of time spent drinking for each of those episodes to calculate (along with gender and weight) the students' estimated peak and typical BAC (pBAC and tBAC, respectively), using the Matthews & Miller (1979) equation. Age of first drink was assessed by asking the student when he/she first started drinking, not counting small tastes or sips of alcohol (Grant & Dawson, 1997).

Alcohol-related problems—Study 1 used the *Rutgers Alcohol Problems Index* (RAPI; White & Labouvie, 1989), 12 problems from the College Alcohol Survey (Wechsler, Lee, Kuo, & Lee, 2000) and 4 additional problems (have a hangover, say or do something embarrassing, say harsh/cruel things, ridden in a car with a driver who had too much to drink). Participants responded using a 5-point scale (0 = *never* to 4 = *10 or more times*). Study 2 used the 48-item dichotomous (yes/no) *Young Adult Alcohol Consequences Questionnaire* (YAACQ; Kahler, Strong, & Read, 2005). Both studies utilized 1-month recall periods. As there was a subset of 21 problems assessed in both Study 1 and Study 2, we used these items (dichotomizing the problems items from Study 1) to construct an alcohol-related problems scale that demonstrated good internal consistency at the pre-BMI assessment ($\alpha = .86$).

Descriptive norms—Perception of peer drinking was assessed using the *Drinking Norms Rating Form* (Baer, Stacy, & Larimer, 1991); this 3-item measure recorded the participants' estimates of their own weekly alcohol consumption, as well as that of close friends and the typical student at the college. In order to estimate the degree of perceptions of self-other differences (Carey, Borsari, Carey, & Maisto, 2006), we created difference scores of personal alcohol consumption minus perceived norms for close friends and typical students.

Coding Client In-Session Behaviors

The Motivational Interviewing Skill Code (MISC 2.0; Miller et al., 2003) was used to code the BMI sessions. The target behavior change in this investigation was alcohol use reduction or cessation, avoidance of alcohol-related negative problems, or use of harm reduction strategies. Seven MISC client language codes (reason, desire, need, ability, commitment, taking steps, other) were used and the valence of the codes reflected movement toward (change talk, positive valence) or away (sustain talk, negative valence) from change. Client utterances that were not related to the target behaviors were coded as follow/neutral, such as general statements (“Classes are hard here”), alcohol use in general (“Drinking is so common on campus”), asking a question (“Where did this information come from?”) or following along (“Uh huh”).

Study Demographics

We examined baseline sample descriptors (including demographic factors and baseline alcohol outcome variables) separately by study (see Table 1). Participants in Study 1 were slightly older, less likely to be male, and more ethnically diverse than the participants in Study 2. The two sites differed in pre-BMI alcohol use as well: Study 1 participants drank more frequently but consumed lower quantities per week and per occasion than the participants in Study 2. There were no significant differences between studies on alcohol-related problems.

Data Reduction and Analysis Plan

BMI session recording rates were 92% (Study 1; 91 of 99 sessions) and 82% (Study 2; 158 of 193 sessions), and 6-month follow-up assessment rates were 63% (Study 1) and 87% (Study 2). Training and coding procedures have been described elsewhere (Borsari et al., 2015). Reliabilities ranged from the “good” to “excellent” according to criteria established by Cicchetti (1994) for client change talk, sustain talk, and follow/neutral. Consistent with the MISC 2.0 and previous research (Borsari et al., 2015; Gaume, Bertholet, Faouzi, Gmel, & Daeppen, 2010; Vader et al., 2010), the general construct of change talk included all seven language codes reflecting movement towards change, and sustain talk was the same seven categories of language that reflected movement away from change.

Consistent with previous research indicating that a composite of change talk and sustain talk was predictive of outcomes (Apodaca, Magill, Longabaugh, Jackson, & Monti, 2013; Davis, Houck, Rowell, Benson, & Smith, 2016; Magill et al., 2014; Moyers, Martin, Houck, Christopher, & Tonigan, 2009; Romano & Peters, 2016), we computed proportions rather than using raw frequency counts of client language. This was accomplished by dividing the number of occurrences of change talk by the total number of coded utterances by the speaker: $\text{change talk} / (\text{change talk} + \text{sustain talk} + \text{follow/neutral})$ (CT/CT+ST+FN). This resulted in a “change talk proportion” that could range from 0 (no change talk) to 1.0 (all utterances being change talk). Following previous work in this area (Amrhein et al., 2003), we then divided each session into ten equal segments (deciles). Thus, each participant has one change talk proportion per decile. For example, in a decile with 5 utterances of change talk, 3 of sustain talk, and 2 of follow/neutral, $\text{CT} / (\text{CT} + \text{ST} + \text{FN}) = 5 / (5 + 3 + 2) = 5 / 10 = .50$, indicating that 50% of all client language expressed in that decile was change talk.

Figure 1 shows mean values of change talk, sustain talk, and follow/neutral utterances within each decile, as well as percent change talk (calculated for the entire sample). The figure shows a notable shift in the pattern of client language at Decile 10, such that the mean level of change talk shifted course and suddenly decreased, while the mean level of FN suddenly increased. Examination of session transcripts revealed that this shift in client language was likely not due to a change in what was occurring therapeutically within the BMI, but rather due to a transition to discussion of organizational and structural issues related to study procedures (e.g., timing of follow-ups, clarification of contact numbers). Thus, it was decided to remove the last decile, and subsequent analyses are based on the first nine deciles only in order to best capture what occurred during the BMI.

Latent class analysis—We examined whether there were identifiable trajectories of change talk relative to other types of utterances (percent change talk) over the course of the nine deciles using latent class analysis (LCA; Bartholomew, 1987; McCutcheon, 1987). In LCA, mutually exclusive discrete error-free latent variables, or classes, are extracted from a set of variables. In the present case, the latent classes were trajectories of the proportions of change talk displaying similar mean patterns across the session. The latent class solution produces class membership probabilities, which reflect the proportion of individuals who are categorized in a given class, as well as mean values on each indicator across the nine deciles.¹

Model fit was evaluated with reference to the Bayesian Information Criteria (BIC; Schwartz, 1978) fit index and a likelihood ratio test for relative improvement in fit, the Vuong-Lo-Mendell-Rubin test (VLMR; Lo, Mendell, & Rubin, 2001). We also considered theoretical interpretability, parsimony, and entropy, a measure of the average highest predicted probability of class membership that signifies the extent to which a model is effectively distinguishing individuals (with values near 1.0 indicating high certainty in classification). Models were estimated using Mplus Version 7.3 (Muthen & Muthen, 1998–2014). Models were run with automatically generated random start values with 100 initial-stage random sets of starting values and 10 final stage optimizations, and models were run using full information maximum likelihood to account for any missing data, which were assumed to be missing at random.

To examine whether individual-level variables predict trajectory membership, we conducted a multinomial logistic regression of the latent class variable on each of the following variables within Mplus (controlling for site): gender, age of first drink, perceived norms and measures of current alcohol use and problems. We conducted two analyses to evaluate whether trajectory membership predicted 6-month drinking outcomes. The auxiliary option in Mplus tested the equality of means across latent classes using posterior probability-based multiple imputations in order to determine *if* the trajectories differed significantly on alcohol use and problems. Then, we used the Wald statistic, a distribution free test for group

¹Latent class analysis with continuous latent class indicators is also sometimes referred to as latent profile analysis (Lazarsfeld, Henry, & Anderson, 1968). Given that we were modeling behavior over time, an alternative approach would have been to use latent class growth analysis (LCGA) which treats time as an ordered variable, by virtue of setting slope factor loadings according to the interval between assessments. However, as we did not hypothesize a specific functional form for our classes (e.g., linear, quadratic), we elected to treat each timepoint as an unordered variable without specifying a slope.

comparison (given the skewed nature of the alcohol use and problems variables) to compare baseline with 6-month alcohol use and problems to determine the *direction* (increasing, decreasing) of any differences.

Results

Trajectories of change talk

We examined two through six-class LCA solutions for nine deciles of the relative change talk proportion, controlling for site. Although the four-class (trajectory) solution was best fitting according to BIC, the VLMR test favored the three-trajectory solution (see Table 2); we selected this model as it was more parsimonious than the four-class solution.

Figure 2 portrays the percent change talk over the session for each of the three trajectories. We examined the mean number of utterances per decile by trajectory (see Table 3) and decided to assign the three change talk trajectories the following names: high ($n = 59$; 22%), increasing ($n = 121$; 49%) and low ($n = 71$; 29%). These names were selected given that both the low and increasing trajectories exhibited very low percent change talk in Decile 1 (7% and 9%, respectively), but the increasing trajectory gradually increased over the course of the session so that by Decile 9, the increasing trajectory had the approximate percent change talk (56%) as the high trajectory (60%). For all three trajectories, the increase in change talk tended to occur after Decile 6, roughly halfway through the session. Finally, there were a large percentage of follow/neutral utterances in the low trajectory compared to the high and increasing trajectories.

Predicting trajectory membership from individual-level variables

Models controlling for site are presented in Table 4. Compared to the low trajectory, women had greater odds of belonging to the high (OR = 2.03; 95% CI: 1.25, 8.62) or increasing (OR = 2.59; 95% CI: 1.11, 6.06) trajectories. No significant differences in trajectory membership were observed for age of first drink or self-other differences in perceived norms (close friend or typical student) or self-reported measures of alcohol use in the month before the BMI session (drinks per week, number of heaving drinking episodes, estimated peak BAC, estimated typical BAC). Participants reporting a higher number of alcohol-related problems in the month prior to the BMI were more likely to be members of the high trajectory than the increasing (OR = 1.11; 95% CI: 1.01, 1.23) or low (OR = 1.17; 95% CI: 1.04, 1.33) trajectories.

Trajectories of change talk and subsequent changes in alcohol use and problems

We also examined *whether* the three trajectories significantly differed in self-reported alcohol use and alcohol-related problems 6 months following the BMI, controlling for site and the corresponding baseline variables (Table 5). Members of the low trajectory reported lower typical BAC than members of the high trajectory. Members of the increasing trajectory reported significantly fewer drinks per week, heavy episodic drinking episodes and alcohol-related problems than members of the high trajectory, as well as fewer drinks per week than the Low trajectory. Table 6 reports significant changes in alcohol use and problems within each trajectory from baseline to the 6-month follow-up. Members of the

high trajectory demonstrated significant reductions in drinks per week, heavy episodic drinking, and alcohol-related problems. Increasing trajectory members demonstrated no significant reductions in alcohol use, only alcohol-related problems. Low trajectory members demonstrated significant reductions in heavy episodic drinking, peak BAC, and alcohol-related problems. Taken together, Tables 5 and 6 indicate that members of the high and low trajectories demonstrated the greatest reductions in alcohol use and problems from baseline to the 6-month follow-up. That said, the increasing trajectory tended to demonstrate the lowest rates of alcohol use and problems at baseline and at the 6-month follow-up assessment.

Discussion

To our knowledge, this the first study to identify trajectories of client change language within a session, explore individual characteristics of the members of each trajectory, and link trajectories of change language to subsequent changes in alcohol use and problems. Regarding our first research question, we found that participants belonged to one of three distinct trajectories of change talk. Specifically, the high trajectory demonstrated the highest proportion of change talk in the first decile, and that trend was maintained throughout the session. Members of the increasing trajectory exhibited a steady increase in change talk over the course of the session. Both trajectories can be viewed as consistent with the technical hypothesis of MI, in which the therapist uses MICO skills to evoke and reflect change talk during the session to end with a high percentage of change talk. In contrast, members of the low trajectory exhibited low levels of change talk throughout the session, which appeared to be the result of high levels of follow/neutral language throughout the session rather than particularly high levels of sustain talk. Furthermore, the three trajectories exhibited different patterns of behavioral change six months after the intervention. Thus, each of these trajectories has significant relevance to MI theory and clinical practice.

The observed link between the three trajectories and subsequent alcohol use and problems was not fully consistent with the technical hypothesis of MI. Although the members of the high trajectory did exhibit significant changes in alcohol use and problems following the intervention, as would be expected, the members of the increasing trajectory did not. Given that previous research in non-college samples has suggested that change talk at the end of the session best predicts subsequent reductions in substance use (Amrhein et al., 2003; Bertholet et al., 2010), it is surprising that the increasing trajectory did not display significant reductions in alcohol use and problems. We have two possible explanations why increasing change talk during the session did not lead to subsequent changes. First, the members of the increasing trajectory reported lower levels of baseline alcohol problems than the high trajectory; therefore, they may have fewer opportunities to discuss personal problems that could facilitate significant changes in alcohol use. Second, prior analyses reported elsewhere (Borsari et al., 2015) established that the sessions were characterized by high quality therapist MI skills. As a result, the intentional reflection and shaping of client change talk that is encouraged in MI may have evoked two types of change language that were less predictive of change. In one type, the clients might have been explicitly telling the clinicians what they wanted to hear, which is referred to as “dubious change talk” (Miller & Rollnick, 2013, p. 178). In the other type, the clients may have reflected back the therapists’

own amplified reflections (or hunches) of the clients' desire, ability, reasons, need or commitment to change (e.g., Barnett et al., 2014; Davis et al., 2016). In either of these possibilities, therapists may have evoked client change language that did not represent personal intention or motivation to change alcohol use.

Also contrary to the technical hypotheses of MI, members of the low trajectory group exhibited significant reductions in both alcohol use and problems. During these sessions, the low trajectory showed lower rates of both change talk and sustain talk, but also showed a great deal of follow/neutral language. In other words, the members of the low trajectory were not talking about personal use or consequences, or even stating a desire to maintain the status quo (sustain talk). Instead, it appears they were making general statements about alcohol use in general or others' alcohol use (e.g., friends). This prevalence of follow/neutral client language could have been the result of several factors. First, in the context of a BMI structured by personalized feedback, we could therefore characterize the low trajectory sessions as being consistent with engaging in a didactic (but cordial) discussion about the personalized feedback and alcohol use in general, but not personal behaviors or attitudes (as this would have been coded as change language). As individuals in the low trajectory had experienced significantly fewer problems at baseline than member of the high trajectory, perhaps the feedback was not distressing enough to facilitate a discussion of personal change. Second, client gender may have contributed to this finding, as female participants were less likely to be members of the low trajectory. Women have been shown to be slightly more self-disclosing about personal topics than men, especially with fellow women (Dindia & Allen, 1992); in this study, the majority of the interventionists were women (all 3 in Study 1; 10 of 12 in Study 2). Therefore, perhaps women felt more comfortable discussing personal alcohol use with women than men did, especially as women are more motivated to avoid future sanctions (Carey & DeMartini, 2010). Third, familiarity with the BMI format may have impacted the discussion of the PF. Specifically, members of the low trajectory were more likely to be in Study 1, and participants in Study 1 were receiving a BMI with PF for the first time. In contrast, Study 2 participants had already received a brief advice session including a didactic booklet about alcohol use from a peer counselor, yet had continued to exhibit heavy drinking and alcohol-related problems in the subsequent six weeks (which were explicitly addressed in the PF). As a result, receiving PF and didactic information may have been more novel and required more discussion (follow/neutral) for Study 1 participants whereas Study 2 participants could exert greater focus on personal use during their BMI session. Therapists in the low trajectory may have played a significant role in hindering the discussion of personal alcohol use during the session. Sequential analyses have found that client follow/neutral utterances are significantly less likely to be followed by therapist reflections of client change language (Barnett et al., 2014). Likewise, therapist "other" language (such as giving information or asking closed-ended questions) is more likely to be followed by client follow/neutral in adolescents (Davis et al., 2016), college students (Apodaca et al., 2016) and adults (Magill et al., 2016; Moyers et al., 2009). Therefore, both the therapist and client may have fostered a focus on feedback content rather than personal change language during the session. Finally, the members of the low trajectory did significantly change their alcohol use and problems, indicating that follow/neutral client language may not be inert. Instead, as posited by Martin and colleagues (2011), it may

suggest the presence of a therapeutic alliance, willingness to follow the therapist, or talkativeness that actually represents covert commitment to change in which “whether or not it is evident in overt speech there is a deliberation going on inside” (Miller & Rollnick, 2013, p. 289).

These findings suggest several promising avenues to pursue more refined tests of the technical hypothesis of motivational interviewing. First, certain components of the personalized feedback of the type used in these BMIs may be particularly effective at eliciting change talk. PF has been linked with increased efficacy of BMIs (Davis et al., 2016; Ray et al., 2014), and both reviewing PF (Vader et al., 2010) as well as completing a change plan (Magill, Apodaca, Barnett, & Monti, 2010) has been linked to higher rates of client change talk. Furthermore, completion of a change plan has been shown to be one component of the in-session deciles that were predictive of subsequent reductions in substance use (Amrhein et al., 2003; Morgenstern et al., 2012). Second, this and other research (Davis et al., 2016) indicates that current definitions of change talk and sustain talk may not capture key in-session language that is predictive of subsequent behavior change for certain populations (Hilton, Lane, & Johnston, 2016). In the context of these findings, follow/neutral is currently a very inclusive category in the MISC coding system, and some types of follow/neutral utterances may be more predictive of change than others. For example, client questions about feedback content (e.g., “Does my BAC really get that high during most of my drinking occasions?”) may be more predictive of subsequent behavior change than statements about alcohol use in general (e.g., “Looks like college students really drink quite a lot”). Finally, current MI coding systems that focus on what is said (verbal utterances) may be missing important aspects of in-session client and therapist behaviors such as nonverbal behavior (tone of voice and prosody) and dyadic context modeling (Romano & Peters, 2016; Xiao et al., 2016). These non-verbal aspects may permit the accurate identification of predictive, or “genuine,” change language. Unfortunately, evaluation of these issues was not possible in the current study, given limitations of the dataset (e.g., therapist flexibility in the presentation and discussion of PF resulted in significant variability in the order of topics discussed, MISC coding system does not capture non-verbal behavior).

The findings of the study should be considered in the context of some limitations. First, neither study used collateral report verification of self-reported drinking, alcohol-related problems, or other variables. That said, self-report is generally considered valid and reliable with little evidence of intentional bias even among mandated students (Borsari & Muellerleile, 2009). Second, unknown demand characteristics may have differentiated the Study 1 sessions (videotaped) and the Study 2 sessions (audiotaped), resulting in differences in client behaviors in the session. However, similarities between the two studies of in-session behaviors indicate no major discrepancy between the BMIs (Borsari et al., 2015). Third, the referral incident may have facilitated the reduction of risky behaviors for the participants, a finding observed in Study 1 (Carey et al., 2009) and in other mandated student samples (e.g., Morgan, White, & Mun, 2008). Although interventions following alcohol-related incidents have been linked to reductions in alcohol use in other populations such as adolescents (e.g., Monti et al., 1999) and adults (e.g., Zatzick et al., 2014) presenting to emergency departments, it remains unclear how the referral event and the intervention interact to facilitate changes in alcohol use and problems as well as the degree to which the current

findings will replicate in other, non-opportunistic, populations. Fourth, this was a primarily non-Hispanic and white sample, thus limiting overall generalizability of our findings and precluding our ability to examine differences in MI efficacy (e.g., Hetteema, Steele, & Miller, 2005) or in-session change language in racial and ethnic minorities. Finally, the small number of male therapists in the study (2 of 15) precluded a detailed examination of the impact of therapist and client gender on in-session change language.

In sum, this work complements and extends previous work examining client change language across MI session deciles (Amrhein et al., 2003; Morgenstern et al., 2012), as well as fluctuations of change language during a session (Bertholet et al., 2010). Members of the high trajectory did reduce alcohol use and problems following the BMI, supporting the technical hypothesis of MI, and highlighting the clinical benefit of evoking change talk during the session. Unexpectedly, members of the increasing trajectory demonstrated the *least* amount of behavior change following the session, raising the possibility of the presence of dubious or non-specific change language. Furthermore, the low trajectory sessions may have included a general discussion of the PF that could have fostered covert (i.e., non-verbalized) commitment to subsequently reduce alcohol use and problems. These findings can inform future research linking in-session client language to subsequent behavior change.

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Public health significance

Brief Motivational Interventions (BMIs) are currently the most efficacious individual intervention to college student alcohol use and consequences. However, little is known about how BMIs facilitate these changes. The current study linked three trajectories of in-session client speech to observed reductions in alcohol use and problems 6-months after the session. Findings indicated that personal and more general discussion of alcohol use may have clinical utility in facilitating change.

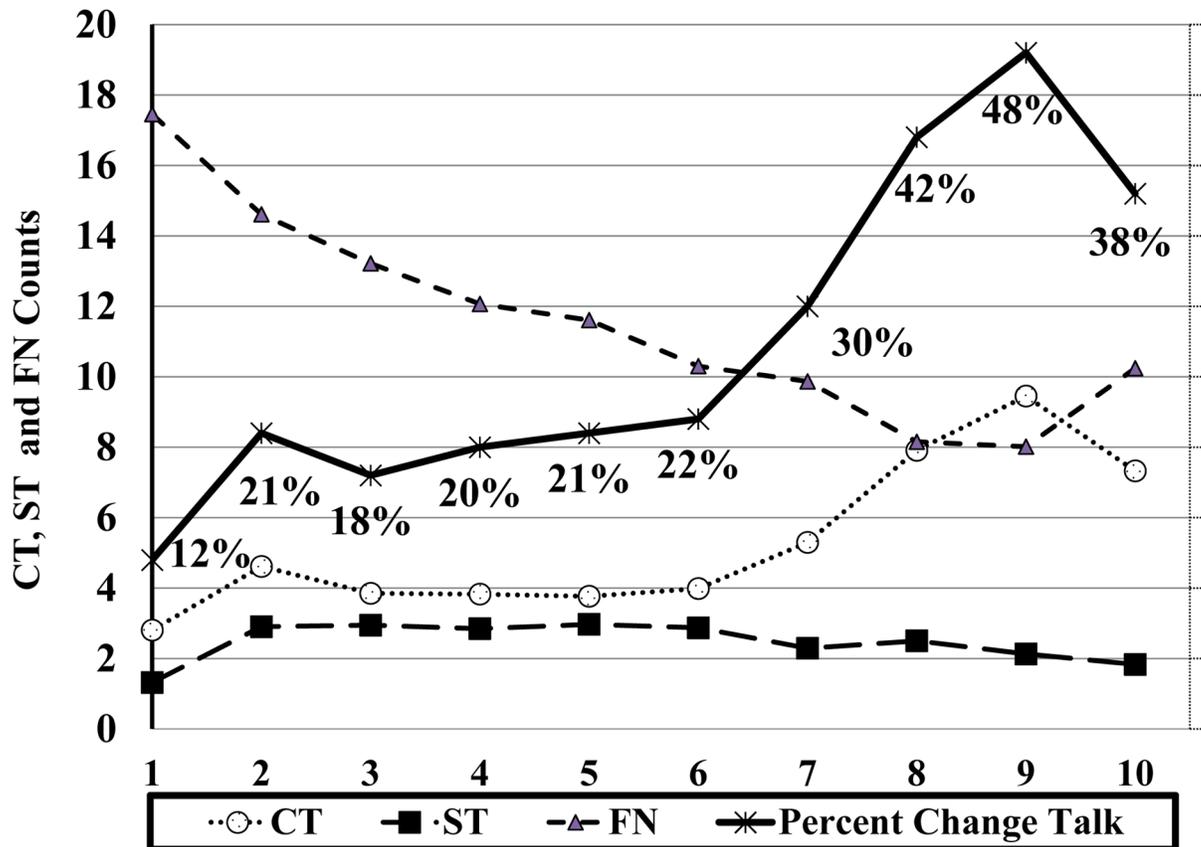


Figure 1. Utterance counts across ten deciles for Change Talk (CT), Sustain Talk (ST), Follow/neutral (FN) along with percent Change Talk ($CT/CT + ST + FN \times 100$)

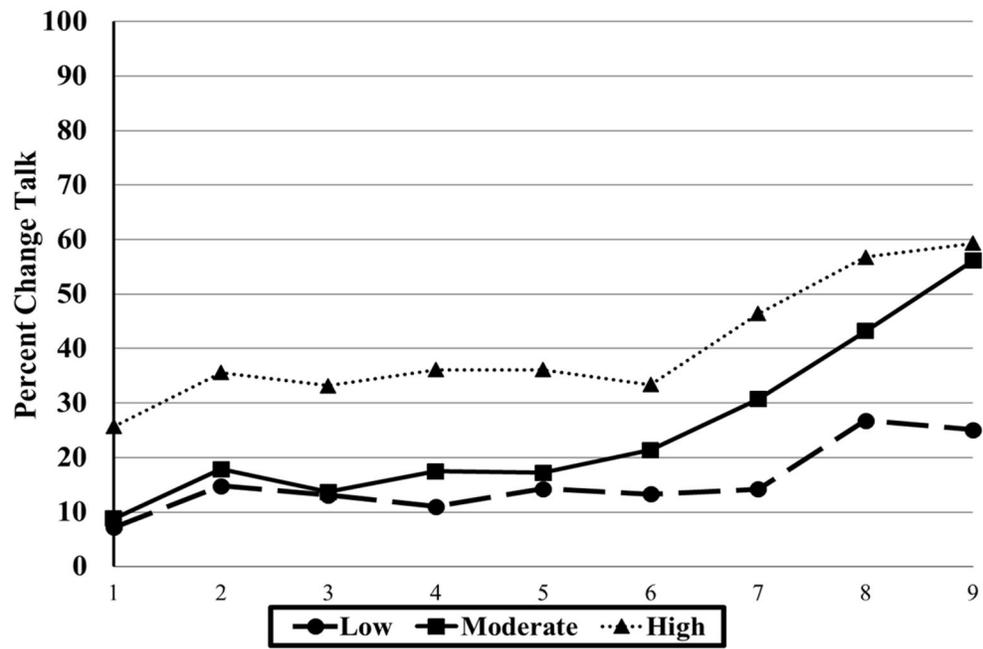


Figure 2.
Percent Change Talk ($CT/CT + ST + FN \times 100$) for each trajectory by decile

Table 1

Demographic information for total sample and comparison of Study 1 and Study 2

Variable	Total Sample (n = 249)	Study 1 (n = 91)	Study 2 (n = 158)	Test Statistic (t/ χ^2)
	Mean/N(SD/%)	Mean/N(SD/%)	Mean/N(SD/%)	
<u>Demographics</u>				
Age in Years	18.83 (0.81)	19.15 (0.70)	18.64 (0.82)	5.28 ***
Sex				
Male	154 (61.85)	49 (53.9%)	105 (66.46)	3.89 *
Female	95 (38.15)	42 (46.2%)	53 (33.54)	
Race				
White	241 (96.79)	85 (93.4%)	156 (98.73)	5.27 *
Non-white	8 (3.21)	6 (6.6%)	2 (1.27)	
Year in school				
Freshmen	153 (61.45)	50 (55.0%)	103 (65.19)	8.15 *
Sophomore	79 (32.73)	38 (41.8%)	41 (25.95)	
Upperclassmen	17 (6.83)	3 (3.3%)	14 (8.86)	
<u>Baseline Alcohol use</u>				
Age at first drink	15.64 (1.40)	15.62 (1.48)	15.66 (1.36)	-0.17
No. drinking episodes ^a	10.59 (5.79)	12.50 (6.15)	9.47 (5.28)	4.02 ***
Average no. drinks: typical episode ^a	6.58 (3.10)	5.61 (2.57)	7.14 (3.25)	-4.08 ***
Drinks per week	18.04 (12.24)	15.36 (11.07)	19.59 (12.64)	-2.66 **
Heavy episodic drinking ^a	6.83 (4.72)	6.28 (4.90)	7.15 (4.61)	-1.41
Peak BAC	0.18 (0.10)	0.16 (0.08)	0.19 (0.10)	-3.03 **
Typical BAC	0.10 (0.06)	0.09 (0.05)	0.11 (0.06)	-1.60
No. peak drinks ^a	10.58 (5.22)	8.87 (4.01)	11.56 (5.59)	-4.39 ***
AUDIT score	11.26 (5.39)	10.89 (5.53)	11.47 (5.32)	-0.814
Alcohol-related Problems	5.42 (3.88)	4.82 (4.06)	5.76 (3.74)	1.83

Note. AUDIT = Alcohol Use Disorders Identification Test; BAC = Blood Alcohol Content; No. = Number

^aPast month.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Latent class analysis for change talk proportion (CT/CT+ST+FN) over 9 deciles.

Total sample (<i>n</i> = 249)		
2 classes	BIC	-1475.264
	VLMR	<i>p</i> < .001
	entropy	.84
3 classes	BIC	-1516.88
	VLMR	<i>p</i> = .003
	entropy	.79
4 classes	BIC	-1520.49
	VLMR	<i>p</i> = .29
	entropy	.83
5 classes	BIC	-1514.82
	VLMR	<i>p</i> = .45
	entropy	.88
6 classes	BIC	-1469.41
	VLMR	<i>p</i> = .54
	entropy	.86

Note. Models controlled for site.

BIC = Bayesian Information Criteria. VLMR = Vuong-Lo-Mendell-Rubin test of relative improvement in fit. Entropy is a measure of the average highest predicted probability of class membership.

Table 3

Mean Change talk, Sustain Talk, and Follow/Neutral Utterances and Percent Change Talk by trajectory across 9 deciles.

Trajectory	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9
	<i>M (SD)</i>								
High									
Change Talk	5.95 (4.96)	7.68 (4.38)	7.12 (5.51)	7.20 (4.27)	6.67 (3.76)	6.08 (4.58)	8.98 (5.07)	11.02 (5.78)	12.78 (5.41)
Sustain Talk	2.12 (2.68)	3.76 (3.70)	3.59 (3.06)	3.51 (3.41)	3.19 (2.58)	3.10 (3.10)	2.53 (2.10)	2.05 (2.60)	2.44 (2.97)
Follow/Neutral	14.63 (7.37)	10.73 (5.13)	10.41 (5.91)	9.00 (4.61)	9.02 (6.23)	8.39 (4.82)	7.71 (4.72)	6.14 (4.27)	6.63 (3.46)
% Change Talk	26%	35%	33%	36%	37%	33%	46%	57%	60%
Increasing									
Change Talk	1.92 (2.51)	3.71 (3.43)	2.98 (3.50)	3.15 (2.84)	2.90 (2.63)	3.75 (3.89)	5.25 (3.92)	8.08 (5.11)	10.58 (4.77)
Sustain Talk	1.16 (1.93)	2.77 (3.09)	3.22 (3.04)	2.98 (2.46)	2.84 (2.58)	2.82 (3.12)	2.18 (2.40)	2.52 (2.86)	1.94 (2.17)
Follow/Neutral	17.8 (6.52)	14.13 (6.52)	13.21 (6.04)	11.56 (6.14)	11.68 (6.13)	10.20 (5.66)	9.16 (5.60)	7.70 (4.73)	6.49 (3.70)
% Change Talk	9%	18%	13%	17%	16%	21%	31%	43%	56%
Low									
Change Talk	1.72 (2.58)	3.62 (3.74)	2.63 (3.40)	2.20 (2.50)	2.97 (2.88)	2.85 (3.01)	2.31 (2.49)	5.04 (4.29)	4.75 (3.66)
Sustain Talk	0.93 (6.86)	2.42 (2.49)	1.94 (2.67)	2.07 (2.25)	3.00 (3.07)	2.77 (3.10)	2.30 (3.14)	2.86 (3.13)	2.20 (2.81)
Follow/Neutral	19.23 (8.82)	18.66 (7.87)	15.56 (8.18)	15.49 (7.46)	13.58 (8.15)	12.06 (6.73)	12.89 (6.63)	10.62 (7.33)	11.79 (5.26)
% Change Talk	7%	14%	13%	11%	15%	13%	13%	26%	24%

Note: % Change Talk = CT/CT+ST+FN x 100

Table 4

Differences in change talk trajectory membership on individual level variables assessed prior to the BMI.

	High versus Low OR (95% CI)	High versus Increasing OR (95% CI)	Increasing versus Low OR (95% CI)
Female	2.03* (1.26, 8.70) (High)	1.28 (0.52, 3.63)	2.59* (1.11, 6.06) (Increasing)
Age of first drink	1.09 (0.62, 1.57)	1.14 (0.83, 1.55)	0.96 (0.69, 1.33)
Norms ^a			
Close friend	0.99 (0.95, 1.05)	0.98 (0.94, 1.04)	1.01 (0.97, 1.05)
All students	0.99 (0.95, 1.05)	0.98 (0.95, 1.02)	1.001 (0.96, 1.04)
Drinks per week	1.003 (0.97, 1.04)	1.02 (0.98, 1.06)	0.99 (0.95, 1.02)
Heavy episodic drinking ^b	1.06 (0.97, 1.15)	1.04 (0.96, 1.13)	1.02 (0.93, 1.11)
Peak BAC	0.75 (0.0008, 66.92)	0.13 (0.003, 5.17)	5.67 (0.06, 6.22)
Typical BAC	2.80 (0.00001, 3152.28)	0.15 (0.0002, 94.91)	18.44 (0.03, 10524.70)
Alcohol-related problems	1.18* (1.04, 1.33) (High)	1.11* (1.01, 1.23) (High)	1.06 (0.93, 1.19)

Note. *N* ranges from 242 to 249; *df*=2 on all tests. All models control for site; Post-BMI models control for the corresponding baseline variable; OR = Odds ratio; CI = Confidence Interval; BAC = Blood Alcohol Content. Confidence intervals for Peak BAC and Typical BAC are large in magnitude due to the small unit size. Trajectory in parentheses reported is the group with the *higher* percentage or value.

^aDifference score = (participant self-reported drinking – normative referent)

^bPast month

* *p* < .05,

** *p* < .01,

*** *p* < .001

Table 5

Chi-square tests of differences between change talk trajectory and alcohol use and problems assessed 6 months after the BMI session.

	High versus Low χ^2	High versus Increasing χ^2	Increasing versus Low χ^2
Drinks per week	0.71	6.04 [*] (Increasing)	15.20 ^{***} (Increasing)
Heavy Episodic Drinking ^a	0.14	3.96 [*] (Increasing)	3.31
Peak BAC	2.42	0.04	1.62
Typical BAC	7.58 ^{**} (Low)	1.30	2.07
Alcohol-related problems	3.07	5.08 [*] (Increasing)	0.05

Note. *N* ranges from 242 to 249; *df* = 2 on all tests. BAC = Blood Alcohol Content

All models control for site and the corresponding baseline variable; Trajectory in parentheses reported better outcomes (*less* alcohol use, *fewer* alcohol-related problems, corresponding with means provided in Table 6).

^aPast month.

^{*}*p* < .05,

^{**}*p* < .01,

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

Table 6

Changes in alcohol use and problems from baseline to 6-month follow-up for each of the three trajectories

	High Trajectory (n = 59)			Increasing Trajectory (n = 122)			Low Trajectory (n = 71)		
	Baseline	6 Month	Wald χ^2	Baseline	6 Month	Wald χ^2	Baseline	6 Month	Wald χ^2
Drinks per week	19.247 (13.716)	17.718 (14.029)	7.68**	15.598 (10.276)	13.299 (8.352)	0.31	19.718 (12.712)	19.625 (13.195)	2.88
Heavy Episodic Drinking ^a	7.615 (5.069)	6.336 (5.190)	6.16**	6.496 (4.629)	5.334 (3.802)	3.58	6.815 (4.534)	6.019 (4.640)	5.73*
Peak BAC	0.169 (.089)	0.145 (.077)	3.68	0.182 (.095)	0.157 (.071)	12.90	0.192 (.105)	0.186 (.114)	105.66***
Typical BAC	0.098 (.063)	0.084 (.054)	1.68	0.103 (.055)	0.098 (.055)	2.56	0.103 (.063)	0.113 (.071)	3.12
Alcohol problems	6.986 (4.166)	5.420 (4.489)	6.37**	4.847 (3.485)	3.938 (3.100)	7.89**	5.140 (3.914)	3.782 (3.890)	29.10***

Note. N ranges from 242 to 249; BAC = Blood Alcohol Content

For all Wald χ^2 tests, $df=1$

^aPast month

* $p < .05$,

** $p < .01$,

*** $p < .001$