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Brief Motivational Interviewing and Normative Feedback for Adolescents: Change Language and Alcohol Use Outcomes

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Abstract

Few studies have investigated the impact of adolescent change language on substance use treatment outcomes and even fewer have examined how adolescents respond to normative feedback. The purpose of this study was to understand the influence normative feedback has on adolescent change language and subsequent alcohol and cannabis use 3 months later. We examined how percent change talk (PCT) was associated with subsequent alcohol and drug use outcomes. Adolescents (N = 48) were randomly assigned to receive brief motivational interviewing (MI) or MI plus normative feedback (NF). Audio recordings were coded with high interrater reliability. Adolescents with high PCT who received MI + NF had significantly fewer days of alcohol and binge drinking at follow up. There were no differences between groups on cannabis use or treatment engagement. Findings indicate that NF may be useful for adolescents with higher amount of change talk during sessions and may be detrimental for individuals with higher sustain talk.

Keywords

Alcohol treatment; Cannabis use; Adolescents; Motivational interviewing; Change talk

1. Introduction

Adolescence represents a time when alcohol and drug use begins to increase (Johnston, 2013; Shih, Miles, Tucker, Zhou, & D'Amico, 2012) with many or most high school seniors reporting they have tried alcohol (70%) and cannabis (45%) at least once (Johnston, O'Malley, Bachman, & Schulenberg, 2013). Adolescent substance use disorder (SUD) treatment admissions have remained stable over the past several years representing 7% of all admissions (SAMHSA, 2014). Nearly 90% of all adolescent treatment admissions involved cannabis as a primary or secondary substance and alcohol use disorders represent 52% of all mild SUD cases (Johnston, O'Malley, Bachman, & Schulenberg, 2011; SAMHSA, 2014).

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Interventions such as motivational interviewing (MI; Miller & Rollnick, 2012) are efficacious in reducing alcohol and drug use in adult (see Magill et al., 2014), emerging adult (e.g. Apodaca et al., 2014), and adolescent (e.g. Baer et al., 2008; D'Amico et al., 2012) studies. Recently, researchers have become interested in the mechanisms through which MI works, investigating nuanced within-session factors such as client change talk (CT) and sustain talk (ST). *Change talk* refers to “any self-expressed language that is an argument for change” (Miller & Rollnick, 2012, p. 159) and *sustain talk* is a “person’s own arguments for not changing, for sustaining the status quo” (Miller & Rollnick, 2012, p. 7). Normative feedback (NF), when combined with MI, is efficacious for emerging adults and increases their change language (Neighbors et al., 2010; Vader, Walters, Prabhu, Houck, & Field, 2010; Walters & Neighbors, 2005). However, some researchers posit that NF may increase sustain talk among adolescents, resulting in poorer outcomes (Osilla et al., 2015). Therefore, the purpose of this study was to understand how NF influenced change language within an adolescent MI intervention designed to increase treatment adherence and reduce substance use. Findings will help personalize interventions for specific treatment populations such as youth presenting for alcohol use disorder treatment.

1.1. Motivational interviewing and its key components

MI is a client-centered and directive intervention designed to resolve ambivalence about change (Miller & Rollnick, 2012). MI encourages individuals to articulate the potential benefits of change, respects individuals’ autonomy (Barnett, Sussman, Smith, Rohrbach, & Spruijt-Metz, 2012; Smith & Hall, 2007; Smith, Hall, Jang, & Arndt, 2009), and emphasizes the collaborative therapeutic relationship in which therapists elicit and reinforce client change talk (Baer et al., 2008; Barnett et al., 2014a, 2014b). MI is an efficacious intervention for at-risk adolescents (Baer et al., 2008; Carcone et al., 2013; D'Amico et al., 2015; D'Amico et al., 2012; Erickson, Gerstle, & Feldstein, 2005; Feldstein & Ginsburg, 2006; Naar-King & Suarez, 2011; Smith, Davis, Ureche, & Tabb, 2015; Spirito et al., 2011; Walker, Roffman, Stephens, Wakana, & Berghuis, 2006). Few adolescent studies have investigated the active ingredients of MI or its mechanisms of change.

1.2. Change talk and sustain talk as predictors of outcomes

A nascent literature focuses on technical mechanisms within an MI session such as client and therapist behaviors, and how such behaviors predict treatment outcomes (Miller & Rose, 2009). One review found in-session client behaviors such as CT and ST, and clinician behaviors like maintaining MI spirit and MI-consistent behaviors were strong predictors of subsequent substance use outcomes (Apodaca & Longabaugh, 2009). Other research has demonstrated links between therapist skills and behaviors on client CT. For example, sequential analyses show higher probabilities of client CT immediately after therapists use MI-consistent skills (e.g. offering support, affirming, emphasizing autonomy and personal choice) and more ST immediately following use of MI-inconsistent skills (e.g. confronting, giving advice without permission, and warning; Gaume, Gmel, Faouzi, & Daeppen, 2008, 2009; Gaume, Bertholet, Faouzi, Gmel, & Daeppen, 2010; Moyers & Martin, 2006; Moyers, Martin, Houck, Christopher, & Tonigan, 2009). Early studies investigating the impact of CT found participants who reduced their substance use at post-treatment had higher proportion of CT statements (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003). Numerous replications

show that within-session CT is associated with changes in alcohol use (Bertholet, Faouzi, Gmel, Gaume, & Daeppen, 2010; Magill, Apodaca, Barnett, & Monti, 2010; Martin, Christopher, Houck, & Moyers, 2011; Moyers et al., 2009; Vader et al., 2010), cannabis use (Walker, Neighbors, Rodriguez, Stephens, & Roffman, 2011a; Walker, Stephens, Rowland, & Roffman, 2011b) and illicit drug use (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008). However, more recent evidence suggests that, while CT is important to elicit, it may be more important to reduce the amount of ST. Magill et al. (2014) conducted a meta-analysis and tested the causal model linking therapist behaviors to client CT and subsequent treatment outcomes. Results suggested no significant relationship between CT and outcomes. However, composite measures of CT such as percent CT (PCT) were associated with better outcomes and client ST predicted worse outcomes. Similar results were found in a study with mandated college students where client ST, but not CT, was significantly associated with poorer alcohol use outcomes (Apodaca et al., 2014).

1.3. Adolescent substance use and change talk

The studies above were completed with adult and emerging adult samples, prompting the question – how well does client change language predict outcomes with adolescents? To date only five adolescent studies investigated the impact of client CT on subsequent treatment outcomes (Baer et al., 2008; Barnett et al., 2014a, 2014b; D’Amico et al., 2015; Engle, Macgowan, Wagner, & Amrhein, 2010; Osilla et al., 2015). Baer et al. (2008) recruited homeless adolescents ($n = 54$), finding adolescents expressing more CT (i.e., reasons subtype) were more likely to be abstinent at 1 and 3 month follow up. Barnett et al. (2014a, 2014b) found that PCT mediated the relationship between therapist behaviors and cannabis outcomes at 1 year post-treatment ($n = 107$). While understanding how individual therapy impacts client CT is important, many studies utilize a group format (Kaminer, 2005). Engle et al. (2010) investigated the impact of group MI ($n = 108$, $k = 19$ groups) on cannabis use at 1, 4, and 12-month follow up. Though only correlational, results supported a mediational model where group commitment language (i.e. group change language) mediated the relationship between therapist behaviors and cannabis use outcomes at post-test, 1-month, 4-month, and 12-month follow up. D’Amico et al. (2015) investigated group-level adolescent CT and ST as mechanisms of change ($n = 129$). Using sequential analysis, group CT was associated with *individual* reductions in alcohol use, heavy drinking, and alcohol intentions at 3-month follow up. Group CT was not associated with any cannabis variables. Further, group ST was not associated with alcohol or cannabis use but was associated with increased intentions to use cannabis and positive expectancies for alcohol and cannabis use. Finally, Osilla et al. (2015) explored how various types of CT (e.g. ability, reason, commitment, other) and ST (e.g. reason) were associated with subsequent alcohol and drug use at 3-month follow up using multilevel modeling. Results indicated commitment (e.g. “*I m not hanging out with them anymore so I won’ t drink*”) and reason (e.g. “*I don’ t want to fail out of school*”) CT subtypes were associated with decreased alcohol, fewer alcohol consequences, lower alcohol use intentions, and lower cannabis intentions. ST was not associated with outcomes.

1.4. Normative feedback and adolescent substance use

Normative feedback (NF) interventions strive to alter an individual's perception of their drinking or drug use by contrasting, or comparing, their current substance use against a representative sample of their peers. That is, NF interventions target an individual's misperception of the frequency and quantity of their peers' substance use (Pedersen et al., 2013; Walker et al., 2011a). Extant studies document the efficacy of NF interventions for reducing college drinking (Baer et al., 1992; Borsari & Carey, 2000; Collins, Carey, & Sliwinski, 2002; Dimeff & McNeely, 2001; Larimer et al., 2001; Marlatt et al., 1998; Murphy et al., 2004; Neal & Carey, 2004; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Walters & Bennett, 2000; Walters & Neighbors, 2005; Walters & Woodall, 2003; Walters, Vader, & Harris, 2007). Only one study, however, has investigated whether a normative feedback component is an active ingredient in brief MI treatment with adolescents and (Smith, Ureche, Davis, & Walters, 2015) randomly assigned youth ($n = 48$) to receive MI or MI plus NF. Adolescents receiving NF had lower post-session readiness to change (Smith et al., 2015), lower self-reported treatment engagement ($d = -.31$, ns ; Smith et al., 2015), and fewer days of abstinence (-7.9% , ns) at 3-months, however these effects showed no differences between groups. These findings, while not significant, echo anecdotal concerns about the appropriateness of NF for adolescents (Winters, Fahnhorst, Botzet, Lee, & Lalone, 2012). That is, for some adolescents NF may elicit a surprise or ambivalence to the information as they may view their use as "normal" (Osilla et al., 2015). Further, Barnett et al. (2012) noted that, compared to college students, adolescents may not be as receptive to NF given the varying levels of psychological reactance (Hong, Giannakopoulos, Laing, & Williams, 1994). Other studies found adult substance users' CT decreased when receiving feedback (Amrhein et al., 2003) and among adolescents the percent of ST increased during sessions including NF (Osilla et al., 2015).

1.5. The current study

Using data from a randomized controlled trial examining the impact of MI and MI plus NF among adolescents presenting for a substance use assessment (Smith et al., 2015), we investigated whether the percentage of change talk (PCT) was 1) predictive of 3-month alcohol and cannabis use outcomes and 2) predictive of treatment engagement (attending 3 or more sessions post assessment). Based on prior concerns in the literature, we tested whether receipt of NF interacted with PCT to predict worse alcohol and cannabis use outcomes at 3-month follow up. Finally, we used sequential analyses to explore the communication patterns present in these sessions. This will be the first study to investigate the associations between NF, PCT and subsequent drug and alcohol use.

2. Methods

2.1. Procedure and sample

Session tapes ($n = 43$) were recorded as part of a larger study designed to isolate the effects of NF within a brief post-assessment MI intervention designed to increase treatment engagement (Smith, 2012; Smith et al., 2015; Smith et al., 2015). In the original study, consecutively referred adolescents from two not-for profit treatment agencies were invited to participate if they were referred for substance use disorder intake assessments, used

substances on a weekly basis, or had CRAFFT (Knight, Sherritt, Harris, Gates, & Chang, 2003) screener scores over two. Those who volunteered were randomized to receive either MI ($n=22$) or MI + NF ($n=26$). Therapist training procedures were rigorous, with 15 tapes (34.8%) coded for MI adherence. Therapists received 12 hours of MI didactic training, feedback from coded mock tapes prior to participant enrollment, and received coaching on session tapes during the study period. Training and feedback were provided by the fifth author, a member of the Motivational Interviewing Network of Trainers (MINT). Tapes were coded using the Motivational Interviewing Treatment Integrity Scales (MITI, 3.1.1; T. Moyers, Martin, Manuel, Miller, & Ernst, 2010) with a mean MI spirit rating of 4.11 ($SD = .45$), a reflection to question ratio mean of 1.74 ($SD = 1.15$), a percent of MI adherent responses of 99% ($SD = 3.0$), a percent of complex reflections at 52% ($SD = 12.0$), and a mean percent of open questions of 62%, ($SD = 23.0$). Follow up attrition was low, and efforts were made to collect data from participants that did not complete MI sessions (i.e., intent to treat). For full details on the original study, see Smith et al. (2015) and Smith et al. (2015). Recordings were available for 43 study participants (89.5%), with missing recordings occurring due to youth not attending the MI session after randomization ($n=3$), interviewers forgetting to record ($n=1$), or the participant refusing to be recorded ($n=1$).

Participants were mostly male (77.1%) and racially-diverse adolescents (mean age = 16.3, 76.6% ethnic minority). Most participants (85.4%) met the DSM-5 SUD criteria (American Psychiatric Association, 2013). On average participants reported binge drinking on 5.7 ($SD = 12.1$) days, using alcohol on 8.8 ($SD = 15.8$) days, and cannabis on 44.2 ($SD = 33.6$) days in the 90 days prior to the baseline assessment. In short, participants were heavily-using adolescents referred for initial SUD assessments.

2.2. Coding and parsing

Intervention audio recordings ($n=43$) were coded independently by two raters using an objective sequential coding system: the Motivational Interviewing Skill Code (MISC 2.5; Houck, Moyers, Miller, Glynn, & Hallgren, 2010) and the CACTI coding application (Glynn, Hallgren, Houck, & Moyers, 2012). Sequential coding was performed using CACTI to preserve the temporal order of behaviors across the sessions with 12% of the sample (5 sessions) randomly selected for double-coding to assess inter-rater reliability.

Coders were previously trained on the MISC 2.5 and attended weekly coder meetings to prevent coder drift. Discrepancies during coder meetings were discussed and resolved using the coder manual and expert supervision. Inter-rater reliability was good to excellent based on well accepted guidelines (Cicchetti & Sparrow, 1981). Interclass correlations were .584 for change talk, .882 for sustain talk, .839 for percent change talk, .973 for open questions, and .845 for reflections of change talk. The utterance-to-utterance reliability of our coders was $k = .58$, indicating approximately 63% agreement on the exact sequence of behaviors (Bakeman, McArthur, Quera, & Robinson, 1997). This utterance-to-utterance reliability estimate is less biased than count approaches (Lord et al., 2015), and is commonly assessed in sequential coding studies (e.g., D'Amico et al., 2015; Moyers et al., 2009). Coders' behavior count and utterance-to-utterance reliabilities were high.

2.3. Measures

2.3.1. GAIN Q3—The GAIN-Q3 (Titus et al., 2012a, 2012b) is a semi-structured assessment that covers a wide range of life domains including substance use, mental health, school and work problems, physical health, stress, and risk behaviors. The GAIN-Q3 was derived from the larger instrument, the GAIN-I (Dennis, Titus, White, Unsicker, & Hodgkins, 2003), and has a validated training and supervision process (Titus et al., 2012a, 2012b). The GAIN-Q3 uses time line follow back (TLFB; Sobell & Sobell, 1992) procedures, where participants are asked to recall, for example, days of alcohol use in the past 90 days. All variables described below came from the GAIN-Q3 baseline and follow-up assessment.

2.3.2. Outcomes—Counts of the number of days participants reported using alcohol and cannabis in the past 90 days were assessed at baseline and 3-month follow up. Binge drinking was also assessed by asking participants how many days, in the past 90, they got drunk or drank 5 or more drinks. To measure treatment engagement at 3-month follow up, we asked participants how many days they received any substance use treatment in the past 90 days. In accordance with previous literature (Garnick, Lee, Horgan, & Acevedo, 2009) we defined treatment engagement as attending three or more post-assessment treatment sessions (1 = engaged, 0 = not engaged).

2.3.3. Statistical analyses—Behavior codes produced by the MISC are count variables that can be confounded by session length; that is, longer sessions necessarily have more instances (i.e., higher counts) of many behaviors than do shorter sessions. To adjust for this, counts for each session were scaled by the length of that session. Session length was selected rather than the number of utterances because session length is unbiased by the rater's parsing of the session. All speech measures used in outcome analysis were analyzed in the form of these rate variables, rather than as raw counts. Client change language was evaluated as the percentage change talk (i.e., $CT/(CT + ST)$), using the CT and ST rate variables. All count outcomes were evaluated using negative binomial regression with a log link (see Atkins, Baldwin, Zheng, Gallop, & Neighbors, 2013 for a tutorial). Dichotomous outcomes were evaluated using logistic regression. All outcome analyses were conducted using Mplus (Muthén & Muthén, 1998–2012). Missing data were handled using full information maximum likelihood (FIML) which estimates a case-wise likelihood function based on the variables that are present so that all the available data are used for each subject (Allison, 2002; Graham, 2009; Schafer & Graham, 2002). Interaction effects were probed using simple slopes analysis, using procedures described by Preacher and colleagues (Preacher, Curran, & Bauer, 2006). Finally, to examine the effects of feedback on therapist MI skill, within the NF group we split each CACTI file at the time of the first NF utterance using procedures developed by the second author (Houck, Hunter, Benson, Cochrum, & Rowell, 2015) and computed behavior counts and summary scores separately for each segment. MI skill was evaluated using standard summary measures including the number of MI-consistent (MICO) and MI-inconsistent behaviors (MIIN), each scaled as described above, as well as the percentage of MI-consistent utterances (%MIC; i.e., $MICO/(MICO + MIIN)$). Due to non-normality of the summary measures, the influence of NF on MI skill was evaluated using Wilcoxon matched-pair signed rank tests. Because NF utterances were

rare, occurring less than five times in each NF session, it was not possible to examine NF in our sequential analysis.

In sequential coding, the term “lag” is used to indicate the relative position of utterances. Lag 0 indicates the first utterance in the series of interest, lag 1 indicates the second, lag 2 indicates the third, and so on. For example, in the exchange “(A) [*Tell me about your drinking*] (B) [*I don’t really drink that much*] (C) [*but I guess I have been smoking a lot*]”, if utterance A is designated as the lag 0 (given) behavior, utterance B is the lag 1 behavior, and utterance C is the lag 2 behavior. We assessed sequential patterns only at lag 1; that is, the temporally-adjacent behaviors. For any given behavior, this allows us to estimate the probability that the very next behavior to occur will come from any other behavior assessed by the coding system. Estimation of sequential patterns was performed using the General Sequential Querier (GSEQ 5.1; Bakeman & Quera, 2012).

3. Results

3.1. Intervention integrity

Independent samples *t*-tests indicated significantly more clinician normative feedback in the MI + NF condition than in the MI condition ($t(26.011) = 6.135, p < .001$). No significant between-group differences were detected for session length ($t(26.986) = 1.470, p > .15$), client change talk ($t(29.921) = .274, p > .75$), sustain talk ($t(29.098) = 1.159, p > .25$), or neutral speech ($t(36.678) = 1.252, p > .20$).

3.2. Treatment Integrity

Independent samples *t*-tests indicated no significant between-group differences on common measures of MI competence including MI-consistent behaviors (i.e., MICO; $t(38) = 0.588, p > .55$), MI-inconsistent behaviors (i.e., MIIN; $t(39) = 0.04, p > .95$), percent MI consistent (i.e., MICO/(MICO + MIIN); $t(38) = 0.011, p > .99$), ratio of reflections to questions ($t(38) = 1.058, p > .30$), percent open questions (i.e., OQ/(OQ + CQ); $t(38) = 0.339, p > .70$), or percent complex reflections (i.e., CR/(SR + CR); $t(38) = 0.20, p > .80$).

3.3. Drinking outcomes

We examined drinking days at 3 months, baseline drinking days, PCT, condition, and the condition $\times$ PCT interaction. Results supported use of the negative binomial distribution (dispersion parameter $\alpha = 1.817, p < .001$) and indicated significant effects of baseline drinking days (coefficient = 0.146, $p < .001$) and for the condition $\times$ PCT interaction (coefficient = $-14.340, p < .01$). Higher baseline drinking was related to more drinking at follow-up. Analysis of the interaction effect indicated that participants with high PCT had significantly fewer drinking days in the MI + NF group at follow-up than did those in the MI group (see Fig. 1). Complete results are presented in Table 1a.

The significant interaction term indicates that the slopes for the MI and MI + NF groups for drinking days differed from each other. Simple slopes analysis for values of PCT ± 1 SD from the mean indicated that for the MI group, the gradient differed significantly from zero

(gradient = 5.248, $t = 31.3235$, $p < .001$); for the MI + NF group, the gradient also differed significantly from zero (gradient = -2.813, $t = -20.099$, $p < .001$).

We also examined binge drinking days at 3 months, baseline binge drinking days, PCT, condition, and the condition $\times$ PCT interaction. Results supported use of the negative binomial distribution (dispersion parameter $\alpha = 3.256$, $p < .01$) and indicated significant effects of baseline drinking days (coefficient = 0.147, $p < .01$) and for the condition $\times$ PCT interaction (coefficient = -11.334, $p < .05$). Higher baseline binge drinking was related to more binge drinking at follow-up. Analysis of the interaction effect indicated that participants with high PCT had significantly fewer binge drinking days in the MI + NF group at follow-up than did those in the MI group (see Fig. 2). Complete results are presented in Table 1b.

The significant interaction term indicates that the slopes for the MI and MI + NF groups for binge drinking days differed from each other. Simple slopes analysis for values of PCT ± 1 SD from the mean indicated that for the MI group, the gradient differed significantly from zero (gradient = 0.853; $t = 5.425$, $p < .001$); for the MI + NF group, the gradient also differed significantly from zero (gradient = -0.383, $t = 2.456$, $p < .05$).

3.4. Cannabis outcomes

We examined cannabis use days at 3 months, baseline cannabis use days, percent CT, condition, and the condition $\times$ PCT interaction. Results supported use of the negative binomial distribution (dispersion parameter $\alpha = 2.256$, $p < .001$) and indicated significant effects only for baseline cannabis use days (coefficient = 0.020, $p < .05$). Higher baseline cannabis use was related to more cannabis use at follow-up. Complete results are presented in Table 2.

3.5. Treatment engagement

We examined treatment engagement at 3 months, PCT, condition, and the condition $\times$ PCT interaction. No significant effects were detected. Complete results are presented in Table 3.

3.6. Sequential results

A state transition diagram of the behaviors most related to client change language is given in Fig. 3. The transition matrix deviated significantly from random transitions ($\chi^2(100) = 6786.05$, $p < .001$), indicating that the transitions that we observed between behaviors in the present study did not occur at random. The sequential dependencies in Fig. 3 are reported as odd ratios, with the odds of the transition of interest occurring in the numerator and the odds of all other transitions occurring in the denominator. For example, in a case where the transition of interest is RCT to CT, and the transition from RCT to CT occurred 10 times, the transition from RCT to all other behaviors occurred 15 times, the transition from all other behaviors to CT occurred 4 times, and the transition from all other behaviors to all other

behaviors occurred 31 times, the odds ratio would be computed as $\frac{10/15}{4/31} = \frac{0.667}{0.129}$, for an odds ratio of 5.167. Odds ratios greater than 1 indicate that the transition is more likely than

expected by chance, while odds ratios less than one indicate that the transition is less likely than expected by chance. In these sessions, open-ended questions (OQ) and reflections of change talk (RCT) by the therapist were more likely to be followed by client change talk (OQ $OR = 2.80$; 95% CI [2.35, 3.34]; RCT $OR = 3.74$, 95% CI [3.29, 4.25]). When the interventionist reflected sustain talk, change talk was suppressed ($OR = 0.15$, 95% CI [0.07, 0.30]); instead, these reflections of sustain talk were more likely to be followed by sustain talk ($OR = 13.89$; 95% CI [10.38, 18.59]). When youth produced change talk, they were significantly more likely to continue with additional change talk ($OR = 2.40$; 95% CI [2.17, 2.67]). After sustain talk, youth were significantly more likely to continue with additional sustain talk ($OR = 12.02$, 95% CI [10.13, 14.27]). Youth were also less likely to transition to neutral speech after change talk (CT) or sustain talk (ST) (CT $OR = 0.36$, 95% CI [0.31, 0.42]; ST $OR = 0.71$, 95% CI [0.58, 0.87]). Table 4 displays lag-one conditional probabilities.

3.7. Effects of feedback on MI skill

We found no support for the hypothesis that therapist MI skill would be reduced by normative feedback. No significant differences were detected in the pre-NF and post-NF segments for MICO ($Z = -1.529$, $p = .126$), MIIN ($Z = -0.722$, $p = .470$), or %MIC ($Z = -0.594$, $p = .552$).

4. Discussion

This is the first investigation finding an interaction between NF and client change talk in predicting adolescent substance use outcomes. This study sets out to answer three key questions: 1) Does PCT predict alcohol and cannabis use 3 months following a post-intake MI based assessment?, 2) Does client change language predict treatment engagement?, and 3) Does NF interact with PCT to produce worse alcohol and cannabis outcomes? A secondary aim of the paper was to report transitional probabilities, documenting typical adolescent responses to clinician behaviors.

For question 1 and 2, we found that overall PCT was trending toward significance for days of alcohol use ($p = 0.05$), however PCT did not predict binge drinking ($p = 0.13$), cannabis use ($p = 0.64$) or treatment engagement ($p = 0.23$); instead the effect of PCT varied depending upon treatment condition.

For question 3, we found the opposite of what was hypothesized. Adolescents assigned to MI + NF who had high PCT had significantly *lower* number of alcohol use days and binge drinking days compared to individuals receiving only MI. Contrary to anecdotal concerns about using NF with adolescents (Barnett et al., 2012; Winters et al., 2012) our study finds lower binge drinking days and any alcohol use days among those with high change talk only in the MI + NF condition. Those with high CT in the MI condition actually increased their overall and binge drinking days. This peculiar finding contradicts prior research showing that CT predicts MI outcomes on alcohol use for both adults and adolescents (Moyers et al., 2009). It may be that for younger adolescent drinkers with episodic binge drinking patterns, the combination of high CT and NF is necessary. This could be because NF may be raising adolescents' awareness of non-normative behavior (i.e., developing discrepancy), which

could account for the different way CT influences drinking across the MI and MI + NF conditions. This significant interaction suggests an important relationship between NF, PCT, and alcohol use among adolescents. For example, in sessions when adolescents are expressing relatively less CT (or more ST), substance use seems to be maintained at follow up periods indicating that NF may be counterproductive for individuals with less in-session CT. This is in line with prior research which posits that a discussion around NF may elicit more ST if it is the first time an adolescent has been presented with new information that contradicts their prior perceptions of their substance use (Osilla et al., 2015).

It is also possible that change talk marked initial treatment motivation rather than a mechanism activated by NF. That is, more highly motivated adolescents may not view feedback as negative, whereas more resistant adolescents may not believe NF or may view it as confrontational. We did not find strong associations between provision of NF and subsequent change talk in preliminary analyses, nor could we test transitional probabilities due to low base rates of NF across sessions. Thus, change talk in this study did not meet Nock, Janis, and Wedig's, (2007) temporal order criterion in that we cannot be certain that it was prompted by NF. Additionally, it may be that there is a synergistic effect of providing NF within the context of an MI intervention.

This study's results, however, mimic the positive findings of combining MI and NF for college students. Students that receive MI plus NF changed their normative perceptions of drinking (Walters & Neighbors, 2005; Walters, Vader, Harris, Field, & Jouriles, 2009), had higher CT (Vader et al., 2010) and had more positive drinking outcomes at follow up (Walters & Neighbors, 2005).

We did not find a significant effect for PCT on cannabis use outcomes or treatment engagement at 3 months. While our results are in line with other studies utilizing NF with college student cannabis users (Lee, Neighbors, Kilmer, & Larimer, 2010) it is unclear why client change language for adolescents receiving NF did not predict lower cannabis use. It may be that hearing feedback regarding cannabis use does not have a strong effect because the proportion of adolescents who view cannabis use as problematic has fallen over the past 10 years. For example, in 2014 only 16% of 12th graders believed occasional cannabis use to be harmful and 13% believed experimenting with cannabis to be dangerous (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2015). In terms of treatment engagement, one explanation may lie in our inability to isolate client change language associated specifically with entering treatment after the assessment. That is, all CT statements, whether about alcohol use, cannabis use, or treatment engagement, were captured using a single code. Future studies may attempt to isolate CT or ST directly associated with treatment entry.

Overall, we found that when therapists used MI consistent behaviors (e.g. open questions, reflections) adolescent change talk increased. This finding is in concert with numerous studies showing that MI-consistent behaviors result in eliciting change talk from clients (D'Amico et al., 2015; Gaume et al., 2010; Magill et al., 2014; Moyers et al., 2007, 2009) and thus result in behavior change. We also found that when adolescents expressed CT it was more likely to be followed by more CT and, similarly, when adolescents expressed ST

they were more likely to continue with ST. These data add to the growing literature on the importance of eliciting change talk from clients during MI sessions such that when a therapist or facilitator encounters ST it is important to avoid reflecting the ST and use other MI techniques such as a double sided reflection that ends in support for change side.

5. Conclusion and Limitations

Despite the study's novelty and methodological vigor, some limitations remain. All participants in our sample were referred for a substance use treatment assessment. Therefore, the generalizability of our results may be limited to heavy-using adolescents. Further, therapists in this study were trained in MI, received ongoing supervision, and had high competency and therapist ratings. It may be useful for future research to examine the impact of NF on adolescent change language and subsequent substance use outcomes within a setting that has varying levels of MI competency. Further, our study was limited by a small sample size and a low frequency of NF statements by the therapists (approximately 1 per session). We were still limited in our models due to potential power issues (small sample size and use of secondary data analysis) to detect group effects on outcomes. Although this low frequency limited our ability to investigate transition probabilities following NF, this would be an important aspect to consider as it would give practitioners a more nuanced understanding of what happens immediately following NF for adolescents. Future research should investigate the impact of NF on client change language in other formats such as group treatment. Some adolescent group MI studies have found that when an individual produces ST the group is more likely to continue with ST (D'Amico et al., 2015). It may be that NF, when given to a group, may not resonate given that they are surrounded by individuals their own age. Experimenting with various types of NF such as group NF, gender specific norms (Neighbors et al., 2007), or grade specific norms may elicit different responses from adolescents regarding alcohol and cannabis use. Finally, our data were limited to the 3 month follow up; it may be useful to investigate longer term outcomes for adolescents.

Despite limitations, this study adds to the small literature on adolescent change talk and, further, is the first adolescent study to investigate the impact of NF on substance use outcomes. Findings support the use of NF for adolescents who have high PCT (or low proportion of ST) and support suppression of using NF for individuals with low PCT (or high proportion of ST) during a brief MI session. Practitioners familiar with MI can easily incorporate a short NF segment into an initial meeting with an adolescent or during a treatment assessment in attempts to improve alcohol use outcomes (Barnett et al., 2014a, 2014b).

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Abbreviations

CT change talk

ST	sustain talk
MI	motivational interviewing
NF	normative feedback
PCT	percent change talk

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Fig. 1.

Interaction of percent CT and condition for drinking days at 3 months. *Note:* MI = motivational interviewing; NF = normative feedback; CT = change talk.

Fig. 2. Interaction of percent CT and condition for binge drinking days at 3 months. *Note:* MI = motivational interviewing; NF = normative feedback; CT = change talk.

Fig. 3.

State transition diagram for behaviors related to client change language. *Note:* Dotted line = related to sustain talk, solid line = related to change talk. Positive valence (+) = significantly more likely than chance; negative valence (−) = significantly less likely than chance.

Table 1

Effects on drinking outcomes.

Variable	Estimate	SE	t ratio	p	95% CI	
					Lower	Upper
A. Number of drinking days						
Intercept	0.228	0.468	0.487	0.626	-0.689	1.144
Condition	-0.427	0.531	-0.803	0.422	-1.468	0.615
Baseline drinking days	0.146	0.035	4.181	0.000	0.077	0.214
Percent CT	4.634	2.440	1.899	0.058	-0.149	9.417
Percent CT $\times$ condition	-14.340	4.330	-3.312	0.001	-22.82	-5.853
B. Number of binge drinking days						
Intercept	-0.055	0.530	-0.104	0.917	-1.094	0.983
Condition	-0.230	0.711	-0.323	0.747	-1.624	1.165
Baseline binge drinking days	0.147	0.048	3.073	0.002	0.053	0.241
Percent CT	4.990	3.322	1.502	0.133	-1.521	11.502
Percent CT $\times$ condition	-11.334	5.702	-1.988	0.047	-22.509	-0.158

Note. CT = change talk.

Table 2

Effects on days of cannabis use.

Variable	Estimate	SE	t ratio	p	95% CI	
					Lower	Upper
Intercept	2.336	0.460	5.075	0.000	1.434	3.238
Condition	0.169	0.494	0.342	0.732	-0.800	1.138
Baseline cannabis days	0.020	0.008	2.439	0.015	0.004	0.037
Percent CT	-0.970	2.043	-0.475	0.635	-4.974	3.034
Percent CT × condition	-1.582	3.534	-0.448	0.654	-8.508	5.344

Note. CT = change talk.

Table 3

Effects on treatment engagement.

Variable	OR	Estimate	SE	t ratio	p	95% CI	
						Lower	Upper
Condition	0.511	-0.672	0.712	-0.934	0.346	-2.068	0.725
Percent CT	0.025	-3.678	3.071	-1.198	0.231	-9.697	2.342
Percent CT × condition	12.568	2.531	6.290	0.402	0.687	-9.797	14.859

Note. CT = change talk. OR = odds ratio.

Table 4

Lag-one conditional probabilities for within-session speech.

Subsequent behavior											
Initial behavior	Change	Sustain	Neutral	sMICO	MIIN	Open	Closed	RefChan	RefSust	RefOth	TherOth
Change	.35+	.07	.10−	.05−	.01−	.05	.03−	.20+	.01−	.02−	.10−
Sustain	.17−	.39+	.15−	.03−	.01	.02−	.02−	.05−	.07+	.03−	.06−
Neutral	.12−	.06−	.11−	.10+	.02+	.05	.06	.07−	.02	.16+	.25+
sMICO	.07−	.01−	.32+	.15+	.01	.08+	.08+	.06−	.00	.03−	.18+
MIIN	.18	.08	.17	.10	.10+	.04	.12+	.03−	.00	.02	.17
Open	.43+	.04−	.43+	.01−	.00	.03−	.02−	.01−	.00	.01−	.03−
Closed	.21	.03−	.63+	.02−	.00	.01−	.03−	.00	.00	.00	.07−
RefChan	.47+	.01−	.04−	.04−	.00	.04−	.04	.25+	.02	.03−	.05−
RefSust	.04−	.50+	.08−	.03−	.01	.01−	.00	.13	.13+	.03	.05−
RefOth	.04−	.02−	.57+	.04−	.00	.05	.04	.09	.02	.08+	.07−
TherOth	.10−	.02−	.18	.14+	.02+	.11+	.13+	.06−	.01−	.04−	.19+

Note: sMICO = sequential MI-consistent behaviors, including advice with permission, affirm, emphasize control, and support, but excluding reflections and open questions, which are categorized separately. MIIN = MI-inconsistent behaviors, including advice without permission, confront, direct, raise concern without permission, and warn; RefChange = reflections of change talk; RefSustain = reflections of sustain talk; RefOther = all other reflections; TherOth = all therapist behaviors not otherwise captured, including facilitate, filler, give information, structure, raise concern with permission, and inaudible/uncodeable utterances. (+) = significantly more likely than expected by chance; (-) = significantly less likely than expected by chance.