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A Test of Motivational Plus Nicotine Replacement Interventions for HIV Positive Smokers

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Abstract

The purpose of this study was to test two combination motivational plus pharmacological interventions for smoking cessation among HIV positive smokers. Participants were 40 adults receiving HIV care who smoked daily reporting interest in smoking reduction. Measures were administered at baseline, 1-month, and 3-month follow-ups. Participants were randomly assigned to self-guided reading plus nicotine patch (n = 18) or motivational interviewing plus nicotine patch (n = 22). Groups did not differ at 3 months on biochemically-verified abstinence. The sample reduced cigarettes per day by half a pack and the percent of smoking days by 41%, and 22% were abstinent at 3-month follow-up. Compliance with the nicotine patch was poor and declined over time, but patch use was unrelated to carbon monoxide level at 3-month follow-up. Smoking cessation interventions for people with HIV can be helpful and should include components that encourage some smoke-free days, increase self-efficacy, and attend to adherence to nicotine replacement treatment.

Keywords

Smoking reduction; Motivational intervention; Guided self-change; Nicotine replacement therapy; HIV

Introduction

The deleterious impact of smoking on health is well known, with smoking characterized as the nation's number one public health problem by many sources including the Surgeon General (CDC 2004). Smoking accounts for excess morbidity and mortality in cardiovascular disease, cancer, asthma, and pulmonary disease, and smoking is the primary preventable cause of death in the US (CDC 2004). While rates of smoking have declined overall from the 1960s, rates of smoking have remained essentially unchanged since the 1990s (CDC 2004). Disenfranchised groups such as substance abusers, prisoners, and the mentally ill all smoke at rates higher than the general population (Budney et al. 1993;Cropsey et al. 2004).

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Smoking among people with HIV may confer increased risks of medical consequences including development of bacterial pneumonia, cardiovascular disease, emphysema, lung cancer, periodontal disease, oral candidiases, oral hairy leukoplakia, oral lesions, Karposi's sarcoma, and AIDS dementia complex compared to HIV positive non-smokers (Burns et al. 1996; Diaz et al. 2000; Niaura et al. 2000; Palacio et al. 1997; Nieman et al. 1993; Phelps et al. 2001). Smoking is related to increased rates of depression and neurological disease among this HIV positive people, and smoking during pregnancy triples the risk of HIV transmission to the fetus (Niaura et al. 2000). Smoking is also related to poorer health quality of life in general among people with HIV (Turner et al. 2001).

Niaura et al. (2000) reviewed the evidence and rationale for promoting smoking cessation among people with HIV. They found that over 70% of HIV positive outpatients smoked, and that 80% of that sample had not considered quitting (Niaura et al. 2000). Similarly, Mamary et al. (2002) found that 54% of outpatients with HIV smoked, but in contrast, found that 64% expressed some desire to quit. These rates of smoking are much higher than among the general population (21% prevalence), where 70% report wanting to quit; (CDC 2007). Niaura et al. (2000) state that the high smoking prevalence rate among the HIV-positive may indicate low motivation and a lack of access to tailored smoking cessation treatments. They suggest making efficacious treatments more accessible to this group (e.g., as part of HIV medical clinics) and specifically targeting motivational issues. They also recommend that minimal interventions such as brief advice and nicotine replacement therapy (NRT) be available for individuals who do not have access to more intensive interventions.

People are living with HIV longer and might maximize their healthy years and quality of life through quitting smoking, but they may need specially tailored smoking cessation interventions given the challenging nature of this population (Chaisson 1994; Niaura et al. 2000). We could identify no specific smoking cessation interventions for HIV positive smokers at the onset of this study, although recently, a study comparing brief advice plus NRT to cell-phone-delivered counseling plus NRT was reported (Vidrine et al. 2006). The cell phone intervention was found to be more effective than the brief advice condition (Vidrine et al. 2006).

A motivational approach seems appropriate to address some of the motivational issues (low interest, confidence, or readiness) that HIV positive smokers can have with the decision to consider cessation and with treatment non-adherence. Due to its success with other addictive substances and its brevity, Motivational Interviewing (MI, Miller and Rollnick 2002) was considered a promising approach to smoking cessation, consistent with Niaura's recommendations. Motivational Interviewing is a brief counseling intervention used to encourage people to consider changing addictive or unhealthy behaviors by exploring and resolving ambivalence and increasing commitment for change. At the time of the onset of this study, there were few published studies using MI to encourage smoking cessation. Currently, MI as a smoking cessation intervention shows mixed results. While MI shows some promise with adult dependent smokers in primary care (Soria et al. 2006) and postpartum women (Thyrian et al. 2007), it did not increase quitting among low-income housing residents (Okuyemi et al. 2007), cancer patients offered NRT (Wakefield et al. 2004), nor pregnant smokers receiving home-based midwife care (Tappin et al. 2000). However, these studies (with the exception of Wakefield) used MI alone rather than paired with NRT. Like other behavioral methods, MI could be more effective when paired with NRT (Richter et al. 2005) and vice-versa.

An adaptation of motivational interviewing is Self-guided Change, a brief cognitive-behavioral motivational intervention designed to assist people to recognize and use their own personal strengths to resolve mild to moderate addictive problems that has been conducted via telephone and the mail (SGC, Sobell and Sobell 1993, 1998). Its techniques include a guided self-

assessment of risk and barriers to change followed by personalized feedback generated from the assessment, advice to change, and instructions on removing barriers to change and increasing the rewards of change. SGC has been applied successfully to the reduction of problem drinking, and can be more cost effective than approaches requiring a specialist counselor (Sobell et al. 1996, 2002). A behavioral variation of SCG was tested for smoking cessation (Killen et al. 1990) and SGC as described by the Sobells shares many assumptions and techniques with MI, and thus provides a less expensive alternative to a counselor-directed intervention. Our rationale was to compare two conceptually similar conditions, one of which could be easily transported to the typical clinical care setting, and one which required specialist training. If similar in impact, these conditions or the less expensive, non-specialist modality could be tested in a larger study, and if different, the superior intervention could be further tested.

Therefore, the current study was undertaken to test the acceptability and feasibility and preliminary effectiveness of two delivery formats of a novel combination of interventions that included motivational and pharmacological components for smoking cessation targeting HIV positive smokers. Behavioral treatment should be paired with NRT as the standard of care for an optimal impact (Fiore 2000; Ingersoll and Cohen 2005), so each of these motivational approaches was paired with NRT in the form of the 24-h nicotine trans-dermal patch.

Methods

Participants

Forty participants were recruited from an urban university hospital Infectious Disease (ID) clinic. Eligibility requirements for participation were 18 years or older, HIV positive, smoking daily, not pregnant, able to give informed consent, not obviously cognitively impaired, and medically cleared for use of the nicotine patch by their medical care provider. In addition, participants were screened for interest in smoking reduction or cessation because they would be asked to use a medication, nicotine patches, and it seemed most appropriate to try this type of combination intervention with those with at least some motivation to reduce smoking. Forty people (17 women, 22 men, and 1 trans-gendered individual) participated with a mean age of 42 ± 6.1 years. These demographic characteristics are comparable to the ID clinic population in general. The majority (95%) was African American and 2 (5%) were Caucasian. Seventeen (43%) had greater than a high school education, while 12 (30%) had a high school education and 11 (27%) had less than a high school education. Most (93%) were unemployed.

Procedures

Participants were recruited via flyers or personal contact at the ID clinic and were asked to call study staff using a toll-free number to schedule an appointment. After participants completed an initial screening for eligibility and consent for release of information, study staff sought medical clearance from the patients' primary ID physicians. This clearance was sought to ensure that patients were unlikely to have negative side effects due to medication interactions of the nicotine patch with any of the drugs in their medication regimens. Once medically cleared, participants were enrolled at their convenience.

After providing written informed consent, participants completed self-report instruments and provided a lung capacity sample, carbon monoxide (CO) breath sample, and blood pressure measurements. Research assistants helped patients read and understand the survey items if necessary. Interviewers were trained to develop good rapport with participants, ask all questions neutrally and non-judgmentally, and correct inconsistencies that arose over the course of the interview before proceeding. These procedures were developed to reduce

potential response bias in which participants would be tempted to "please" the interviewer by under-reporting tobacco intake.

Interventions

Following baseline assessment, participants were randomly assigned to one of two treatment conditions. While both conditions were designed to provide motivation for cessation and patch use through attention to the participants' own assessment of their reasons to quit, tools needed to quit, and goal-setting around quitting or reducing smoking, we compared two different formats for the provision of the intervention, motivational interviewing counseling, and self-guided change.

In the motivational interviewing plus nicotine patch condition (MI + Patch), the participant met with the project counselor for a single intervention session. Components of the motivational interviewing intervention included personalized feedback drawn from the baseline measures regarding the participant's current health status, consequences of smoking, and readiness to change. Feedback was delivered in an MI counseling style, following the Elicit-Provide-Elicit strategy (Rollnick et al. 1999). Additionally, the counselor followed the principles of Expressing Empathy, Reducing Resistance, Developing Discrepancy, and Supporting Self-efficacy as described by Miller and Rollnick (2002). The primary counseling techniques employed were open questions, reflective listening, affirmations, and summaries, while strategies included the provision of personalized feedback, completion of a decisional balance exercise, and eliciting participants' own goals about changing their smoking. The feedback provided in the MI counseling condition included lifetime cigarette use and financial costs, CO blood levels compared to non-smokers, nicotine dependence scores, pulse rate, Forced Expiratory Volume (FEV) measured with a spirometer, given as a comparison of the participant's FEV versus a normal level for that person's age, and blood pressure. Feedback was targeted specifically toward HIV positive individuals. For example, the health risks of smoking at particular levels for those with HIV were shared with participants, and they were asked open-ended questions about their perceptions of their own personal risks given their HIV positive status. Following these components, the counselor reviewed the instructions for using the nicotine patch described below.

If assigned to the Self-guided Reading plus nicotine patch condition (Self-guided + Patch, SGC), the participant received a reading packet developed by the National Cancer Institute entitled "You Can Quit Smoking" (U.S. Public Health Service 2000). This consumer guide includes self-assessment of smoking habits, recommendations about setting a quit date, seeking help, substituting habits, self-monitoring, and other tips. The counselor provided guidance in its use by reviewing the contents, suggesting attention to specific topics, and suggesting that the participants record their thoughts and decisions on the forms provided. Therefore, this condition differed from the MI counseling condition in that the participant received feedback through a self-assessment rather than via counseling and were recommended to complete the exercises in the guide without the direction of a counselor. Following the counseling session or self-guided change instructions given by the counselor, the participant met with a research assistant to set the date of the 1-month follow-up and to review instructions for handling any adverse reactions to the patch before the follow-up appointment.

Participants in both conditions set a quit date and were given a 1-month supply of nicotine patches (NicoDerm CQ®) based on their current level of smoking, using standard dosing recommendations. Individuals who were smoking >10 cigarettes per day (CPD) were started on the 21 mg patch for 1 month, then at the 1-month follow-up were provided with the 14 and 7 mg patches with instructions to use each for 2 weeks. Individuals smoking <10 CPD began with the 14 mg patch for 2 weeks and then stepped down to the 7 mg for 2 weeks. About 1 and 3 months later, participants returned to the study office to complete an assessment of cigarette

smoking status and secondary variables. At the 1-month follow-up, participants who still needed nicotine replacement patches based on initial and then-current smoking levels at the 1-month follow-up were given the appropriate dosage patch for up to a month's supply. Participants received merchandise gift cards from a discount department store as compensation for their participation. A post-doctoral fellow in psychology or a counselor with a master's degree provided the treatment. Counselors were selected for the study due to having experience in motivational interviewing either through coursework or workshops. In addition, all underwent further MI training, protocol training, and regular clinical supervision from an experienced MI counselor and trainer (KSI).

Measures

Demographic characteristics (sex, age, race, employment, partner status, education level) were assessed at baseline using an interviewer-administered form developed for this study. Baseline medical status was abstracted from the ID clinic medical record at baseline, and included: HIV/AIDS diagnosis, smoking status, most recent CD4-cell count, most recent viral load level, and current medical conditions such as asthma, cardiovascular disease, diabetes, etc.

The primary outcome measure was smoking abstinence verified by CO levels assessed with a breath CO monitor. A reading of (3 ppm was used to denote a non-smoker and is a more sensitive and specific cutoff for low levels of smoking (Cropsey et al. 2006). Readings between 3 ppm and 8 ppm denoted occasional smoking and readings of 9 or more denoted regular smoking. The *Time Line Follow-Back* method (TLFB, Sobell and Sobell 1992) was used to gather the daily number of cigarettes smoked over the previous month. This is a self-report, calendar-based approach with memory prompts to assist recall of the number of cigarettes smoked each day. TLFB data collection methods can be more sensitive to changes in specific habits and are generally superior to simple quantity-frequency self-report measures. In addition, we queried type of cigarettes, costs, and when the last cigarette was smoked on a form designed for the study. The *Fagerstrom Test of Nicotine Dependence (FTND)* (Heatherton et al. 1991) was used to measure the severity of nicotine dependence. It is a widely used and well-validated brief measure. The *Minnesota Withdrawal Form* (Hughes and Hatsukami 1986) is a widely used, well-validated symptom rating form and was used to measure withdrawal-related symptoms that predict smoking cessation outcomes.

In this study we assessed not only outcomes, but also processes that are theoretically related to change due to motivational interventions. The *Smoking Stage of Change* (*Short Form*) (DiClemente et al. 1991) was used to assess the participant's stage of change at baseline, 1-month, and 3-month follow-ups. The *Smoking Processes of Change* (*Short Form*) (Prochaska et al. 1988) was used to assess the change processes being utilized by the participant at each time-point. The *Smoking Self-Efficacy/Temptation* (*Short Form*) (Velicer et al. 1990) was used to assess the participant's confidence in quitting smoking and temptation to smoke at each time point. The *Smoking Decisional Balance* (*Short Form*) (Velicer et al. 1985) was used to assess the participant's rating of the pros versus the cons of smoking cessation at each time point. *Importance, confidence, and readiness* were measured for both patch use and smoking cessation using a 0–10 cm visual analogue scale on which participants marked their importance, confidence, and readiness for each construct using a slash mark on the horizontal ruler.

Since previous studies have shown that mental health and substance abuse problems could moderate or mediate outcomes, we screened for major Axis I disorders such as Major Depression, Anxiety Disorders, Alcohol Dependence, and Drug Dependence using the self-report World Health Organization *Composite International Diagnostic Interview Short Form* (*CIDI-SF*, WHO 1998), which has excellent psychometric properties and correlates well with lengthier semi-structured interviews (Kessler et al. 2003). An additional measure of depression widely used in HIV positive samples is the Centers for Epidemiological Studies Depression

Form (CES-D), which has sound psychometric properties and produces a reliable and valid score; scores over 16 are considered likely cases of current depression (Radloff 1977). A brief drug history and the *Alcohol Use Disorders Identification Test* (*AUDIT*,Bohn et al. 1995) provided information on drug and alcohol use history and severity. These mental health and substance abuse instruments were administered only at baseline for use as predictors of outcome and treatment effects.

Data Analyses

Means, standard deviations, and frequencies were used respectively to describe continuous and discrete demographic and smoking characteristics of the sample, and χ^2 and *t*-tests were used to compare the two conditions on baseline characteristics. Group differences in outcomes were analyzed using χ^2 and *t*-tests. Among the entire sample, changes in the primary outcome (CO level at 3M), associated smoking behaviors, patch use, nicotine dependence, cessation side effects, readiness, self-efficacy, decisional balance, and stages and processes of change were assessed by comparing baseline to 3-month follow-up using χ^2 tests and paired *t*-tests (Table 1). A secondary goal of the study was to identify possible mechanisms of action of the interventions. To assess whether patch use was related to reported nonsmoking days at the 3-month follow-up, we used correlation analysis. We also examined baseline CPD and confidence in positive affect, negative affect, and habit situations (clarify) as potential explanatory variables in a multivariate logistic regression model of nonsmoker status at 3 months.

Results

Baseline Characteristics of the Sample

Of the 40 participants who completed the baseline assessment, 35 (87.5%) also completed the 3-month follow-up. Participants had an average of more than two health conditions, including HIV. The mean CES-D Score of 19.45 (SD 13.52), indicated that the sample on average was experiencing moderate symptoms of depression. Drinking and drug use were common in the sample, but this group was not likely alcohol dependent, and on average, drank or used drugs on fewer than 6 days per 30.

Participants smoked nearly a pack of cigarettes per day, with an average of 17.3 CPD at study entry. Most participants (85%) were daily smokers and had tried to quit seven times previously on average. The mean CO level expired by participants at baseline was 15.05, indicating current daily smoking. At the time of their baseline assessment, they reported they had last smoked a cigarette 2.6 h ago (SD 5.5). The mean Fagerstrom nicotine dependence score was 4.98 out of 10, indicating moderate nicotine dependence. The mean withdrawal score was 13.3 out of 27, indicating mild nicotine withdrawal symptoms. Table 2 provides further detail and other smoking characteristics.

Regarding motivation to quit smoking at baseline, the majority of participants (62%) was in the preparation stage of change, and the remainder of the sample (38%) was in the contemplation stage (See Prochaska and DiClemente 1983 for a discussion of the stages of change). This indicates that all participants at study entry were considering quitting or preparing to quit in the next month prior to the intervention but that no participant had already quit. The mean score on the smoking decisional balance—pros scale was 8.85 out of 10, and the mean score on the decisional balance—cons scale was 8.69. The similarity of the decisional balance scores suggests that these participants were truly ambivalent about smoking cessation at baseline. Participants reported that quitting smoking and using the patch were important to them, rating importance a 9 out of 10 on both scales. Participants felt more confident and ready

to use the patch than confident or ready to quit, with higher confidence and readiness reported for patch use (8.0 and 7.5, respectively) as compared to cessation (6.0 and 7.0, respectively).

Baseline characteristics of the two intervention groups were examined to ascertain the success of randomization in equating the groups. Most of these variables were equivalent across the intervention and control groups; however, the groups differed on pulse rate, with the SGC participants having an average pulse rate of 84.4 (SD 14.7) compared to a mean pulse rate of 73.9 (11.2) among MI plus Patch participants, a significant difference ($t_{(36)} = 2.51$, $P < .02$). However, there is no reason to expect that this difference would lead either group to respond differentially to MI or SGC conditions.

Feasibility

The study took 19 months to complete, including a 1-month start-up period used to explain the study to ID clinic providers and potential referring clinicians, and to advertise the study to patients via flyers. Active recruiting occurred over a 14-month period, with 4 months used to collect final follow-up data from those last enrolled. Thus, we accrued participants at a rate of 2.9 per month. Most enrollments resulted from the participant calling the study team after seeing a flyer, but a few were generated by clinician referral. Commonly, participants enrolled after speaking with a study team member in the waiting room of the ID clinic. Face-to-face contact seemed to enhance the likelihood of the participant pursuing enrollment in the study. Participants reported enjoying the study and that they would refer friends for it. Participants were paid up to $60 in gift cards for their participation over the course of the 3-month study as compensation for time spent.

Outcomes

In this small sample, we found no group differences between the two motivational treatment conditions in primary outcomes of CO level at 3 months, CPD, and or percent smoking days. Because neither baseline characteristics nor smoking outcomes differed by treatment group, groups were combined and the whole sample was used for all subsequent analyses. These analyses revealed changes at 3 months compared to baseline in the primary outcome of CO, associated smoking behaviors, patch use, nicotine dependence, cessation side effects, readiness, self-efficacy, decisional balance, and stages and processes of change (see Table 2). Specifically, mean CO level fell from 15.05 at baseline to 10.9 at 3-month follow-up, a statistically significant difference, and the proportion of nonsmokers (those with biochemically verified abstinence of CO less than 3 ppm) increased from 2.5% at baseline to 22.5% ($n = 9$) at 3 months, while the proportion of daily smokers (those with CO greater than 8 ppm) declined from 80% to 57.5%. While this difference was not statistically significant, it is clinically notable. Cigarettes per day declined from 17.3 at baseline to 6.2 at follow-up, and percent smoking days calculated from TLFB data declined from 98.7% to 57.9% from baseline to 3-month follow-up.

Statistically significant changes were also observed in the Fagerstrom dependence scores, with scores declining from 5 to 3.8, and in Decisional Balance Pros of smoking score, with scores declining from 8.9 to 6.7. There were some statistically significant changes in the processes of change over time. All processes of change (except Reinforcement Management) increased, but only Self-Reevaluation, Dramatic Relief, the use of Helping Relationships, and the use of Counter-Conditioning increased to a statistically significant extent.

Participants under-utilized the nicotine patch. At the first follow-up, during which participants reported behavior for the month following the intervention session, and during which all participants were prescribed a full month of patches, the average percent of patch use days was only 62.7% (SD 31.3%). At the 3-month follow-up, patch use occurred on only 37% (SD

30.3%) of prescribed days. Given that few participants achieved smoking cessation, but many achieved reduction, we assessed whether the rate of patch use was related to the primary outcome, CO level at the 3-month follow-up, or to CPD and percent of smoking days at the 3-month follow-up in a correlation analysis. Patch use rate at the 1-month follow-up was not related to CO level, CPD, or percent of smoking days at three months, with a Pearson correlation coefficients of −.04, $P = .84$,−.22, $P = .20$, and −.25, $P = .13$, respectively.

Patch use was also unrelated to achieving nonsmoking days.

To explore possible mechanisms of action of the intervention, we considered additional possible groups of explanatory variables. Three psychological variables were correlated with outcome CO level. Confidence to avoid smoking in positive affect situations correlated −.50 ($P < .01$) with outcome CO, while confidence to avoid smoking in negative affect situations correlated −.56 ($P < .01$). Similarly, confidence to avoid smoking in habitual situations correlated −.42, ($P < .05$). We conducted a logistic regression analysis of the probability of being a nonsmoker at 3 months considering CPD and the three psychological variables as explanatory factors. The model was significant, (Likelihood Ratio $\chi^2 = 7.39$, $P < .03$) and Confidence to avoid smoking in positive affect situations was the only significant independent predictor, with an OR of 2.07 (95% confidence interval 1.05–4.11) (see Table 2).

Discussion

This study demonstrated that motivationally based behavioral interventions combined with nicotine replacement patches were acceptable, feasible, and show promising outcomes for HIV positive patients. Both interventions led to significant reductions in CPD and CO expiration at 3-month follow-up among people with HIV. Nine of 40 were bio-chemically confirmed (CO < 3 ppm) quitters at 3-month follow-up, while an additional eight achieved between 3 ppm and 8 ppm on expired CO, consistent with occasional smoking. These reductions in cigarette smoking and CO levels at 3-month follow-up are superior to no intervention, as well as behavioral interventions without medication, which yield quit rates of 3–18% (Feenstra et al. 2005; Sutton and Gilbert 2007) and are comparable to studies of NRT with and without behavioral intervention components that yield quit rates of 22–28% in general populations (Cummings and Hyland 2005). We observed low rates of attrition and positive comments from research participants, regardless of assigned condition, suggesting that participants liked both interventions and the process of being in the study. However, we enrolled only 2.9 participants per month, suggesting that it is difficult to interest smokers with HIV in a smoking intervention and that additional outreach and motivational efforts may be needed to reach those who are not yet considering quitting.

We expected that the motivational interviewing counseling condition would be superior to the self-guided reading condition, but both interventions were equally useful. The two interventions had many similarities including information provision and building of motivation through exercises. This raises the question of whether the behavioral interventions added to the efficacy of nicotine replacement therapy. In general, NRT doubles quit rates compared to no treatment or placebo, and is recommended for all smokers (Fiore 2000). NRT combined with behavioral treatments, even brief ones, is more effective than NRT alone (Ingersoll and Cohen 2005). Additionally, given the poor adherence to NRT in this study, at least some of the observed change was likely due to the motivational interventions. Taken together, our findings suggest that motivational interventions with NRT can increase the number of HIV positive smokers who reduce and quit smoking, and that both intervention components may be needed to achieve this effect. Identifying the precursors of successful outcomes can help to isolate effective intervention components. In this study, few markers were predictors of outcome, although baseline CPD was related to outcome, as was confidence in one’s ability to

avoid smoking in positive but not negative affect situations, which doubled the odds of smoking cessation. Many previous studies have documented the impact of self-efficacy, or confidence to implement a particular behavior change (Bandura 1977) on subsequent changes in smoking (Amodei and Lamb 2005; Schumann et al. 2005; O'Hea et al. 2004). Interestingly, baseline confidence in smoking cessation or in patch use were unrelated to outcome. Whether motivational interventions should target specific types of challenging situations that may lead to smoking relapse among people with HIV remains an open question.

Major strengths of this study are that it targeted a population in need and gathered detailed information on smoking and quitting processes. We must also note that in our study, we used a more recent, but stricter definition of abstinence, CO breath levels of less than 3 ppm (Cropsey et al. 2006). Many previous studies of smoking cessation have classified those with (9 ppm CO as nonsmokers (Aubin et al. 2004; Uyar et al. 2007; West et al. 2005). Therefore, our results are *more* conservative, and our success rate may not be comparable to that in older studies due to these definitional differences.

This study has several important limitations. This sample of HIV positive smokers was small, and thus the power to detect group differences and our ability to determine efficacy of the interventions is limited. Both interventions may be promising, but one may indeed be superior when tested in a larger sample. Another limitation was the high rate of poor adherence to nicotine replacement patches (appropriate use on 63% of days at 1-month follow-up for the overall sample). Even though patch use rate was unrelated to outcome, most participants failed to use the patch adequately, and this may have limited or even counteracted the efficacy of the intervention. We enrolled only participants who expressed interest in reducing or quitting smoking, resulting in recruitment of a sample that was more ready to change than some others, and thus, possibly not representative of all smokers in HIV care. Even given their readiness to change, the fact that over half continued to smoke (although at significantly reduced levels) indicates that work remains to achieve optimal health-related benefits. Lastly, we observed participants only through a 3-month follow-up. A longer follow-up period is needed to determine whether motivational interventions plus NRT result in maintenance of smoking cessation among HIV positive smokers.

A clinical and empirical question that arises from this study is how to motivate HIV positive smokers to use the patch or other nicotine replacement therapy adequately and thereby enhance cessation outcomes. This threat to intervention efficacy has been noted previously. Alterman et al. (1999) found that only 55% of general smoking treatment participants used the patch as prescribed, and that at the group level, patch use was related to outcomes. Similarly, Cooper et al. (2004) found that patch use was associated with better treatment participation and cessation outcomes, and that perfect adherence occurred in only one-third of participants. Likewise, adherence problems have been noted among HIV patients in other areas as well (Ingersoll 2004; Ingersoll and Heckman 2005). Smoking interventions should probably contain NRT adherence-enhancing components. It is possible that SGC materials are adequate to motivate a quit attempt, and that the more intensive MI counseling could be used to help motivate adequate use of nicotine replacement treatment rather than to address smoking per se. It is also possible that a booster session to address patch adherence could be helpful.

Overall, this pilot study showed that two variants of a combination motivational plus nicotine replacement intervention had beneficial effects among HIV positive smokers and resulted in 22.5% of participants quitting smoking by strict criteria. It is quite promising from a harm reduction perspective that 43.5% were classified as either nonsmokers or occasional smokers by 3 months, especially given that participants were recruited based on a willingness to consider reducing (not necessarily quitting) smoking. A recent review suggests that there may be some health benefits to reduced tobacco consumption (Pisinger and Godtfredsen 2007).

Additionally, most smokers are interested in gradual versus abrupt cessation (Hughes et al. 2007), and reduction may be a step along the road to quitting (Hughes and Carpenter 2006), particularly if self-efficacy can be enhanced. Therefore, while smoking cessation was not achieved for most participants, these results suggest that tailored smoking interventions for people with HIV can be helpful.

Future studies should consider enhancements to tailor smoking cessation interventions further for people with HIV such as by addressing HIV specific stressors (e.g., stigma, other substance use, SES), and should extend their sample to include those without plans or intentions to reduce or quit smoking. Interventions with both motivational and NRT components should be studied further, and should include components that encourage some smoke-free days, increase self-efficacy, and attend to adherence to nicotine replacement treatment. Adaptations of MI and SCG interventions appear promising when combined with pharmacotherapy for HIV positive smokers.

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Table 1

Baseline, and 3M smoking characteristics and changes from baseline to 3M

Continuous variables	**Baseline mean (SD)**	**3M mean (SD)**	**Paired *t*-test**	**Categorical variables**	**Baseline n and proportion**	**3M *n* and proportion**	χ^2
Cigarettes per day from TLFB	17.3 (10.6)	6.2 (5.9)	$t_{(34)} = 7.15^{**}$	Abstinent	1 (2.5%)	9 (22.5%)	ns
				Irregular smoking	7 (17.5%)	8 (20%)	
				Daily smoking	32 (80%)	23 (57.5%)	
Percent smoking days	98.7 (.04)	57.9% (37.3)	$t_{(34)} = 6.27^{**}$	Precontemplation	0	2 (5.7%)	ns
				Contemplation	15 (37.5%)	9 (25.8%)	
				Preparation	25 (62.5%)	15 (42.9%)	
				Action	0	9 (25.7%)	
Last smoked in hours	2.62 (5.5)	245.8 (629.5)	$t_{(34)} = 5.29^{**}$	Nonsmoking days on TLFB	6 (815%)	26 (74.3%)	ns
CO level	15.05 (8.38)	10.9 (6.1)	$t_{(34)} = 2.76^{**}$				
Pulse rate	78.87 (13.88)	80.91 (13.04)	ns				
Forced expiratory volume	14.07 (41.23)	1.99 (.93)	ns				
Fagerstrom dependence score	5.0 (2.3)	3.8 (2.3)	$t_{(31)} = 2.91^{**}$				
Minnesota withdrawal score	13.3 (7.8)	11.5 (8.6)	ns				
Decisional balance pros score	8.9 (3.0)	6.7 (3.4)	$t_{(32)} = 4.23^{**}$				
Decisional balance cons score	8.7 (3.2)	9.1 (3.4)	ns				
Confidence: positive affect	8.9 (3.8)	9.3 (3.6)	ns				
Confidence negative affect	8.2 (4.1)	8.1 (3.9)	ns				
Confidence habit	8.6 (3.5)	9.2 (3.6)	ns				
Temptation: positive affect	10.9 (2.5)	8.9 (4.0)	$t_{(34)} = 2.97^{**}$				
Temptation negative affect	12.3 (2.8)	9.4 (3.9)	$t_{(34)} = 4.82^{**}$				
Temptation habit	10.9 (3.3)	8.2 (3.4)	$t_{(34)} = 3.65^{**}$				
Importance of quitting smoking	9.0 (1.6)	9.1 (1.5)	ns				
Confidence in quitting smoking	6.2 (2.5)	7.0 (2.8)	ns				
Readiness to quit smoking	7.0 (1.9)	7.1 (2.8)	ns				
Importance of using patch	9.0 (1.7)	8.3 (2.4)	ns				
Confidence to use nicotine patch	7.9 (2.3)	7.0 (2.8)	ns				

Continuous variables	Baseline mean (SD)	3M mean (SD)	Paired *t*-test	Categorical variables	Baseline n and proportion	3M *n* and proportion	χ^2
Readiness to use nicotine patch	7.6 (2.0)	7.1 (2.8)	ns				
Consciousness raising	5.7 (2.2)	7.3 (2.9)	ns				
Environmental re-evaluation	5.6 (2.8)	6.4 (2.6)	ns				
Self re-evaluation	5.5 (2.2)	6.7 (2.1)	$t_{(31)} = 2.78^{**}$				
Social liberation	6.8 (2.3)	7.3 (2.4)	ns				
Dramatic relief	4.3 (1.8)	5.9 (2.6)	$t_{(32)} = 3.91^{**}$				
Helping relationships	4.2 (2.4)	5.8 (2.9)	$t_{(31)} = 3.94^{**}$				
Self liberation	6.5 (1.9)	6.8 (2.1)	ns				
Counter conditioning	3.7 (1.7)	5.6 (2.0)	$t_{(32)} = 5.23^{**}$				
Reinforcement management	4.7 (2.7)	4.6 (2.7)	ns				
Stimulus control	3.0 (1.8)	4.1 (2.7)	$t_{(31)} = 2.43^{*}$				

* $P < .05$;

** $P < .01$

Table 2

Multiple logistic regression model of achieving nonsmoker status (CO level < 3 ppm) at 3 months

Variable	β	Standard error	Odds ratio	95% confidence interval	Wald χ^2 test
Intercept	−4.67	2.01			5.36*
Baseline confidence to avoid smoking in positive affect situations	.73	.35	2.07	1.05–4.11	4.35*
Baseline confidence to avoid smoking in negative affect situations	−.44	.26	.65	.39–1.08	2.79 ns

* $P < .05$