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## Temporal variation in facilitator and client behavior during group motivational interviewing sessions

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### Abstract

There is considerable evidence for Motivational interviewing (MI) in changing problematic behaviors. Research on the causal chain for MI suggests influence of facilitator speech on client speech. This association has been examined using macro (session-level) and micro (utterance-level) measures; however, effects across sessions have largely been unexplored, particularly with groups. We evaluated a sample of 129 adolescent group MI sessions, using a behavioral coding system and timing information to generate information on facilitator and client speech (CT: change talk) within 5 successive segments (quintiles) of each group session. We hypothesized that facilitator speech (open-ended questions and reflections of CT) would be related to subsequent CT. Repeated measures analysis indicated significant quadratic and cubic trends for facilitator and client speech across quintiles. Across quintiles, cross-lagged panel analysis using a zero-inflated negative binomial model showed minimal evidence of facilitator speech on client CT, but did indicate several effects of client CT on facilitator speech, and of client CT on subsequent client CT. Results suggest that session-level effects of facilitator speech on client speech do not arise from long-duration effects of facilitator speech; instead, we detected effects of facilitator speech on client speech only at the beginning and end of sessions, when open questions respectively suppressed and enhanced client expressions of CT. Findings suggest that clinicians must remain vigilant to client CT throughout the group session, reinforcing it when it arises spontaneously and

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selectively employing open-ended questions to elicit it when it does not, particularly towards the end of the session.

### Keywords

motivational interviewing; psychotherapy process; group intervention; alcohol and drug use; adolescent

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### Introduction

Motivational interviewing (MI), a directional, client-centered intervention for problematic health behaviors (Miller & Rollnick, 1991, 2002, 2012) has accumulated considerable evidence of its efficacy, both for adults (Hettema, Steele, & Miller, 2005; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010) and for adolescents (Cushing, Jensen, Miller, & Leffingwell, 2014; Jensen et al., 2011). Empirical support has been found for a theoretical mechanism for MI's effectiveness, (Miller & Rose, 2009), specifically, a causal chain linking within-session facilitator speech, client speech, and substance use outcomes (Moyers, Martin, Houck, Christopher, & Tonigan, 2009). Later studies have also fully or partially replicated this seminal finding (Barnett et al., 2014; Morgenstern et al., 2012; Pirlott, Kisbu-Sakarya, DeFrancesco, Elliot, & MacKinnon, 2012; Vader, Walters, Prabhu, Houck, & Field, 2010). Studies examining specific links of the causal chain have also shown robust effects, such as the link between within-session client and facilitator speech (Barnett et al., 2014; Gaume, Bertholet, Faouzi, Gmel, & Daeppen, 2010; Glynn & Moyers, 2010; Moyers & Martin, 2006) and the link between within-session client speech and outcomes (Apodaca et al., 2014; Barnett et al., 2014; D'Amico et al., 2015; Gaume et al., 2010; Shorey, Martino, Lamb, LaRowe, & Santa Ana, in press; Vader et al., 2010). Most of this work has been conducted using individual sessions except for a recent study by D'Amico et al. (2015) and a subsequent study by Shorey et al. (in press). Thus, little is known about how facilitator and client speech co-vary over the course of a group MI session, and how the group therapeutic intervention may be optimized to support behavior change. This is especially important given that group modalities are commonly used in addiction treatment settings (Price et al., 1991; United States Department of Health and Human Services. Substance Abuse and Mental Health Services Administration. Office of Applied Studies, 2014).

One approach to evaluating the mutual influence of facilitator and client speech is by examining the temporal associations between these behaviors through sequential coding. Specifically, given that a particular behavior has occurred, what is the very next behavior that will occur? The first MI study to apply this approach in an individual session (Moyers & Martin, 2006) found that facilitator speech consistent with MI (*i.e.*, affirmations, support, advice with permission, open questions, reflections) was significantly more likely than expected by chance to be followed by client change talk (CT), a type of within-session client speech that favors changing a problematic health behavior. In contrast, facilitator speech inconsistent with MI (*i.e.*, confrontation, direction, warning, advice without permission) was significantly more likely than expected by chance to be followed by client sustain talk (ST),

a type of within-session client speech that favors maintaining a problematic health behavior. Subsequent studies examining individual therapy have consistently found that facilitator reflections of CT are likely to be followed by client CT, whereas facilitator reflections of ST are likely to be followed by client ST (Barnett et al., 2014; Gaume et al., 2010; Moyers et al., 2009). These findings have been replicated in the group setting, with the additional finding that open-ended questions (OQ) are likely to be followed by CT (D'Amico et al., 2015). These effects support the immediate (*i.e.*, next utterance) influence of facilitator speech on client speech. However, longer-term effects within a therapeutic session have been relatively unexplored. Understanding how to structure and facilitate talk across a therapeutic session may help to optimize client behavioral change following therapy.

Longer-term associations between facilitator and client speech within sessions can be examined by breaking the session into smaller units, such as fifths (*i.e.*, quintiles) or tenths (*i.e.*, deciles) of a session. A seminal study by Amrhein and colleagues (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003) used this approach to examine individual motivational enhancement therapy (MET; a variant of MI that incorporates feedback) sessions and found not only that CT strength (*i.e.*, a Likert rating of CT strength) predicted drug use treatment outcomes, but also that this effect was only significant for CT in the 7<sup>th</sup> and 10<sup>th</sup> deciles, suggesting that particular portions of the session may represent critical periods of influence on client treatment outcomes. Using similar methodology for individual sessions, Walker, Stephens, Rowland, & Roffman (2011) found that in deciles related to when clients received personalized feedback, client CT was particularly predictive of outcome. However, the particular deciles included were not reported. A study of cocaine use applying the decile approach (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008) found that overall CT strength predicted use and that the shift in CT strength from the 5<sup>th</sup> to the 10<sup>th</sup> deciles predicted treatment retention for individuals. A close replication of Amrhein's work (Morgenstern et al., 2012) examined the effects of CT at the end of an individual session only (*i.e.*, in deciles 9–10) and did not find a significant association between CT in these deciles and outcomes. Finally, a study of significant other effects in MI examined facilitator, client, and significant other speech across deciles and found that only CT from the significant other, and not facilitator speech, predicted client CT (Apodaca, Magill, Longabaugh, Jackson, & Monti, 2012).

Clearly, studies applying the decile technique have taken diverse approaches and shown inconsistent results. In addition, each of these studies has examined this question in individual, rather than group, sessions. The importance of CT from segments of group MI sessions, and the association between facilitator and client speech during these segments, remains an open question. Rather than examine effects on outcome, an important first step may be the assessment of how facilitator and client speech relate over time in group MI sessions in order to provide a theory-driven rationale for segment selection and an explanation for potential effects on outcomes. For instance, if the association between facilitator speech and client CT is consistent throughout the session, then facilitators can maintain a high level of CT by eliciting and reflecting CT from group members throughout the session. If this association varies depending upon the segment of the session, then particular moments during the session may be more important, requiring specialized

strategies to ensure that group member CT is elicited and reflected during these critical times.

The present study addresses this question by examining changes in the mutual influence of within-session facilitator and client speech over the course of group MI sessions with adolescents. Although sequential analysis would appear an attractive choice, the relative infrequency of client change language (Moyers et al., 2009, see Supplemental materials) limits the number of transitions involving client change language during a segment. Due to the requirement that at least five instances of the transitions of interest occur (Wickens, 1982), it is not feasible to examine transition probabilities for facilitator speech and client change language by segments. Instead, we examined longer-term effects of facilitator speech by segmenting sessions into five equal parts (i.e., quintiles). Because previous studies of individual MI sessions have found quadratic slopes for CT within sessions (Amrhein et al., 2003), we hypothesized that group sessions would show a similar pattern. In addition, we hypothesized that that, due to the natural development of CT as well as variability in facilitator reinforcement of CT, the associations between CT and reflections of CT (i.e., RefCT) and between CT and open questions (i.e., OQ) would vary across quintiles.

## Method

### Study setting

This study involves secondary analysis of data collected in a randomized clinical trial of a group intervention for adolescents in a Teen Court setting (D'Amico, Hunter, Miles, Ewing, & Osilla, 2013). Youth who committed a first-time alcohol or other drug (AOD) offense and were deemed by the Probation department as not in need of more intensive intervention were offered the chance to participate in the community-based Teen Court diversion program. Given that this was a first-time offense, these youth were not further processed by the Probation department. The Teen Court program is not part of the juvenile justice system (i.e., Teen Court is not a drug court), and youth in the Teen Court program are not considered a prison population as they are not formally on probation. Youth could choose to end their participation in the study at any time without any negative consequences; study participation was not tied to youth status in the juvenile justice system. Youth who elect to participate in the Teen Court program enter into a contract with the Teen Court in which they agree to abide by the decisions of a peer jury. Youth who do not wish to participate in Teen court retain the right to have a closed hearing in Juvenile Court. For those who decide to go the teen court, the peer jury is provided with sentencing guidelines, including sanctions such as community service, service on the Teen Court jury, and fees. However, if a teen does not fulfill their contract, the community-based Teen Court lacks the authority to impose any legal consequences; instead, the consequence that has already been imposed by the justice system remains in place (i.e., the offense remains on the youth's record.). Youth who chose to participate in the study received six group intervention sessions. The current manuscript is based upon examination of behavior during the group intervention sessions, *Free Talk*. Youth who chose to end their participation in Free Talk could complete any remaining sessions in usual care. As is typical of early-intervention programs (see e.g., McCambridge, Slym, & Strang, 2008), completion rates for both Free Talk and usual care

were high; in both cases around 95%. Despite similar completion rates, the rate of recidivism in the following year was much higher for usual care than for Free Talk participants (D'Amico et al., 2013). Usual care participants and sessions were not audio recorded and were therefore not included in the analyses. We coded 135 *Free Talk* sessions. Six sessions were used in coder training; 129 sessions were used for the analyses.

## Participants

Youth were eligible if they were 14–18 years old, chose to participate in the Teen Court program during the study period (January 2009–October 2011) for a first-time AOD offense, and agreed to be randomized to one of the study conditions and complete the study survey instruments. We excluded youth who did not speak and read English well enough to complete the informed consent and self-administered surveys, as well as youth who had multiple offenses or possession of a medical marijuana card. Study refusals (10%) were mostly due to lack of time or transportation to complete a baseline survey before their first group session (see D'Amico et al, 2013 for the CONSORT diagram). No statistically significant demographic differences were observed between study participants and those that refused to participate. 110 youth participated in the *Free Talk* group sessions. The average age was 16.75 years (SD=1.02, range 14 – 18); 65.5% were male, 51.8% were White, 39.1% were Hispanic, and 9.1% were mixed/other race.

*Free Talk* group sessions were led by one of five facilitators (all female and white) who were psychology doctoral students with prior at-risk teen work experience. The five facilitators received 40 hours of MI and *Free Talk* training delivered by two licensed clinical psychologists affiliated with the Motivational Interviewing Network of Trainers (MINT). All *Free Talk* groups were digitally audio recorded. These two experts reviewed recordings and provided one-hour weekly supervision to facilitators. The Motivational Interviewing Treatment Integrity scale (MITI; Moyers, Martin, Manuel, Hendrickson, & Miller, 2005) was used to monitor intervention fidelity and to provide feedback during supervision.

**Intervention**—Facilitators delivered a six-session manualized group intervention, *Free Talk* (D'Amico, et al., 2010). Detailed study procedures are available elsewhere (D'Amico et al., 2013). The sessions were offered weekly and enrollment in the intervention was based on a rolling admission, so that attending the second session was not contingent upon attending the first session. Facilitators used MI strategies throughout the sessions. For example, facilitators used willingness and confidence rulers, a motivation-building exercise, to facilitate discussions about participants' willingness and confidence to change. Session content included an interactive discussion of AOD myths (e.g., using alcohol will make me more sociable), the pathway from abstinence to addiction, effective interpersonal communication strategies, the effects of AOD on the brain, and the contribution of AOD on other risk-taking behavior such as unsafe sex and driving under the influence (see D'Amico et al., 2013). Each group session lasted 55 minutes and the average group size was 5 adolescents (mean=4.54; SD=1.96). Due to the rolling admission approximately one adolescent was new to each group session (mean=1.29, SD=2.28). Ninety-five percent of youth completed all six sessions within the required 90-day time frame.

## Procedures

All procedures were approved by the institution's Human Subjects Protection Committee (HSPC). Audio recordings of intervention sessions were used for coding. Independent coders previously rated sessions using an objective sequential behavior coding system (MISC 2.5: Houck, Moyers, Miller, Glynn, & Hallgren, 2010) and a computerized coding application (CACTI: Glynn, Hallgren, Houck, & Moyers, 2012). Although this approach is novel in the group setting, the sole major difference in the coding approach in the present study compared with prior sequential coding studies was in the handling of client speech. Because it was not possible to determine from the audio recording *which* teen was speaking, "client speech" could occur from *any* teen in the group. For example, if a facilitator asked a question of one teen, another teen might respond with CT, the facilitator might reflect this CT, and yet another teen could respond with additional CT. As in prior sequential coding studies (Barnett et al., 2014; Moyers & Martin, 2006; Moyers et al., 2009), each session was sequentially coded in its entirety, from beginning to end.

Inter-rater reliability was generally good to excellent, with intra-class correlations (ICC: Shrout & Fleiss, 1979) for change talk (ICC = .897), sustain talk (ICC = .954), open questions (ICC = .668), and reflections of change talk (ICC = .728) all in the good to excellent range (Cicchetti & Sparrow, 1981). In addition, the utterance-to-utterance reliability of our coders was  $k = .67$ , indicating that our coders agreed on the *exact sequence of behaviors* approximately 73% of the time (Bakeman, Quera, McArthur, & Robinson, 1997). Subsequent research has suggested that this utterance-to-utterance approach is superior to reliability estimates that are based upon counts (Lord et al., 2015). On the whole, these results indicate very high inter-rater reliability.

Detailed coding procedures and inter-rater reliability estimates are available elsewhere (D'Amico et al., 2015). The extraction of data for quintiles was possible because sequential coding using CACTI preserves both the temporal sequence of behaviors and the exact time at which behaviors occurred. Quintiles were constructed by calculating the length of the session (i.e., end time of the final utterance minus the start time of the initial utterance) and dividing by five. Coding data from these quintiles were extracted using time codes embedded in CACTI output files. Each session's CACTI output file was used to create 5 separate files containing codes corresponding to these quintiles. Summary measures defined in the MISC manual (Houck et al., 2010) were computed for each quintile including the total CT, ST, reflections of CT (RefCT; i.e., simple reflections of CT + complex reflections of CT), and open-ended questions (OQ). The slope of client change language over the five quintiles was tested using repeated measures MANOVA in SPSS version 22. The association between client and facilitator speech across quintiles was evaluated using a cross-lagged panel analysis (path analysis) in Mplus (Muthén & Muthén, 1998–2015), incorporating group size as a covariate.

## Results

As hypothesized, repeated measures ANOVA indicated significant quadratic trends for CT ( $F(1,125) = 34.91, p < .001$ ) and reflections of CT ( $F(1,125) = 34.42, p < .001$ ), and cubic trends for CT ( $F(1,125) = 26.81, p < .001$ ), reflections of CT ( $F(1,125) = 29.45, p < .001$ )



and open-ended questions ( $F(1,125)= 25.47, p < .001$ ). No significant linear trends were detected. A plot of mean CT, reflections of CT, and open-ended questions over quintiles is displayed in Figure 1.

Path analysis was used to evaluate cross-lagged partial regression paths. This approach can distinguish between the effects of client CT on facilitator speech, and the effects of facilitator speech on client CT. In MI, client CT is a relatively rare type of speech (see Supplemental Material in Moyers et al., 2009). Therefore, due to significant zero inflation on the variables of interest, a zero-inflated negative binomial model was used in Mplus 7.2 (Muthén & Muthén, 1998) to evaluate associations between CT and facilitator speech, while also addressing the non-normal distribution of these measures (for a tutorial, see Atkins, Baldwin, Zheng, Gallop, & Neighbors, 2013). This type of multivariate analysis simultaneously assesses a continuous model (e.g., the association between the number of reflections of CT in one quintile and the number of CT utterances in the next quintile) and a logistic model (e.g., the association between the number of reflections of CT in one quintile and having *any* CT utterances in the next quintile). Because a zero-inflated model was used, we were also able to examine the association between client CT and having zero utterances of reflections of CT or open-ended questions, and between reflections of CT or open-ended questions and having zero utterances of CT. The analysis was conducted for the five successive quintiles of the session to evaluate causal effects over time (Finkel, 1995; Kenny, 2004; Kenny & Harackiewicz, 1979), separately for reflections of CT and open-ended questions.

Figures 2–3 present the model and results for CT and reflections of CT. As hypothesized, significant associations were observed between CT and reflections of CT. However, rather than reflections of CT predicting subsequent CT, the count of CT in several quintiles predicted reflections of CT in subsequent quintiles. The significant paths were between CT and subsequent reflections of CT in quintiles two, three, and four ( $b = 0.054, t = 2.39, p < .01$ ;  $b = 0.066, t = 2.711, p < .05$ ;  $b = 0.078, t = 3.461, p < .05$ , respectively), and between CT in quintile 4 and CT in quintile 5 ( $b = 0.062, t = 3.109, p < .05$ ). CT in the second quintile was significantly associated with reflections of CT in the third quintile ( $b = 0.054, t = 2.390, p < .05$ ). CT in the third quintile was significantly associated with reflections of CT in the fourth quintile ( $b = 0.066, t = 2.711, p < .05$ ). CT in the fourth quintile was significantly associated with fifth-quintile CT ( $b = 0.062, t = 3.109, p < .05$ ) and reflections of CT ( $b = 0.078, t = 3.461, p < .05$ ). Group size was not a significant predictor for client or facilitator speech in any quintile. No other partial regression paths were significant in this model.

Figures 4–5 present the model and results for CT and open-ended questions. As hypothesized, significant associations were observed between CT and open-ended questions. Significant paths were detected between CT and subsequent open-ended questions, between open-ended questions and subsequent CT, between open-ended questions and subsequent open-ended questions, and between CT and subsequent CT. Open-ended questions in the first quintile were negatively associated with CT in the second quintile ( $b = -0.050, t = -2.35, p < .05$ ), and open-ended questions in the fourth quintile were significantly positively associated with CT in the fifth quintile ( $b = 0.034, t = 2.313, p < .05$ ). CT in the first quintile

was significantly negatively associated with open-ended questions in the second quintile ( $b = -0.13, t = -2.163, p < .05$ ), and with having zero utterances of CT in the second quintile ( $b = 0.072, t = 2.067, p < .05$ ). This association with having zero utterances of CT in the subsequent quintile means that sessions with high CT counts in the first quintile were more likely to have no instances of open-ended questions in the second quintile. In addition, CT in the third quintile was positively associated with open-ended questions in the fourth quintile ( $b = .022, t = 2.404, p < .05$ ), while CT in the fourth quintile was positively associated with CT in the fifth quintile ( $b = 0.047, t = 2.343, p < .05$ ). Open-ended questions were associated with subsequent open-ended questions across all 5 quintiles ( $b = 0.023, t = 2.966, p < .05$ ;  $b = 0.025, t = 2.534, p < .05$ ;  $b = 0.027, t = 3.468, p < .05$ ;  $b = 0.038, t = 4.228, p < .05$  respectively for first to second, second to third, third to fourth, and fourth to fifth quintile open-ended questions, respectively). Finally, group size was positively related to having zero instances of open-ended questions in the first quintile ( $b = 0.201, t = 2.196, p < .05$ ); that is, larger groups tended to have no open-ended questions in the first quintile. Group size was also positively associated with the number of open-ended questions in the fifth quintile ( $b = 0.034, t = 2.313, p < .05$ ); that is, larger groups tended to have more utterances of open-ended questions in the fifth quintile. No other partial regression paths were significant.

## Discussion

The present study used an advanced behavioral coding approach to assess associations between facilitator and client speech across five segments (quintiles) in a large adolescent sample of group MI sessions. To our knowledge this is the first published study to apply this technique in adolescent group psychotherapy. We detected significant quadratic slopes for client CT and facilitator open-ended questions and reflections of CT, and cubic slopes for CT and reflections of CT, with decreases from the 2<sup>nd</sup> to 4<sup>th</sup> quintiles and an increase from the 4<sup>th</sup> to 5<sup>th</sup> quintile, consistent with prior studies (Amrhein et al., 2003). These slopes likely reflect the structure of the sessions, in which evocation of teens' thoughts about the future and take-home messages from each group occurred at the end of the sessions, leading to increased expression of CT and reinforcement of session material through open-ended questions. Alternatively, high levels of CT at the end of the sessions may simply reflect increased teen engagement in the groups as the sessions drew to a close.

We found evidence of effects of client CT on subsequent client CT and facilitator speech, but saw evidence of cross-quintile effects of facilitator speech on client speech only for open-ended questions, and only at the beginning and end of the sessions. This suggests that the beginning and ending of group MI sessions may be important in exploring group member ambivalence, and particularly for eliciting client CT. The early portions of the session appear to set the stage for the group, whereas the final portions of the session seem to indicate the direction of the client's ambivalence, and may relate to subsequent outcomes (Amrhein et al., 2003).

Given previous findings on within-session speech using conditional probabilities (D'Amico et al., 2015; Gaume et al., 2010; Moyers & Martin, 2006; Moyers et al., 2009) one might expect to see an effect of reflections of CT on client CT over time. However, four previous studies suggest an *immediate* impact (*i.e.*, at lag zero, the very next utterance) of facilitator



speech on client speech, and cannot address longer-term effects. In contrast, the present study used a cross-lagged approach to examine associations over time at the quintile level. The absence of any cross-quintile effects of facilitator reflections of CT on client CT, coupled with high correlations between these categories of speech within quintiles, suggests that facilitator influence on client speech via reflections of CT is stronger in the short term. This is consistent with research demonstrating associations between session-level counts of MI-consistent speech and CT (Moyers et al., 2007, 2009). Although skilled facilitators can use reflections of CT to “lend” CT to clients who did not express it spontaneously (Miller & Rollnick, 2012), reflections of CT are more commonly used to reinforce than to elicit CT. The momentum generated by this reinforcement of CT appears not to persist over quintiles, suggesting that facilitators must remain vigilant in their reinforcement of CT throughout the session.

In contrast to findings for reflections of CT, we detected effects of open-ended questions on CT at the beginning and the end of these group sessions. Again this is not surprising given that prior research on within-session speech using conditional probabilities has indicated strong associations between open-ended questions and CT (D’Amico et al., 2015; Moyers et al., 2009). In addition to predicting CT at the beginning (2<sup>nd</sup> quintile) and end (5<sup>th</sup> quintile) of the session, open-ended questions consistently predicted subsequent OQ across all 5 quintiles, suggesting that facilitator use of open-ended questions was somewhat more stable than was facilitator use of reflections of CT. However, the direction of the effects of open-ended questions on CT differed across segments: at the beginning of the sessions, open-ended questions suppressed CT, whereas at the end of the sessions open-ended questions enhanced CT. The effects of CT were also negative at the beginning of the session, when first-quintile CT suppressed second-quintile open-ended questions. Some of these effects may be due to session structure. For example, at the beginning of each group, open-ended questions focused on topics such as how teens felt about being in the group and generating rules for the group, whereas at the end of the sessions, open-ended questions were typically about what teens would take away from the group or what stood out to the teens about the group. Thus, evocation about thoughts regarding session materials and activities was more likely to generate CT.

Successful implementation of the coding approach used in the present study requires considerable time, effort, and expertise, and as such has not been previously applied in the group setting. What do we learn about group psychotherapy, then, using this novel approach? First, the structure of the group sessions is apparent both from the slopes of facilitator and teen behavior and from the cross-lagged analyses. Across these 129 groups, CT and reflections of CT increased early in the sessions, dropped in the middle and peaked toward the end of the session; open-ended questions peaked early in the sessions and dropped and remained low through the middle and end of the sessions. Overall, the CT-to-CT effect at the end of the session may reflect the influence of peers in group MI. Such effects may also be reflected by the high CT-to CT-transition probability in a sequential coding study in group MI (D’Amico et al., 2015) and in a subsequent group MI study that specifically examined sequential CT statements from one group member to another, which the authors termed “relatedness” (Shorey et al., in press). The direct influence of peers in

group MI sessions may be as important as the influence of the facilitator, suggesting that teen-to-teen CT may be an important mechanism of change in group MI.

In addition, little is known about the influence of other factors in group MI settings, such as the size of the groups. We found that while group size did not influence youth CT or facilitator reflections of CT, group size did appear to be associated with open-ended questions, such that fewer were asked at beginning of the session and more at the end of the session. We speculate that in larger groups, facilitators may have initially asked fewer open-ended questions at the beginning, when facilitators may have been concerned with managing discussion within the allotted session time, and more open-ended questions at the end, when they were confident that all of the session content had been addressed.

### Limitations

Client change language was relatively infrequent in the present sample, as in all prior studies of within-session client speech (e.g., Moyers et al., 2009; see Supplemental Materials). On average, groups offered 136.1 utterances per session ( $SD=51.6$ ), of which 28.3 (approximately 22.5%) were classified as CT. When further subdivided into quintiles, the modal frequency of CT is zero, which complicated analyses and interpretation of facilitator-client exchanges. In addition, the group audio recordings did not allow for individuals to be identified; it is unknown whether client speech would follow the same patterns at the individual level.

### Conclusion

Clinician influence on client CT is clearly important at the utterance level, with greater open-ended questions and reflections of CT eliciting more CT and subsequently changing behavior (D'Amico et al., 2015; Moyers & Martin, 2006; Moyers et al., 2009); however, we found no evidence of consistent long-duration effects of facilitator reflections of CT on client speech across segments of group MI sessions. Instead, we detected effects of facilitator speech on client speech only at the beginning and end of sessions, when open questions respectively suppressed and enhanced client expressions of CT. Results therefore emphasize that in group MI sessions clinicians cannot "coast" on the strength of an initial, rewarding exchange, with many client expressions of CT and facilitator reflections of CT, but rather must remain vigilant throughout the session to reinforce client change language, using open-ended questions to elicit CT if the client ceases to offer it spontaneously, particularly near the end of the session.

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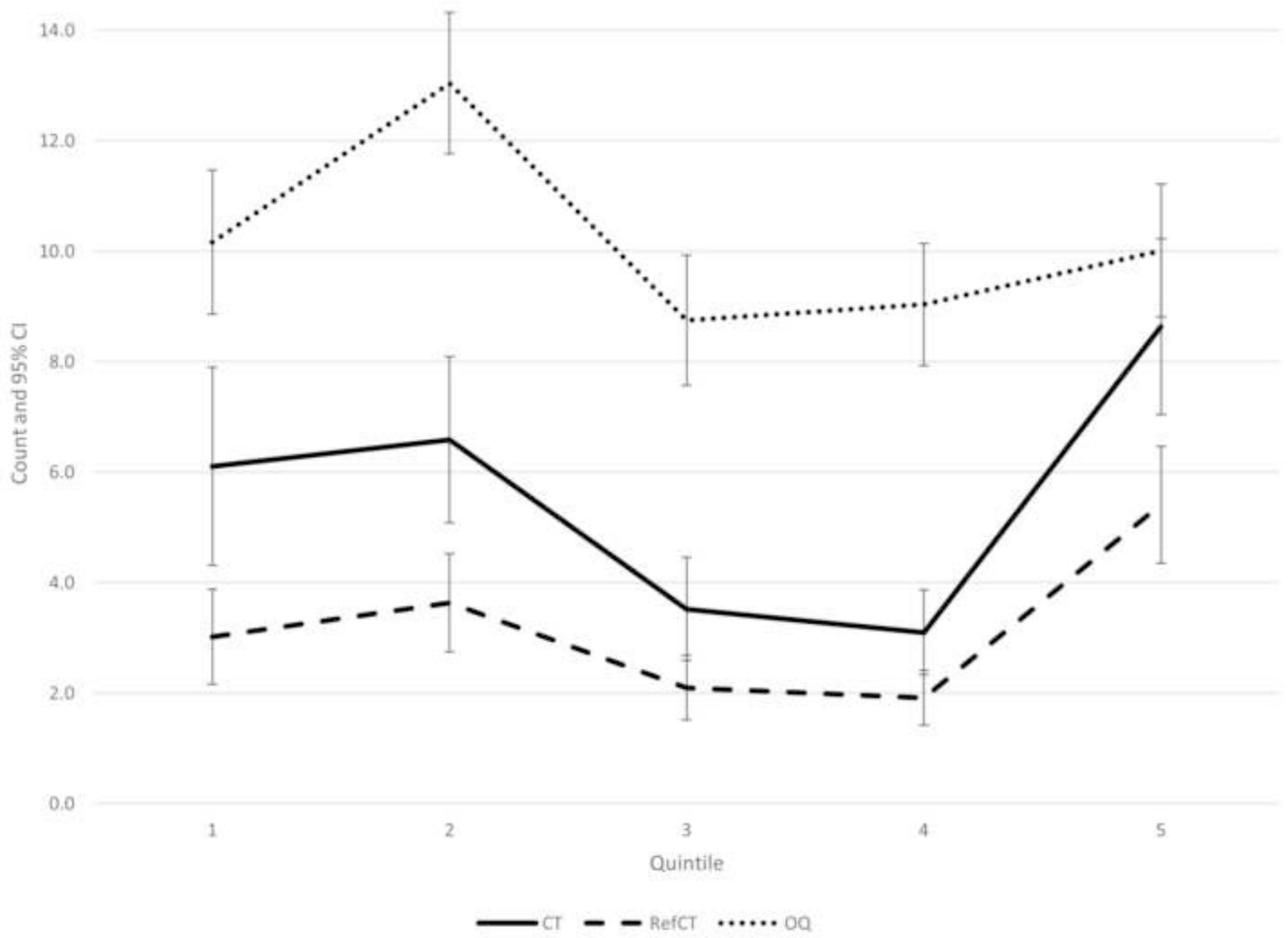
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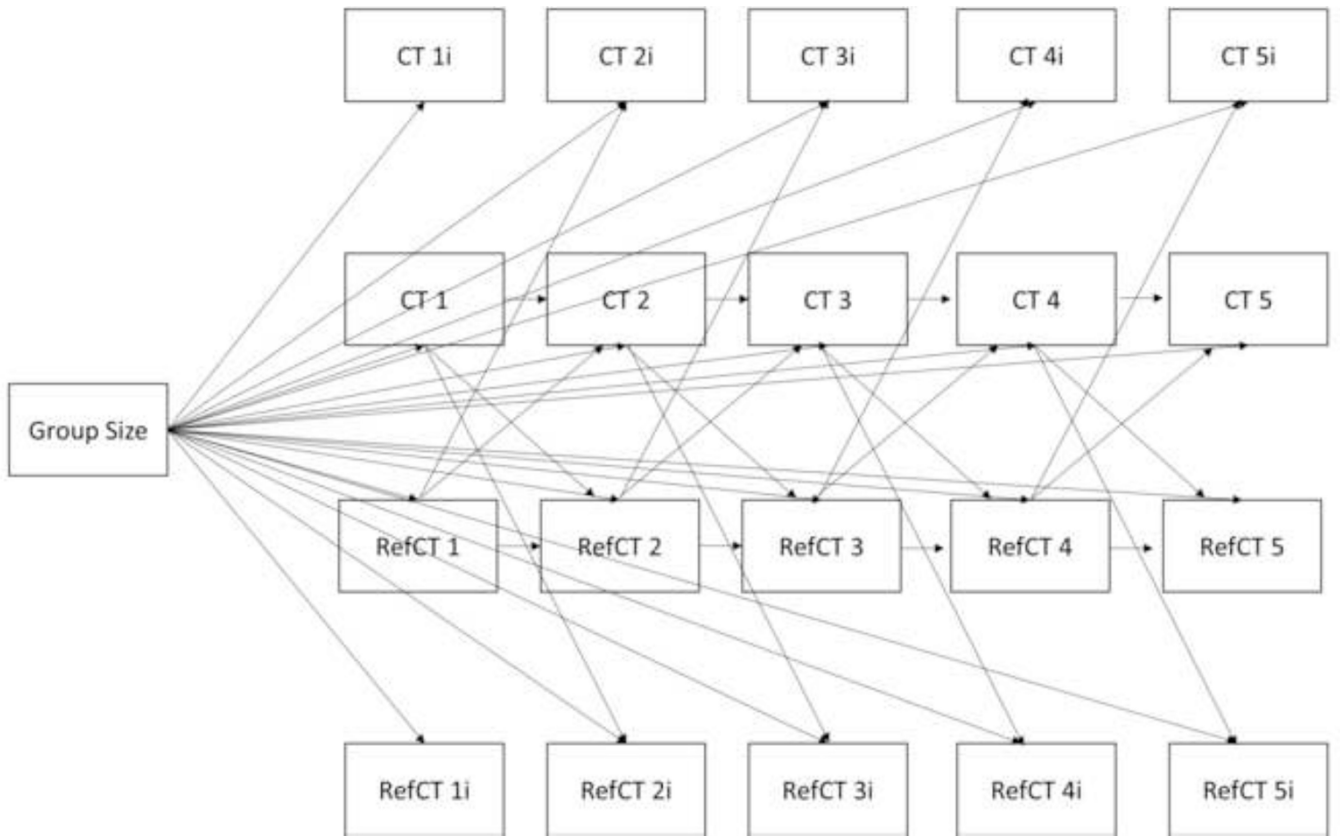
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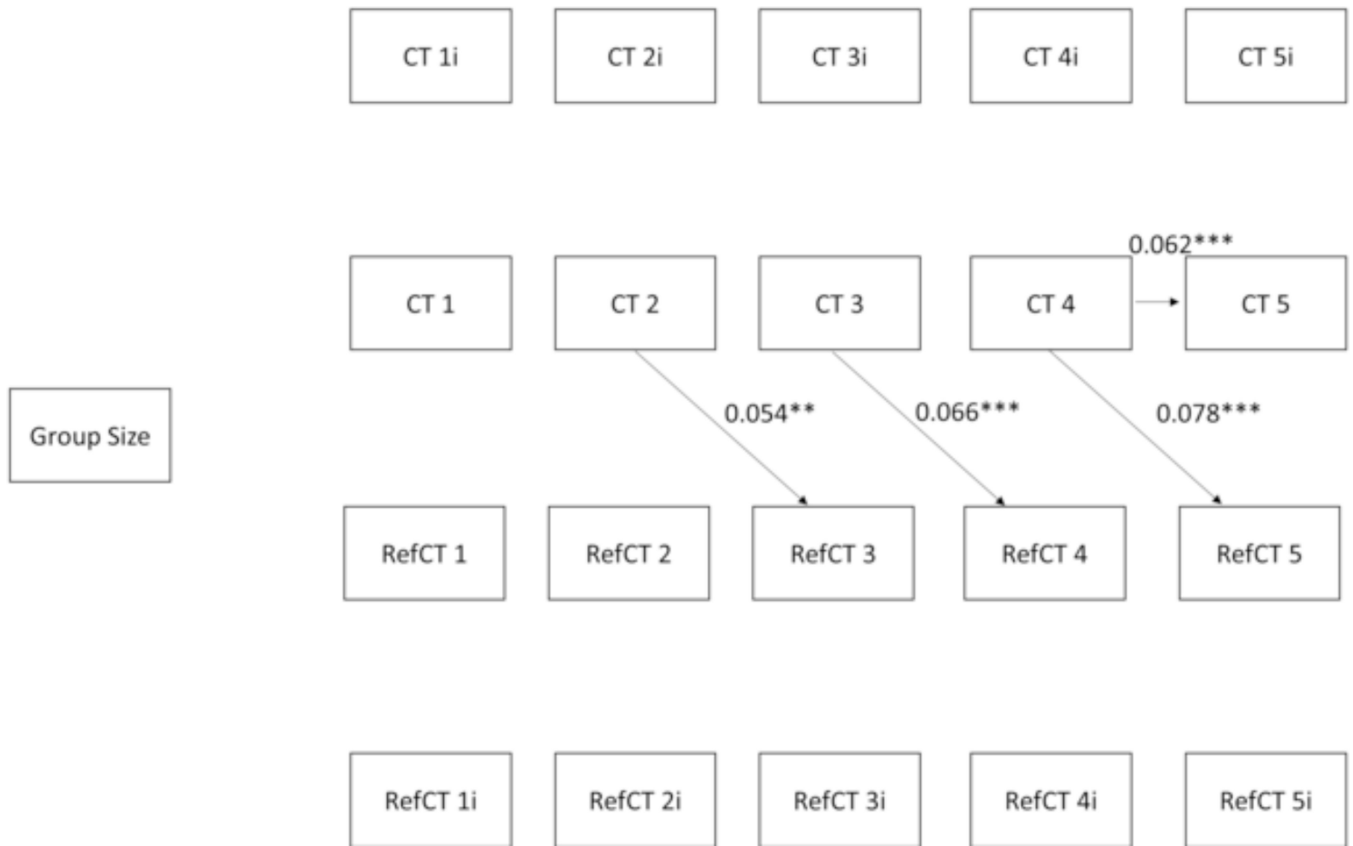


**Figure 1.** Slope of change talk (CT), reflections of change talk (RefCT), and Open Questions (OQ) over time.

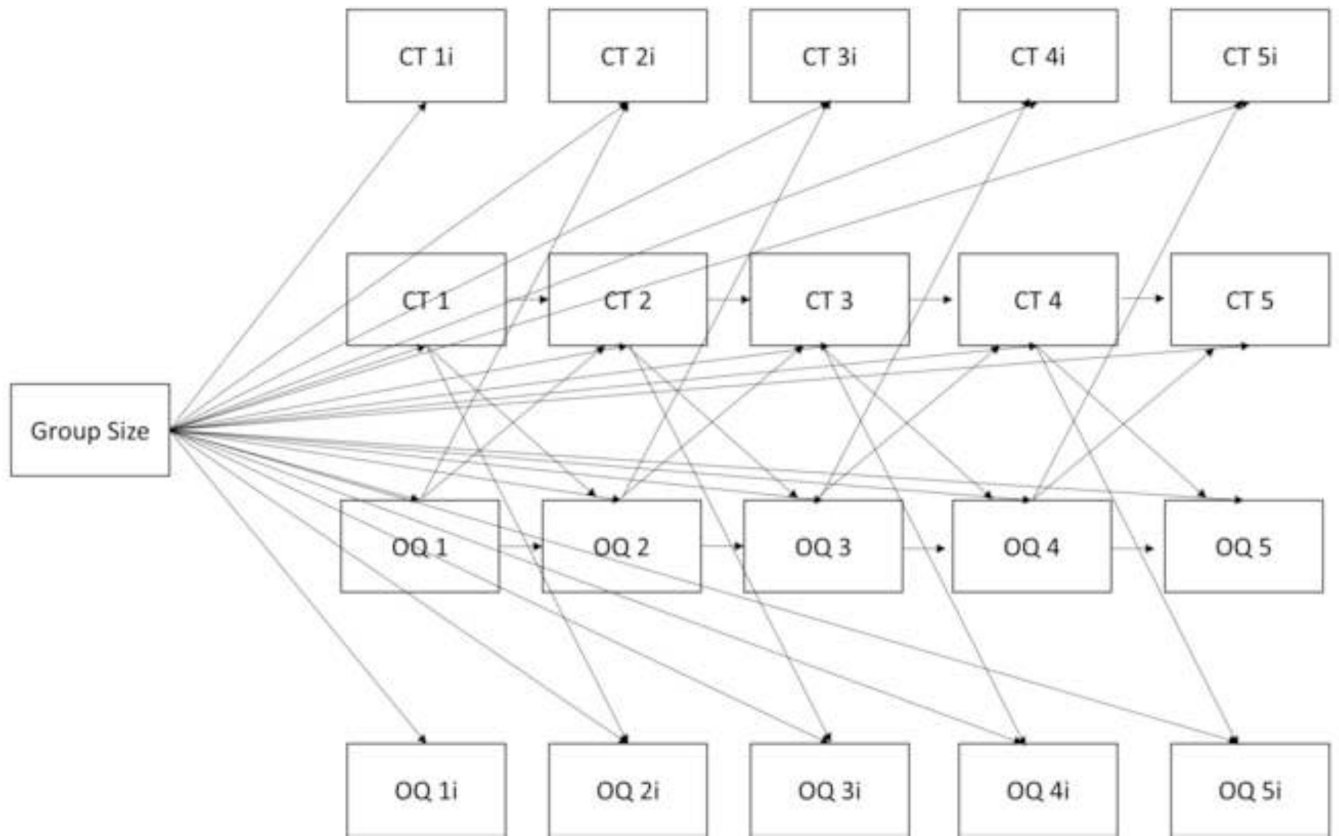




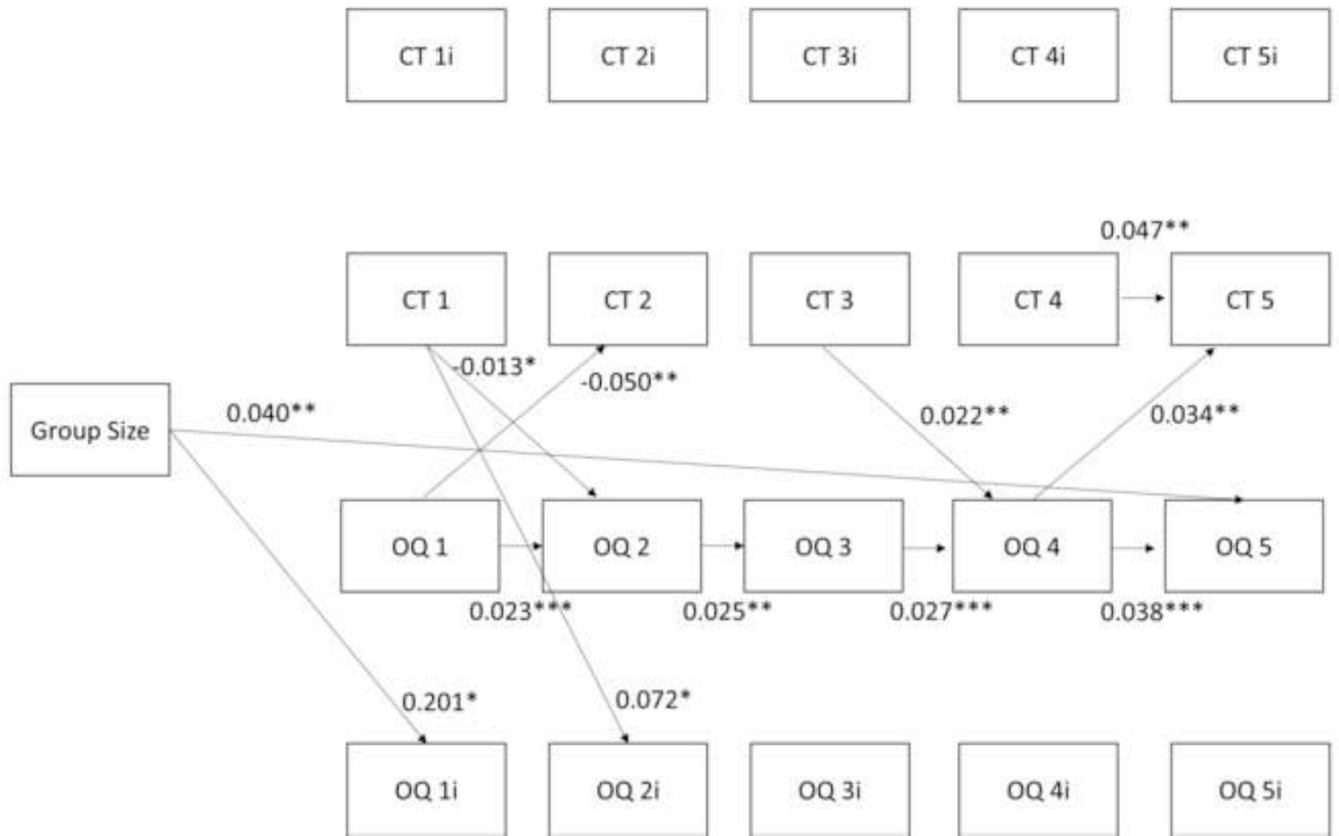
**Figure 2.** Initial cross-lagged panel model of change talk (CT) and reflections of CT (RefCT). Variable names ending in “i” represent the logistic part of the model; all other variables are count variables.



**Figure 3.** Cross-lagged panel model of change talk (CT) and reflections of CT (RefCT) showing only the significant paths. Variables ending in “i” represent the logistic part of the model; all other variables are count variables. Bayesian Information Criteria (BIC) = 5838.686, log-likelihood = -2779.790. Absolute fit statistics such as RMSEA and CFI are not available for models incorporating count outcomes. Note: \* =  $p < .05$ ; \*\* =  $p < .025$ ; \*\*\* =  $p < .01$



**Figure 4.** Initial cross-lagged panel model of change talk (CT) and open questions (OQ). Variable names ending in “i” represent the logistic part of the model; all other variables are count variables.



**Figure 5.** Cross-lagged panel model of change talk (CT) and open questions (OQ) showing only the significant paths. Variables ending in “i” represent the logistic part of the model; all other variables are count variables. Bayesian Information Criteria (BIC) = 7222.875, log-likelihood = -3416.544. Absolute fit statistics such as RMSEA and CFI are not available for models incorporating count outcomes. Note: \* =  $p < .05$ ; \*\* =  $p < .025$ ; \*\*\* =  $p < .01$