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ORIGINAL PAPER

# Telephone-Administered Motivational Interviewing Reduces Risky Sexual Behavior in HIV-Positive Late Middle-Age and Older Adults: A Pilot Randomized Controlled Trial

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**Abstract** By 2014, 50% of all adults living with HIV/AIDS will be 50-plus years of age. This pilot randomized controlled trial assessed the efficacy of two telephone-delivered motivational interviewing (MI) interventions to reduce risky sexual behavior in HIV-infected adults 45-plus years old. Eligible participants reported engaging in at least one occasion of unprotected anal and/or vaginal intercourse in the 3 months prior to study enrollment. Participants were randomly assigned to receive four sessions of telephone-delivered MI, one session of telephone-delivered MI, or no MI. Relative to 4-session MI participants, Controls reported approximately three times as many episodes of unprotected sex at 3- and 6-month follow-up, while 1-session MI participants reported four times as many unprotected sex acts at 3- and 6-month follow-up. No differences in condom use were observed between 1-session MI and Control participants. Additional large-scale studies that evaluate this intervention approach are warranted.

**Keywords** Randomized controlled trial · HIV/AIDS · Motivational interviewing · Risky sex · Older adults

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## Introduction

The number of late middle-age and older adults living with HIV/AIDS in the U.S. continues to rise. In fact, it is estimated that by 2014, 50% of all HIV-positive persons will be 50 years of age or older [1], due largely to (i) better clinical care and the improved efficacy of highly active antiretroviral therapy that has extended the lives of many HIV-positive persons and (ii) an increase in the number of new HIV infections in older persons [2].

For more than a decade, secondary prevention efforts have sought to reduce HIV transmission risk behaviors in HIV-positive persons [3]. These interventions also reduce the chances of HIV-positive persons acquiring other sexually transmitted infections or different strains of HIV, which can complicate treatment [4]. Motivational interventions that were originally developed to reduce problem substance use have been adapted for sexual risk behaviors and implemented in secondary interventions for HIV-positive persons [5–8]. Although traditional motivational enhancement therapy for problem drinking consists of 4 h-long sessions, meta-analyses have shown that briefer motivational therapies for substance use, consisting of just one to two sessions, are just as effective as 4-session interventions in reducing substance use, although direct comparisons between 4- and 1-session interventions have not been made in clinical trials [9]. Brief motivational enhancement therapies consisting of one to two sessions can also reduce sexual risk behavior in HIV+ persons [6].

Despite escalating HIV incidence and prevalence rates in older adults, and the fact that an estimated 13–30% of older persons living with HIV/AIDS continue to engage in risky sexual practices [10, 11], few secondary risk reduction interventions have been contextualized to meet the unique needs of sexually active HIV-infected older

adults. These unique needs include biological and libidinal changes associated with aging such as erectile dysfunction and the increased use of erectile dysfunction medications in older men, sexual partnerships with younger persons, survivor guilt over outliving romantic partners, and the impact of co-morbid chronic illnesses (e.g., diabetes, osteoporosis, cancer, hepatitis C) and associated medication and/or treatment side effects on perceptions of physical attractiveness [10, 12, 13].

Many HIV-positive older adults who would benefit from face-to-face sexual risk reduction interventions live with serious comorbid health conditions that complicate travel to medical and social service appointments, have significant confidentiality concerns, and are geographically isolated from traditional risk reduction resources [14]. As such, face-to-face interventions are an unrealistic intervention modality for many members of this group. However, risk reduction interventions delivered using distance technologies, such as regular and cellular telephones, can reach many older adults living with HIV/AIDS, and brief telephone motivational counseling has reduced occasions of unprotected anal sex in men who have sex with men [15].

In response to the lack of age-appropriate risk reduction interventions for HIV-infected older adults who engage in high-risk sex, and the potential of telephone technology to deliver cost-effective risk reduction interventions to this group, this study tested the efficacy of 1- and 4-session telephone-administered sexual risk reduction motivational interventions for HIV-positive middle-age and older adults who engage in risky sexual behaviors. Previous substance use research suggests that four sessions of motivational therapy, and perhaps as few as just one session, significantly reduce problem substance use, and brief motivational interventions also reduce risky sexual behavior in HIV-positive persons. It was thus hypothesized that participants receiving either intervention would report greater reductions in unprotected anal and vaginal intercourse and greater intentions to always use condoms compared to those in a standard of care control condition. Given the paucity of trials that directly compare 1- and 4-session motivational interventions, no differences on study outcomes were hypothesized between participants receiving a 1-session intervention and those receiving four intervention sessions.

## Methods

### Participants and Recruitment Procedures

Two recruitment strategies identified potential participants. First, recruitment brochures were sent to AIDS service organizations in five metropolitan areas: New York City, Atlanta, Philadelphia, Cincinnati, and Columbus, OH. Participating organizations placed brochures in "high traffic" areas of the facility such as waiting rooms and reception areas. Study brochures contained an e-mail address and toll-free telephone number that interested persons used to inquire into the study. Second, the research team compiled a "call list" of HIV-positive older adults who had been recruited through AIDS service organizations in the same five cities but did not meet full inclusion criteria for previous studies conducted by the research team in the past 3 years. These individuals requested to be contacted if future studies were conducted for which they might be eligible. Recruitment letters were mailed to these 94 individuals inviting them to contact the study team to learn more about the planned study.

Following initial contact, a member of the study team mailed potential participants two informed consent documents and asked them to return one signed copy if interested in the study. The second copy was to be kept for their personal records. A total of 307 documents were mailed to potential participants. Upon receipt of the signed consent form, research staff called the individual to conduct an eligibility screening. Of the 307 potential participants, 27 never returned a consent form, nine individuals were never screened after multiple failed attempts to contact them, and 271 persons completed the screening survey, of which 107 were eligible. Eligible participants satisfied the following inclusion criteria: (i) self-reported being HIV-seropositive or having a diagnosis of AIDS; (ii) 45-plus years of age; (iii) English-speaking; (iv) access to a landline or cellular telephone; and (v) had engaged in one or more occasions of unprotected anal or vaginal intercourse in the past 3 months. Eligible persons were younger, $t(269) = 4.88$, $P < 0.001$, but did not differ from non-eligible persons on gender, race/ethnicity, or sexual orientation.

Between December 2009 and March 2010, 100 participants enrolled into the study (New York = 68, Atlanta = 18, Philadelphia = 4, Cincinnati = 6, Columbus = 6). A priori power analyses, based on outcome effect sizes reported by Cosio et al. [6] and Fisher et al. [7], suggested that 60 participants would permit the detection of significant group differences between treatment and control on the primary outcome measure *number of unprotected anal and vaginal sexual acts in the past 3 months* at the $\alpha = 0.05$ level with 80% power. Figure 1 presents the CONSORT flowchart.

### Design and Randomization Procedures

One-hundred participants completed a telephone-administered baseline interview conducted within 2 weeks of determining the participant's eligibility (Mean = 3.5 days,

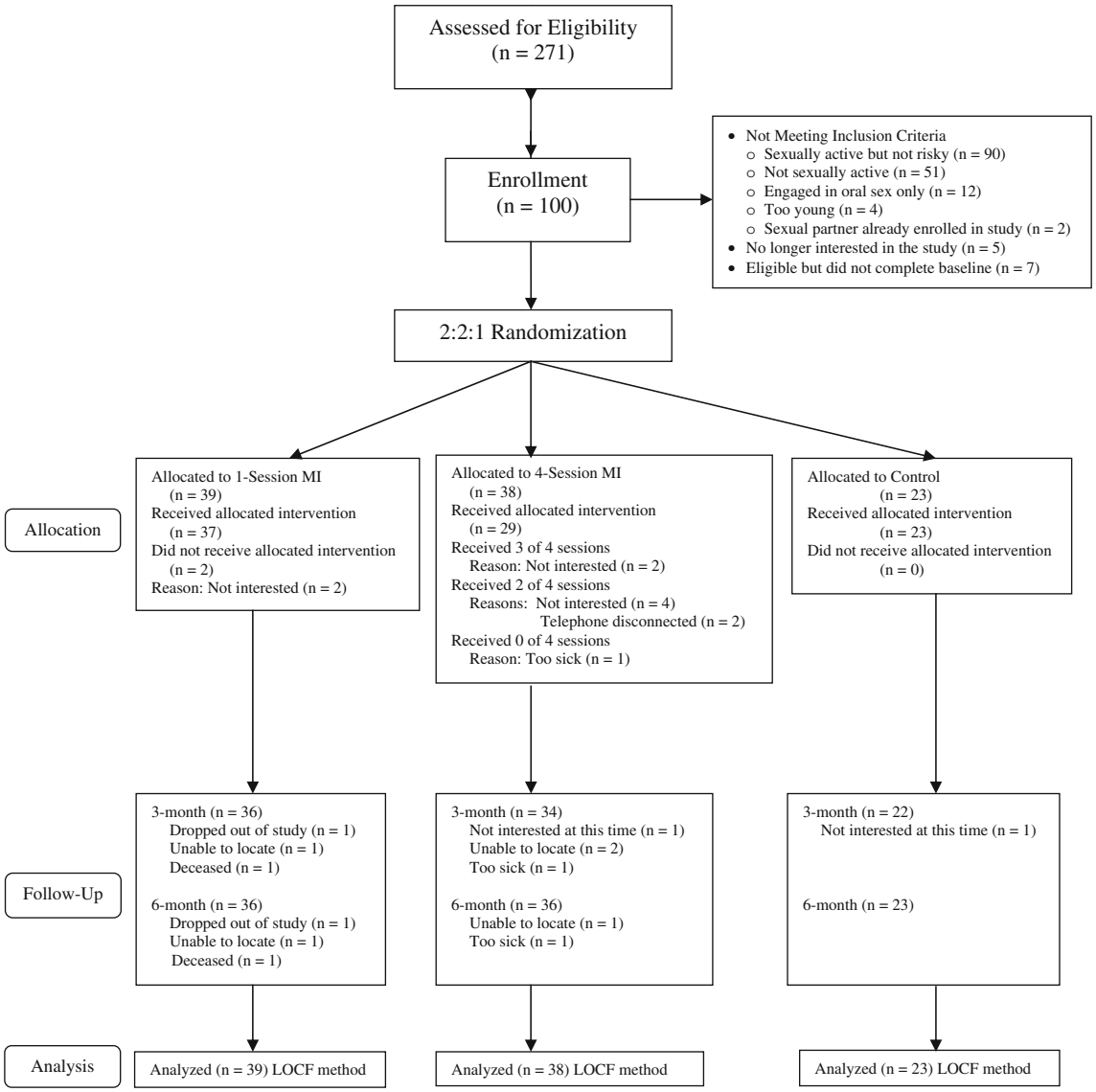


**Fig. 1** The CONSORT flowchart of study participants. *MI* motivational interviewing, *LOCF* last observation carried forward

Minimum = 0 days, Maximum = 14 days). Immediately following the baseline interview, participants were assigned to one of three parallel study conditions using concealment of allocation procedures. Prior to initiating the study, off-site personnel utilized a random numbers table and weighted simple random assignment to generate the allocation sequence, yielding a 2 (1-session motivational interviewing [MI]):2 (4-session MI):1 (Control) ratio. Unequal random assignment, although less common than 1:1 random assignment, is increasingly used in medical research. It is typically used when (i) ethical concerns regarding the safety of participants necessitate the assignment of fewer participants to a control condition, (ii) prohibitive costs limit the number of total participants who can enroll into the trial, and (iii) when researchers testing a new intervention via a small randomized controlled trial wish to establish more reliable point estimates for treatment effects that can help inform future larger trials [16]. It is also common to assign more participants to the active intervention condition(s) because greater variability on outcomes is generally observed in treatment conditions and a larger treatment sample reduces standard error [16]. The effect of unequal random assignment on power is negligible unless ratios exceed 3:1 [16]. This protocol was reviewed and approved by the university's Institutional Review Board. No adverse events were reported during the clinical trial.

Sealed, consecutively numbered, opaque envelopes prepared by off-site personnel contained the randomly allocated conditions. At the conclusion of the baseline interview, the interviewer opened the next envelope in the sequence, revealing the condition to which the participant

had been assigned. All research personnel were blind to participant condition prior to, and during, the baseline interview. If the participant was assigned to either of the two MI conditions, the interviewer scheduled the initial intervention session for a time within the next 14 days that was most convenient for the participant. The mean elapsed time from the baseline interview to the initial session was 10 days (Median = 6 days, Minimum = 0 days, Maximum = 58 days). Seventy-three percent and 85% of participants completed the initial MI session within seven and 14 days of the baseline interview, respectively.

## Study Conditions

The Transtheoretical Model provided the theoretical framework for these brief interventions [17]. Eligibility screening determined that all enrolled participants were in a "pre-action" stage of readiness to always use protection during anal and/or vaginal intercourse at baseline. The current interventions were adapted from two treatment manuals: (i) *Project MATCH*, a 4-session Motivational Enhancement Therapy for problem drinking [18] and (ii) *Project Positive Power*, a 2-session telephone-administered MI sexual risk reduction intervention for HIV-positive rural persons [6]. With the exception of treatment dosage, the study's 1- and 4-session MI interventions were designed to be identical. However, the practicality of administering a 1- vs. 4-session intervention did lead to unique treatment characteristics. The similarities between the treatments are delineated below, followed by a discussion of characteristics that differentiated the two treatments.

### *Similarities Across Interventions*

All interventions were delivered by therapists located at the main research site. Therapists utilized MI, a client-focused and directive form of counseling, to explore participants' sexual relationship dynamics and increase their readiness to always engage in condom-protected sex [19]. Therapists used open-ended questions and empathic reflections to initiate and direct discussions. When opening an initial session, therapists were instructed to "discover the client's story as if you knew nothing about her or him." The topic of sexuality often naturally arose during early discussions. However, if the client did not initiate discussions of sexuality, therapists made the following type of statement: "When two people become intimate, discussions of whether or not to use protection sometimes take place. Tell me about any discussions you and your partner may have had." Therapists ascertained their client's current sexual practices and employed importance and readiness rulers to assess the extent to which clients believed that the use of condoms during all occasions of anal and/or vaginal sex was both important and a practice they felt ready to initiate [20]. During the course of these discussions, therapists appropriately recognized that benefits exist to engaging in unprotected sex with one's sexual partner(s) and helped clients identify and process ambivalence about changing current sexual practices, in light of their relationship, health, and general life goals. For clients in the pre-contemplation and contemplation stages of change, as evidenced by clients' reported readiness to engage in protected sex during readiness ruler activities, therapists attempted to develop discrepancy between client goals and current sexual behaviors.

If, over the course of the session(s), clients reported they were ready to always use protection during anal and/or vaginal intercourse, therapists assessed the clients' confidence to carry out these intentions, and if a client lacked confidence to use protection consistently, barriers to condom use were explored. Barriers included lack of sexual assertiveness, negotiating condom use with sexual partners who did not want to use protection, sexual disinhibition when under the influence of substances, an inability to maintain sexual arousal when using condoms, and "getting caught up in the moment." The therapist and client collaboratively identified strategies to overcome barriers to condom use and specific change plans to employ these strategies. Therapists then strengthened the client's commitment to change by affirming client change talk, while emphasizing client self-efficacy and behavioral control to use condoms consistently. Therapists concluded treatment by summarizing the client's relationship dynamics, current sexual practices, readiness to engage in protected anal and/or vaginal intercourse, health and life goals as they relate to sexuality, specific change plans to overcome barriers to using protection, if applicable, and client confidence in carrying out these change plans. Therapists were instructed to end a session once all manual topics had been addressed and a final session summary was provided to the client. The intervention manual can be obtained from the corresponding author.

### *1-Session MI*

This intervention was designed to be 45–50 min in duration. The actual session length averaged 48.39 min ($SD$ = 13.04 min, Minimum = 20.18 min, Maximum = 69.05 min). Due to the brief nature of this intervention, therapists focused on the most high-risk behavior for clients who had multiple risky behaviors and/or sexual partnerships and only discussed secondary behaviors and concurrent sexual partnerships if time permitted. A sexual risk behavior hierarchy was provided to therapists to assist them in determining the focus of therapy for clients with

multiple risky behaviors. For unprotected sexual acts, insertive anal intercourse with HIV-negative/unknown serostatus partners was of greatest risk, followed by receptive anal intercourse with HIV-negative/unknown serostatus partners, vaginal intercourse with HIV-negative/unknown serostatus partners, insertive or receptive anal intercourse with HIV+ partners, and vaginal intercourse with HIV+ partners. Because the intervention consisted of a single session, therapists were unable to assess any between-session changes in clients' readiness to engage in protected sex, follow up on clients' progress toward implementing change plans, or assist in the modification of change plans as needed.

### *4-Session MI*

Combining the four sessions, this intervention averaged 163.13 min in duration ($SD = 39.58$ min, Minimum = 107.72 min, Maximum = 255.12 min). The average length for Sessions 1–4 was 44.37, 37.92, 38.75, and 38.25 min, respectively. Intervention sessions were conducted 1 week apart. Session 1 focused on ascertaining the client's current relationship and sexual dynamics. Past relationships as they related to current sexual practices were discussed, as appropriate. Therapists also assessed the client's current readiness to always engage in protected sex. In Session 2, therapists discussed the client's concurrent sexual relationships, if applicable, and the sexual behaviors associated with these relationships. Therapists also identified the client's health, relationship, and general life goals and helped the client process ambivalence about always engaging in protected sex in light of these goals. If not addressed in an earlier session, Session 3 focused on the identification of barriers to engaging in protected sex and the development of a client-generated sexual behavior change plan. Finally, in Session 4, the client and therapist discussed the client's progress toward implementing the change plan and made plan modifications as needed.

### *Control Group*

Control participants did not receive an active intervention; however, similar to participants in both MI conditions, they were encouraged by project interviewers at the conclusion of the baseline interview to obtain information and support for their romantic relationships and sexuality through local AIDS service organizations, HIV-related and other support groups, informational websites, and any other resources available to them. No formal referrals to these services were made. The purpose of the Control condition was to represent participants' use of psychosocial services currently available in their community settings.

## Therapist Training

MI therapists were 10 Master's-level clinical psychology trainees from the research institution with prior didactic training in MI and other client-centered therapies. In preparation for the study, therapists participated in a 10-h MI workshop that included an interactive didactic component, role playing situations, and group discussions of role-play activities. Therapists also participated in a 5-h training program on HIV that included pathogenesis, clinical course, treatment, psychosocial issues, sexuality, and aging with HIV, as well as an additional 5-h training on the project's MI intervention manual. Because both MI interventions were designed to be similar, all therapists conducted both types of interventions.

## Intervention Fidelity

To improve intervention fidelity, therapists participated in weekly face-to-face group supervision during the study with licensed clinical psychologists at the home study site. Intervention sessions were audio-recorded, reviewed by the clinical supervisors, and discussed during the weekly group supervision. In addition, all sessions were transcribed and coded using the Motivational Interviewing Treatment Integrity Code (MITI), version 3.1.1 [21]. The MITI assesses therapist utterances to evaluate intervention fidelity in clinical trials that test MI interventions. Therapist utterances were coded as closed- vs. open-ended questions, complex reflections that extend meaning in a client's statement vs. simple reflections that simply reiterate what a client said, and MI adherent vs. MI non-adherent statements. Examples of MI adherent statements include asking clients' permission to offer advice and supporting clients' autonomy. MI non-adherent statements include advising without permission and confronting. In addition, therapists were rated globally using 5-point scales on evocation, collaboration, autonomy/support, direction, and empathy, with greater values indicating closer adherence to MI (see MITI 3.1.1 manual available at http://casaa.unm.edu/download/MITI3_1.pdf for additional information).

In line with MITI guidelines, random 20-min audio segments were selected from each intervention session. Two trained coders coded therapist utterances from which summary scores were derived in the following domains: Global Spirit, which averages global ratings in the domains of therapist evocation, collaboration, and autonomy/support, Reflection to Question Ratio, Percent Open Questions, Percent Complex Reflections, and Percent MI-Adherent. Interrater reliability for MITI coders was excellent (ICC = 0.92). The MITI provides proficiency cut-offs for summary scores that indicate beginning proficiency and more advanced competency in MI. On average,

**Table 1** MITI proficiency cutoffs and summary ratings for study therapists

| | Global spirit | Reflection: question | % open | % complex | % MI adherent |
|---|---|---|---|---|---|
| Beginning proficiency | 3.5 | 1 | 50 | 40 | 90 |
| Competency | 4 | 2 | 70 | 50 | 100 |
| Therapist 1 ($n = 5$) | 3.73 ± 0.64 | 1.84 ± 1.12 | 54.59 ± 16.45 | 47.81 ± 20.32 | 100.00 ± 0.00 |
| Therapist 2 ($n = 7$) | 4.18 ± 0.30 | 5.59 ± 4.79 | 61.06 ± 9.54 | 57.65 ± 8.18 | 100.00 ± 0.00 |
| Therapist 3 ($n = 3$) | 3.97 ± 0.13 | 1.48 ± 0.86 | 60.13 ± 1.47 | 53.76 ± 13.07 | 100.00 ± 0.00 |
| Therapist 4 ($n = 9$) | 3.99 ± 0.24 | 2.82 ± 3.12 | 54.91 ± 11.91 | 45.91 ± 13.39 | 100.00 ± 0.00 |
| Therapist 5 ($n = 6$) | 3.89 ± 0.36 | 2.44 ± 1.64 | 71.84 ± 12.67 | 43.47 ± 11.87 | 87.43 ± 19.39 |
| Therapist 6 ($n = 5$) | 4.04 ± 0.32 | 1.47 ± 0.32 | 33.05 ± 7.59 | 51.85 ± 11.98 | 96.00 ± 8.94 |
| Therapist 7 ($n = 3$) | 4.03 ± 0.05 | 2.04 ± 0.84 | 74.91 ± 21.93 | 38.78 ± 6.36 | 100.00 ± 0.00 |
| Therapist 8 ($n = 4$) | 3.89 ± 0.37 | 1.42 ± 0.27 | 52.39 ± 12.10 | 40.08 ± 9.24 | 100.00 ± 0.00 |
| Therapist 9 ($n = 26$) | 4.24 ± 0.19 | 1.88 ± 0.56 | 67.58 ± 13.84 | 55.45 ± 15.56 | 100.00 ± 0.00 |
| Therapist 10 ($n = 6$) | 4.15 ± 0.30 | 3.35 ± 0.88 | 76.44 ± 13.52 | 42.99 ± 14.88 | 100.00 ± 0.00 |
| Number meeting beginning proficiency | 10 | 10 | 9 | 9 | 9 |
| Number meeting competency | 5 | 5 | 3 | 4 | 8 |

Column values denote mean ± standard deviation. Number of study participants seen for MI by each therapist are specified in parentheses following therapist number

therapists met competency across Global Spirit, Reflection to Question Ratio, and Percent Complex Reflections, while meeting beginning proficiency and near competency for Percent Open Questions and Percent MI-Adherent. All therapists met at least beginning proficiency and often competency in four of the five summary domains, and seven of the ten therapists met at least beginning proficiency in all five domains, suggesting that interventions conducted in the current study remained adherent to MI principles. See Table 1 for average MITI global summary ratings for each project therapist.

## Assessment Instrument

Telephone-administered interviews, conducted from the home study site, were used to obtain participant data at baseline and 3- and 6-month follow-up. Domains assessed included demographics, detailed sexual behavior, alcohol and drug use, and additional psychosocial measures germane to the current study. Study interviewers were six undergraduate students at the participating university. To maximize the reliability of participant responses, all assessments utilized a retrospective recall period of the past 3 months [22]. Participants received $20 for completing the baseline interview, $25 for the 3-month follow-up, and $30 for the 6-month follow-up.

Interviewers underwent 20 h of training that included didactic presentations about HIV and the study questionnaire. With participants' permission, interviewers next listened to five live interviews and were then observed by the interviewer trainer while they conducted their first five interviews. To further interviewing skills and troubleshoot handling of difficult interviewees, weekly meetings were held between interviewers and the interviewer trainer. Interviews were identical across baseline and 3- and 6-month follow-up and took approximately 60 min to complete. Interviewers were blind to participant condition when conducting all interviews.

### *Primary Study Outcome*

Participants responded to a series of questions, adapted from Misovich et al. [23], about their sexual behavior over the past 3 months. The number of non-condom protected anal and vaginal sex acts in the past 3 months was the study's primary behavioral outcome.

### *Secondary Study Outcome*

Participants provided their readiness to engage in condom-protected behaviors (i.e., their "stage of change") by endorsing one of five statements, which was further corroborated by their sexual behavior reports: (i) "I do not intend to always use condoms during anal and/or vaginal intercourse in the next 6 months," (ii) "I intend to always use condoms during anal and/or vaginal intercourse starting in the next 6 months, but not in the next 30 days," (iii) "I intend to always use condoms during anal and/or vaginal intercourse starting in the next 30 days," (iv) "I began always using condoms during anal and/or vaginal intercourse within the last 6 months," (v) "I began always using condoms during anal and/or vaginal intercourse more than 6 months ago." These statements correspond, respectively, to the pre-contemplation, contemplation,

preparation, action, and maintenance stages of change [17]. For analytic purposes, participants were placed in one of two categories: pre-action (i.e., pre-contemplation, contemplation, or preparation) or action/maintenance.

### Statistical Analyses

Generalized estimating equations (GEEs), with model-based variance estimation and unstructured correlation matrices, assessed longitudinal outcomes for all dependent measures. GEEs account for correlated data due to multiple assessments of individual participants in longitudinal study designs. Poisson models are commonly used with count data such as the current study's primary dependent variable *number of unprotected anal and vaginal sex acts in the past 3 months*. An assumption of Poisson models is that the mean and variance of the model parameter are equal. The term overdispersion refers to the situation when the variance exceeds the mean. In such instances, alternative distributions, such as a negative binomial distribution, are used to model the data. In the current study, model diagnostics indicated the presence of overdispersion for the dependent count variable *number of unprotected anal and vaginal sex acts in the past 3 months*. As such, a negative binomial distribution with a log link function was used to model these data. The dichotomous outcome variable *readiness to always use condoms for anal and/or vaginal intercourse* utilized a binomial distribution with a logit link. Binomial distributions, commonly employed in logistic regression, are used to model dichotomous variables. GEE models estimated the effects of (i) time (not reported), (ii) study condition (not reported), and (iii) the time by study condition interaction. For missing data, a last-observation-carried-forward (i.e., intention-to-treat) data imputation strategy was employed to provide a conservative estimate of treatment effects.

Post-hoc analyses utilized GEEs to examine the relationship between potential moderating factors of the primary outcome, *number of unprotected anal and vaginal sex acts in the past 3 months*. Moderating factors included treatment fidelity, as assessed by MITI summary measures, and partner HIV serostatus. In addition, we used GEEs to examine risk reduction behaviors adopted by participants who no longer reported engaging in unprotected anal or vaginal sex at the study's conclusion, as well as possible demand characteristics that may bias participants' reports of sexual risk taking. Alpha $<0.05$ was used for all analyses.

## Results

The average participant was 53.82 years of age ($SD$ = 4.93 years, Minimum = 45.03 years, Maximum = 66.25 years) and had been living with HIV for nearly 17 years. Two-thirds of participants had progressed to AIDS, although only 16% currently reported plasma CD4 cell counts less than 200 cells/μl, and 80% reported undetectable viral loads. Most participants (87%) self-identified as an ethnic minority (primarily African-American), over one-half (54%) were male, and 52% were heterosexual. Eighty-five percent of participants had annual household incomes below $20,000. Participants across the three study conditions did not differ on any baseline demographic or clinical variable (see Table 2).

### Participant Attrition

Of the 100 participants enrolled, 92 completed the 3-month follow-up assessment, and 95 completed the 6-month follow-up assessment (see Fig. 1). Participants who did not complete the 3- and 6-month follow-up assessments had lower self-reported nadir plasma CD4 counts at baseline than participants who did complete the follow-up assessments, $t(90) = 2.33$, $P < 0.05$ and $t(93) = 2.29$, $P < 0.05$, respectively. However, completers and non-completers did not differ by experimental condition or on any other baseline demographic or clinical variables.

### Primary Outcome Analyses

A significant "Time x Condition" interaction (Wald $\chi^2[4] = 61.15$, $P < 0.001$) indicated that participants in the 4-session MI condition engaged in the fewest occasions of unprotected sex at the 3- and 6-month follow-ups (see Fig. 2). Specifically, compared to 4-session MI participants, Controls had approximately three times as many occasions of unprotected sex at 3-month (OR = 3.24, 95% CI [1.79–5.85]) and 6-month (OR = 2.70 [1.45–5.00]) follow-up. Furthermore, 1-session MI participants had four times as many unprotected sex acts as 4-session MI participants at 3-month (OR = 3.98 [2.38–6.67]) and 6-month (OR = 4.39 [2.56–7.46]) follow-up. Controls did not differ from 1-session MI participants at the 3-month (OR = 0.81 [0.47–1.41]) or 6-month (OR = 0.61 [0.35–1.09]) assessments.

### Secondary Outcome Analyses

All participants were in a pre-action stage of readiness to use condoms at baseline. At 3-month follow-up, 45% of all participants had reached the action stage of change, in which they reported always using condoms during anal and/or vaginal intercourse for at least the past month and intended to continue always using condoms in the future. At 6-month follow-up, 57% of all participants were in the action stage. The "Time × Condition" interaction was not significant, Wald $\chi^2(1) = 1.48$, $P = 0.48$. Exploratory analyses

**Table 2** Demographic and clinical characteristics at baseline by experimental condition

| Variable | 1-session MI ($n = 39$) % ($n$) | 4-session MI ($n = 38$) % ($n$) | Control ($n = 23$) % ($n$) |
|---|---|---|---|
| Age[a] | 53.99 ± 4.76 | 53.58 ± 5.68 | 53.95 ± 3.96 |
| Gender | | | |
| Male | 51.3 (20) | 52.6 (20) | 60.9 (14) |
| Female | 48.7 (19) | 44.7 (17) | 34.8 (8) |
| Transgender | 0.0 (0) | 2.6 (1) | 4.3 (1) |
| Sexual orientation | | | |
| Gay | 25.6 (10) | 36.8 (14) | 34.8 (8) |
| Heterosexual | 59.0 (23) | 47.4 (18) | 47.8 (11) |
| Bisexual | 15.4 (6) | 15.8 (6) | 17.4 (4) |
| Race | | | |
| Caucasian | 10.3 (4) | 15.8 (6) | 13.0 (3) |
| African-American | 61.5 (24) | 65.8 (25) | 69.6 (16) |
| Latino/Latina | 12.8 (5) | 10.5 (4) | 4.3 (1) |
| Other/Multi-racial | 15.4 (6) | 7.9 (3) | 13.0 (3) |
| Annual household income[b] | | | |
| <$10,000 | 65.8 (25) | 50.0 (19) | 47.8 (11) |
| $10,001–$20,000 | 23.7 (9) | 34.2 (13) | 34.8 (8) |
| $20,001–$30,000 | 2.6 (1) | 13.2 (5) | 4.3 (1) |
| $30,001–$40,000 | 7.9 (3) | 2.6 (1) | 4.3 (1) |
| >$40,000 | 0.0 (0) | 0.0 (0) | 8.7 (2) |
| Years positive[a] | 15.72 ± 7.20 | 17.03 ± 5.72 | 17.52 ± 6.80 |
| AIDS criteria ever met[c] | | | |
| Yes | 57.9 (22) | 68.4 (26) | 65.2 (15) |
| No | 42.1 (16) | 31.6 (12) | 34.8 (8) |
| AIDS criteria currently met[c] | | | |
| Yes | 5.3 (2) | 23.7 (9) | 21.7 (5) |
| No | 94.7 (36) | 76.3 (29) | 78.3 (18) |
| Nadir CD4[a,d] | 218.03 ± 219.67 | 173.05 ± 169.62 | 166.35 ± 151.95 |
| Current viral load[e] | | | |
| Detectable | 16.2 (6) | 21.1 (8) | 26.1 (6) |
| Undetectable | 83.8 (31) | 78.9 (30) | 73.9 (17) |

[a] Denotes mean ± standard deviation

[b] One participant in the 1-session MI condition responded "don't know" to annual income

[c] One participant in the 1-session MI condition did not know whether she had ever been diagnosed with AIDS or whether she currently met AIDS-defining criteria

[d] Four participants in the 1-session MI condition and one participant in the 4-session MI condition did not know the value of their lowest CD4 count

[e] Two participants in the 1-session MI condition did not know the result of their most recent viral load test

indicated that, at 3-month follow-up, 4-session MI participants were more than three times as likely to be in the action stage compared to Controls (OR = 3.15 [1.02–9.72]); however, this relationship was not significant at the 6-month assessment (OR = 2.23 [0.78–6.40]). No differences were observed between participants in the 1-session MI and Control conditions or the 4- and 1-session MI conditions at 3-month (OR = 2.69 [0.88–8.27] and OR = 1.17 [0.48–2.86], respectively) or 6-month (OR = 1.87 [0.66–5.30] and OR = 1.19 [0.48–2.99], respectively) follow-up. See Fig. 3.

## Treatment Fidelity

For participants who received either one or four sessions of MI, we examined the effect of treatment fidelity, as measured by MITI summary scores, on the primary outcome, *number of unprotected anal and vaginal sex acts in the past*

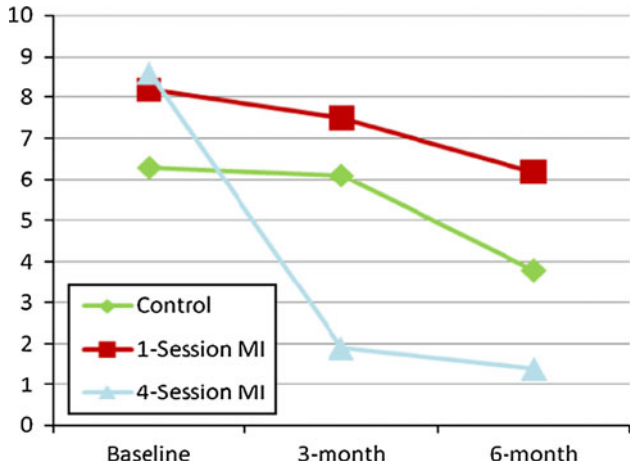


**Fig. 2** Mean number of unprotected anal and vaginal sex acts by time and study condition

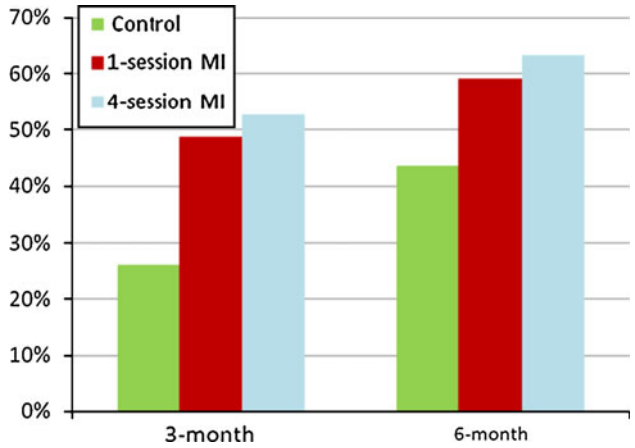


**Fig. 3** Proportion of participants who were in an action stage for always using protection during anal and/or vaginal intercourse. *Note*: 0% of participants across conditions were in an action stage at baseline

*3 months*. At 3-month follow-up, higher Global Spirit (OR = 0.19 [0.09–0.42]), Reflection to Question Ratio (OR = 0.68 [0.54–0.85]), and Percent Complex Reflections (OR = 0.97 [0.95–0.99]) were significantly associated with lower numbers of unprotected sex acts. At 6-month follow-up, higher Global Spirit (OR = 0.28 [0.12–0.62]), Reflection to Question Ratio (OR = 0.25 [0.15–0.42]), Percent Open Questions (OR = 0.97 [0.95–0.98]), and Percent MI Adherent (OR = 0.91 [0.88–0.94]) were associated with fewer unprotected sex acts.

## Partner HIV Status

Twenty-one participants were in a "steady" HIV seroconcordant relationship at baseline. We re-analyzed the primary outcome, *number of unprotected anal and vaginal sex acts in the past 3 months*, on a subsample that excluded these 21 participants. Results were similar to those of the full study sample but with more robust effects. Compared to 4-session MI participants, Controls had approximately five times as many occasions of unprotected sex at 3-month follow-up (OR = 4.90 [2.52–9.52]) and three times as many occasions at 6-month follow-up (OR = 2.83 [1.44–5.56]). 1-session MI participants had over five times as many unprotected sex acts as 4-session MI participants at 3-month (OR = 5.56 [3.03–10.20]) and 6-month (OR = 5.08 [2.78–9.26]) follow-up. Controls did not differ from 1-session MI participants at the 3-month (OR = 0.88 [0.48–1.62]) or 6-month (OR = 0.56 [0.30–1.04]) assessments.

## Risk Reduction

We examined changes from baseline to 6-month follow-up in total number of (i) anal/vaginal and (ii) oral sex acts for the 57 participants who reported always engaging in condom-protected anal and/or vaginal intercourse (i.e., those in the action stage of change) at the final study assessment. In addition, changes in number of unprotected oral sex acts were assessed. Participants in the 1-session MI ($n = 23$) and Control ($n = 10$) conditions who reported being in an action stage to use condoms for anal and vaginal intercourse at 6-month follow-up reported overall reductions in total anal/vaginal sex acts (OR = 0.07 [0.04–0.13] for 1-session MI participants; OR = 0.41 [0.17–1.01] for Controls) and oral sex acts (OR = 0.21 [0.11–0.39] for 1-session MI participants; OR = 0.41 [0.17–0.96] for Controls) from baseline to 6-month follow-up, whereas those in the 4-session MI condition ($n = 24$) reported no change in total sexual activity (OR = 0.70 [0.41–1.19] for total anal/vaginal sex acts; OR = 1.06 [0.61–1.84] for total oral sex acts). Participants in all conditions who reported readiness to always use condoms for anal and vaginal sex at the 6-month follow-up reported fewer occasions of *unprotected* oral sex from baseline to 6-month follow-up (OR = 0.51 [0.28–0.93] for 1-session MI participants; OR = 0.23 [0.13–0.42] for 4-session MI participants; OR = 0.18 [0.08–.38] for Controls).

## Demand Characteristics

Given that approximately 40% of Controls reported being in the action stage of readiness to always use condoms for anal and vaginal intercourse at the final assessment, additional analyses examined the possibility that these self-reported safer sex behaviors were due to interviewer demand characteristics. We examined the change in reported alcohol, marijuana, and crack/cocaine use from baseline to 6-month follow-up in Controls who reported

being in an action stage of readiness to always use condoms at 6-month follow-up. Because substance use in the context of risky sexual behavior carries with it a negative social stigma, one would expect reports of substance use in Controls to also decrease, along with their reports of risky sex. However, analyses revealed an increase from baseline to 6-month follow-up in reported days of alcohol (OR = 1.46 [1.40–1.52]), marijuana (OR = 1.04 [1.03–1.04]), and crack/cocaine (OR = 2.80 [1.72–4.56]) use in the past 3 months, suggesting that interviewer demand characteristics and the need to provide socially desirable responses did not influence Controls' reports of risky behaviors.

## Discussion

This study found that four sessions of telephone-delivered MI reduces sexual risk behavior in HIV-positive late middle-age and older adults compared to an ecologically valid standard of care control condition. Intervention outcomes were even more pronounced for participants who engaged in arguably the riskiest behaviors (i.e., those *not* in primary HIV-seroconcordant relationships). In addition, greater MI treatment fidelity resulted in greater reductions of sexual risk behavior. These findings are consistent with past research documenting the efficacy of brief telephone-delivered interventions to reduce sexual risk behavior in HIV-positive rural adults and groups at elevated risk for HIV, such as men who have sex with men [6, 15].

Contrary to our hypothesis, participants who received four sessions of MI reduced their frequency of unprotected anal and/or vaginal sex to a greater extent than those who received a single MI session. Although some studies have found that very brief motivational interventions in the context of standard patient care can reduce risky sexual behavior in HIV-positive persons [7], these interventions often occur within the context of an ongoing helping relationship, such as a doctor-patient relationship. In this study, 1-session MI therapists were charged with establishing a working therapeutic alliance with participants and providing counseling around sexual risk behavior in a single 50-min session over the telephone. It is possible that this brief time period lacked sufficient intensity to produce meaningful behavior change. In addition, participants who received four sessions of MI had greater opportunity to process ambivalence about using condoms, discuss the dynamics of concurrent sexual partnerships when applicable, develop plans to use condoms with sexual partners, and to evaluate and adjust plans as necessary. Our findings are consistent with the findings in the literature on problem drinking that support the efficacy of four MI sessions to change risky behavior [5].

It is notable that participants in *both* MI conditions showed trends toward greater readiness to always use condoms for anal and/or vaginal intercourse at 3- and 6-month follow-ups compared to Controls. Nonetheless, this trend did not reach statistical significance, perhaps due to limited power as a result of our modest sample size. However, the absolute difference between intervention and control participants in proportion of individuals who reached the action stage of change has clear clinical significance, with approximately 60% of participants who received an intervention reporting consistent condom use compared to approximately 40% of participants who received no MI-based therapy.

The observed reductions in unprotected anal and vaginal intercourse in participants did not lead to increases in other "substitute" sexual acts, such as condom-protected anal/vaginal or unprotected oral sex. In fact, participants in all study conditions who reported no unprotected anal and vaginal intercourse at the study conclusion also reported reductions in unprotected oral sex occasions. Sexually safe participants in the 1-session MI and Control conditions appeared to reduce total sexual activity, whereas participants in the 4-session MI condition maintained baseline levels of sexual activity. The nature of the 4-session intervention, which allowed for MI interventionists and participants to discuss ways to achieve sexual satisfaction and fulfillment while maintaining sexual safety, may account for these between condition findings. Future qualitative studies should explore this phenomenon.

Regardless of study condition, participants reduced sexual risk behavior over the course of the study. This is particularly notable for Control participants, given that approximately two- fifths of these individuals reported consistent condom use at the study's conclusion. One possible explanation is self-monitoring or reactivity [8], in which the mere act of responding to multiple questions about one or more behaviors influences future behaviors. A second possible explanation is demand characteristics. The possibility of *interviewer* demand characteristics was attenuated by analyses that showed increased reporting of the socially undesirable behavior of substance use in Controls who reported reduced sexual risk behavior at the study's final assessment. However, *therapist* demand characteristics may have contributed to participant reports of sexual behavior because persons receiving four sessions of MI may have felt more compelled to report reductions in risk behavior than those receiving one or no MI sessions. Indeed, a limitation of the current study is that it did not employ an attention-equivalent control group to account for the potential effect of amount of contact with a health professional. In addition, behavioral interventions are often unable to blind participants and interventionists to treatment condition, and participants in this study were made

aware of all conditions to which they may be assigned during the consent process. Future studies should employ a time-matched attention control condition and refrain from describing the specific study conditions during informed consent to control for these potential biases.

Study findings should be considered in light of several additional limitations beyond those addressed previously. As a pilot study, this research lacked a sufficient number of participants to examine outcomes by participants' geographic location. In addition, the study sample was composed primarily of ethnic minority persons living in urban areas of the Eastern and Midwestern United States, predominantly from the New York City metropolitan area, who were long-term survivors of HIV and connected to AIDS service organizations in their communities. Although the sample does not accurately represent the population of HIV-positive older adults in the United States in that this sample had a lower proportion of men who have sex with men, a greater proportion of ethnic minority persons, and no persons who lived in rural areas, it does over-represent a group that has been at considerable risk of new HIV infections in recent years, namely, ethnic minority women [2].

In addition, the generalizability of findings may be further limited given that therapists in the current study were Master's-level clinicians and received weekly supervision in MI during the course of the study. While some AIDS service organizations may have Master's-level clinicians or counselors, many interventionists at organizations of this type would not receive regular supervision for their therapeutic work from a licensed psychologist well-versed in MI. The finding that therapists in this study did not meet advanced competency across all intervention fidelity summary measures bodes well for the transportability of this intervention to therapists who need not be "experts" in MI to reduce risky sexual behavior in their HIV+ older clients. Future studies that test the effectiveness of such interventions should include, as therapists, individuals working at AIDS service organizations who would be likely to administer these interventions.

Self-reported sexual behavior using 3-month retrospective recall periods has been shown to be reliable [22]; however, the validity of these self-reports remains in question. Future risk reduction intervention trials with this group should employ objective biomarkers of sexual activity (e.g., prostate specific antigen in receptive partners) to corroborate participant self-reports [24]. Other non-biological assessment methods that may enhance validity of sexual behaviors include daily sexual behavior diaries or the corroboration of reported sexual behavior with the reports of participants' sexual partners.

Finally, although the wording of questions to assess stage of readiness to use condoms was congruent with operational definitions used in previous studies of health behavior change, it is possible that participants may have misunderstood the response options, thus resulting in a misclassification of their current stage of change. In addition, behavior change often involves relapses to undesired behaviors, and the length of the current study did not allow for a sufficient assessment of the durability of observed changes in condom use. Future studies should simplify the wording of the stage of change questions and utilize objective measures of condom use to corroborate reported stage of readiness to use condoms. The length of follow-up should also be extended to determine if participants who begin using condoms consistently maintain this change or revert back to unprotected sex behaviors.

In spite of these limitations, the current study showed that four sessions of telephone-administered MI reduced the frequency of unprotected anal and vaginal intercourse in HIV-infected middle-age and older adults. Given the high transmissibility of HIV via unprotected anal and vaginal intercourse, and increased morbidity and mortality in older adults after they are infected with HIV, the public health implications of study findings are significant. MI continues to grow in popularity as a treatment modality to catalyze health behavior change, and formal trainings on MI are increasingly available, making it a well-known, if not oft-practiced, approach to behavior change within the healthcare arena. Although the current study tested MI to reduce sexual risk behavior as a stand-alone treatment, it could be integrated into brief teletherapy for the treatment of psychiatric conditions such as depression or anxiety, substance use disorders, or primary HIV medical care. As the proportion of older adults who are infected with HIV/AIDS continues to rise, cost-effective secondary risk reduction interventions such as MI that are tailored to the unique needs of this older group, will be paramount for reducing the spread of HIV and protecting the health of those already infected with the virus.

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