



Contents lists available at ScienceDirect

Behaviour Research and Therapy

journal homepage: www.elsevier.com/locate/brat

Do counselor techniques predict quitting during smoking cessation treatment? A component analysis of telephone-delivered Acceptance and Commitment Therapy

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ARTICLE INFO

Article history:

Received 7 November 2013

Received in revised form

11 July 2014

Accepted 17 July 2014

Available online xxx

Keywords:

Acceptance and Commitment Therapy

Tobacco

Quitline counseling

Treatment components

Adherence coding

Therapist behavior

ABSTRACT

No studies to date have examined the effect of counselor techniques on smoking cessation over the course of treatment. To address this gap, we examined the degree to which the use of specific Acceptance and Commitment Therapy (ACT) counseling techniques in a given session predicted smoking cessation reported at the next session. The data came from the ACT arm of a randomized controlled trial of a telephone-delivered smoking cessation intervention. Trained raters coded 139 counseling sessions across 44 participants. The openness, awareness and activation components of the ACT model were rated for each telephone counseling session. Multilevel logistic regression models were used to estimate the predictive relationship between each component during any given telephone session and smoking cessation at the following telephone session. For every 1-unit increase in counselors' use of openness and awareness techniques there were 42% and 52% decreases in the odds of smoking at the next counseling session, respectively. However, there was no significant predictive relationship between counselors' use of activation techniques and smoking cessation. Overall, results highlight the theoretical and clinical value of examining therapists' techniques as predictors of outcome during the course of treatment.

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With 42 million cigarette smokers in the US (US Department of Health and Human Services, 2014), and 1.2 billion smokers worldwide (Mackay, Eriksen, & Shafey, 2006), smoking related deaths currently top 5 million per year, with a projected doubling to 10 million by 2025 (Hatsukami, Stead, & Gupta, 2008). The development of effective behavioral interventions to address tobacco addiction is thus a major public health need. Unfortunately, although there has been considerable innovation in pharmacotherapeutic interventions for smoking cessation over the past 25 years, behavioral interventions have seen little change during this time (Mottillo et al., 2009). Moreover, studies show that across different modalities of delivery, behavioral interventions help only 20% of smokers quit smoking (Lancaster & Stead, 2005; Stead & Lancaster, 2005; Stead, Perera, & Lancaster, 2006). Thus, innovations in behavioral interventions for smoking cessation are long overdue. One way to innovate is to investigate process-level predictors of treatment outcome in order to learn which

processes hold promise for improving quit rates (e.g., Kazdin, 2007; Murphy, Cooper, Hollon, & Fairburn, 2009; Paul, 1969).

To date, the analyses of process-level predictors have focused on the study of *participant*-level processes. For example, in the smoking cessation literature, studies have shown that quit smoking outcomes were mediated by individuals' self-reported self-efficacy (e.g., Bricker, Liu, et al., 2010), cravings and positive affect (e.g., Bolt, Piper, Theobald, & Baker, 2012; McCarthy et al., 2008). Another study found that quitline counseling had an effect on smoking abstinence by increasing individuals' confidence and reducing perceived difficulty quitting (McCarthy et al., 2010). While valuable to the field, the critical limitation of this approach is that it leaves out the role of an important manipulable variable on treatment outcomes — variations in *counselor*-level processes. Variations in counselor-level processes are typically ignored in the analysis of randomized controlled trials that use manual-guided interventions. Therefore examining co-variation between the level of use of counselor strategies and treatment outcomes could be of great value for treatment development purposes.

With a few exceptions (e.g., Calero-Elvira, Froján-Parga, Ruiz-Sancho, & Alpañés-Freitag, 2013), process analysis of counselor-level behavior are rare in the cognitive behavioral literature.

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A notable exception is counselor-level process analyses of Motivational Interviewing (MI). For example, observer ratings of MI counselor techniques predicted relevant client behaviors (e.g., change talk) in alcohol (Glynn & Moyers, 2010), pathological gambling (Hodgins, Ching, & McEwen, 2009), illicit drug use (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003), cocaine dependence (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008) and smoking cessation interventions (Boardman, Catley, Grobe, Little, & Ahluwalia, 2006; Catley et al., 2006).

Although the degree of use of some therapeutic techniques has been directly linked with some treatment outcomes (e.g., McCambridge, Day, Thomas, & Strang, 2011), no study to date examined smoking cessation as the treatment outcome. Furthermore, to our knowledge there have been no counselor-level process analyses of Acceptance and Commitment Therapy (ACT) —an innovative intervention with the promise of improving quit rates of smoking cessation programs. ACT is a transdiagnostic model that has been utilized in a variety of populations (e.g., Bach & Hayes, 2002; Lillis, Hayes, Bunting, & Masuda, 2009; Luoma, Kohlenberg, Hayes, & Fletcher, 2012), including in the treatment of tobacco addiction (Bricker, Mann, Marek, Liu, & Peterson, 2010; Bricker, Wyszynski, Comstock, & Heffner, 2013; Gifford et al., 2004, 2011). ACT aims to increase psychological flexibility by providing clients with tools to identify their core values and strengthen their ability to experience uncomfortable thoughts, feelings and physical sensations while engaging in values-driven behaviors.

In order to foster psychological flexibility, ACT interventions are designed to include techniques targeted at the following six processes: acceptance, defusion, present moment awareness, self-as-context, values and commitment. Acceptance and defusion techniques are conceptualized as the “openness” component; present moment and self-as-context as the “awareness” component; and finally, values and commitment as the “activation” component. This tripartite categorization has been described as the “open, aware and active” framework (Hayes, Villatte, Levin, & Hildebrandt, 2011). Table 1 includes a brief description of these processes, although a more detailed account of them can be found elsewhere (see, for example, Hayes, Strosahl, & Wilson, 2011).

In a previous issue of this journal, Hesser, Westin, Hayes, and Andersson (2009) examined the content of participants' verbal statements while receiving an Acceptance and Commitment Therapy (ACT) intervention for tinnitus. Participants' statements were coded to examine the degree to which they represented two core processes in ACT: willingness to experience the natural flow of thoughts, feelings and physical sensations (acceptance) and the ability to recognize thoughts and images as just words and pictures (defusion) and not as external events (Hayes, Strosahl, & Wilson,

2011). The authors found that the extent to which participants made acceptance and defusion statements during therapy predicted long term improvements in distress and functional impairment due to tinnitus. As pointed out by Hesser et al. (2009), a key limitation of this study was that it did not account for what elements of the intervention might have influenced those verbal statements, suggesting that future studies should examine the role of counseling techniques as agents of treatment outcome. A second limitation to this study was that it targeted a limited range of ACT processes, since it focused on the openness component but omitted both the awareness (also known as mindfulness) and activation components of ACT.

In summary, although previous work in the MI literature has examined treatment components of behavioral interventions for addiction, there is a gap in the MI and ACT literature on the predictive role of counselor behaviors with regards to smoking cessation outcomes. The current study addresses this gap by examining specific ACT counseling techniques as predictors of between-session smoking cessation. Consistent with ACT's theoretical model, we hypothesize that higher levels of counselor use of openness, awareness and activation components of ACT prospectively predict lower probabilities of smoking at the following counseling session. According to the ACT model these three treatment components should jointly influence treatment outcomes, so we do not hypothesize specific ordering effects of such components. By examining these questions, this study will advance our understanding of the counselor-level processes of change in behavioral interventions for smoking cessation.

Method

Overview of parent trial and participants

The aim of the parent trial was to test the effectiveness of two telephone-delivered interventions for smoking cessation (ACT vs. standard telephone quitline counseling), each delivered in combination with Nicotine Replacement Therapy (NRT), in a two-arm randomized controlled pilot trial. Results of this pilot trial showed that the ACT intervention was feasible, more acceptable and had promising smoking cessation outcomes as compared to standard quitline counseling (Bricker, Bush, Zbikowski, Mercer, & Heffner, 2014). After informed consent, participants were randomized to each treatment condition using a stratified procedure that made assignments based on quit attempts in the past 12 months (yes/no) and smoking within the first 5 min of waking (yes/no). Participants were uninsured callers to the South Carolina State Quitline (SCSQL). Having a sample of uninsured SCSQL callers achieved the study goal of including a significant fraction of African Americans and individuals with lower socio-economic status. Both subgroups are important because of their historically low quit rates. The SCSQL is operated by Alere, a US-based company that provides smoking cessation services for 28 state quitlines.

Inclusion criteria: (a) 18 years of age or older, (b) daily smoking for at least the past 12 months, (c) desire to quit smoking in the following 30 days, (d) able to speak and read in English, (e) medically eligible to receive NRT, (e) not participating in other smoking cessation treatments. Among the 59 participants randomized to the ACT condition, 51 (86%) participated in any calls, and 44 (75%) had more than one call (which was required for this predictive session-to-session analysis). These telephone counseling participation rates are at least as good as those of other quit smoking counseling interventions (Stead, Hartmann-Boyce, Perera, & Lancaster, 2013). All 44 participants with more than one call were eligible for the session-to-session analyses of the study. These participants had a total of 139 calls. Table 2 presents descriptive data for the sample.

Table 1
Description of ACT components and processes.

Components	Processes	Description
Openness	Acceptance	Willingness to experience urges, emotions, and thoughts as they are and without any intent to change them.
	Defusion	Recognizing thoughts, self-judgments, images, and memories as just words and pictures.
Awareness	Present moment	Observation and non-judgmental description of current thoughts, feelings, sensations or other events.
	Self-as-context	A sense of self that is flexible and distinct from the content of one's thoughts, feelings and sensations.
Activation	Values	Chosen life directions that guide actions.
	Commitment	Engagement in activities consistent with chosen values.

Table 2
Demographic characteristics and smoking history of the sample ($N = 44$).^a

	Statistic
Age, mean (<i>SD</i>)	40.6 (9.6)
Female	65.9%
Race and Ethnicity	
White	77.3%
Black	20.5%
Hispanic or Latino	2.3%
Socio-economic status	
Unemployed	59.1%
Less than a college degree	54.6%
Smoking history	
Partner smokes	45.5%
Smoked 21 or more cigarettes per day	47.7%
Attempted to quit within the past year	54.5%
Smoked for more than 10 years	79.5%

^a Note. *SD* = Standard deviation.

All study procedures were approved by the Institutional Review Board of the Fred Hutchinson Cancer Research Center.

Intervention

The ACT intervention was a five-session telephone-delivered smoking cessation protocol developed by the senior author (JB). The first session had a duration of 30 min, followed by four sessions of 15 min each. Sessions were provided on a weekly basis. The target quit date was flexible, but participants were encouraged to select a date within the planned 5-week treatment period. The length and duration of the ACT intervention matched that of the standard telephone quitline counseling comparison group. Each session included development of a committed action plan and the use of acceptance techniques, while the remainder of the ACT processes (i.e. values, defusion, present moment, and self-as-context) were the primary focus of one particular session. Counselors were instructed to flexibly apply the protocol so that each session could contain components from other sessions. The goal of allowing this flexibility was to strengthen and consolidate participants' learning, to allow tailoring of content to the participant, and to encourage a holistic (vs. compartmentalized) approach to intervention delivery.

Participants received a 2-week course of the nicotine patch, which was the standard procedure of the South Carolina State Quitlines at the time of trial enrollment.

Counselors

Counselors were three masters-level female therapists with at least 3 years of clinical experience. Their average age was 45 years old. All counselors received 100 h of didactic training and were supervised by a licensed clinical psychologist who is an expert ACT trainer.

Adherence coding of ACT components

Previous research has shown that ACT can be delivered with fidelity as a brief telephone intervention (Schimmel-Bristow, Bricker, & Comstock, 2012). One hundred percent of all 139 calls were coded, and a 20% random sample were coded by two raters to determine inter-rater reliability. Raters used the ACT Adherence Rater's Manual (Bricker & Hayes, 2009), which has Cronbach α 's that range from .72 to .99. For this study, adherence coding was conducted by two bachelors-level raters who were trained and supervised by a licensed clinical psychologist with 15 years of expertise in ACT and behavioral analytic research. In order to

reduce rater drift, calibration meetings were conducted monthly during the rating process.

The two raters independently coded the extent to which each treatment component was addressed during each ACT counseling telephone session. Each counseling telephone session was rated on a 5-point Likert scale. Ratings were behaviorally anchored to reflect the extent to which therapists covered acceptance, defusion, present moment, self-as-context, values and commitment skills. A rating of 1 indicated that "the variable never explicitly occurred," a rating of 2 that "The variable was addressed by the counselor in a superficial manner," a rating of 3 that "The variable was addressed by the counselor in a mildly in-depth manner," a rating of 4 that "The variable was addressed by the counselor in a moderately in-depth manner," and a rating of 5 that "The variable was addressed by the counselor in a very in-depth manner." Raters were instructed to code only counselors' verbal behavior and to start each section with a rating of 1 rather than at the midpoint.

Each of the three ACT treatment components (openness, awareness, and activation) were calculated by summing ratings from its two sub-components, rated on the original 5-point scale. Thus, component scores ranged from 2 to 10. Inter-rater reliability was calculated using intraclass correlation coefficients of the form ICC (3,1) (Shrout & Fleiss, 1979), and interpreted using Cicchetti (1994) standards: "poor" (below .40), "fair" (between .40 and .59), "good" (between .60 and .74), and "excellent" (between .75 and 1.00). The *openness* component included techniques to help individuals be open to their thoughts, feelings and physical sensations and was calculated by summing acceptance and defusion ratings. The *awareness* component included therapists' use of techniques to help individuals be aware of their thoughts, feelings and physical sensations without reacting to them and adopt a more flexible sense of self (also known as mindfulness) and it was calculated by aggregating self-as-context and present moment awareness ratings. Finally, the *activation* component included therapists' use of techniques to help individuals articulate their personal values and encourage them to take actions towards quitting smoking. This component was calculated by aggregating values and commitment ratings. ICCs were .91 (95% CI = .83, .95) for the openness component, .98 (95% CI = .97, .99) for the awareness component and .94 (95% CI = .88, .97) for the activation component, overall indicating excellent agreement between the two raters.

Outcome measures

Smoking cessation and number of cigarettes per day

At the beginning of each call, the participant reported to the counselor their number of cigarettes smoked during the past 7 days. The counselor recorded that number into a study database. Given that the study outcome was smoking cessation, this number was recoded as a binary outcome (i.e., smoked or not smoked). Self-report of smoking status (i.e., 7-day point prevalence abstinence) is a commonly used indicator of behavior change in smoking cessation trials (Fiore, Jaén, & Baker, 2008) that minimizes recall bias (i.e., participants are more likely to remember whether they smoked at all rather than the exact number of cigarettes they smoked). While there was no biochemical verification of smoking status, the literature suggests that false reporting of smoking status is minimal for low-intensity interventions with no face-to-face contact (Patrick et al., 1994).

Baseline cigarettes per day

Baseline smoking data were gathered during the intake survey. Participants reported their smoking levels based on four categories: 10 or less cigarettes, 11–20 cigarettes, 21–30 cigarettes, or 31 or more cigarettes.

Data analytic strategy

Following the “open, aware and active” framework of ACT (Hayes, Villatte, et al., 2011), our goal was to examine the extent to which each treatment component prospectively predicted smoking cessation over the course of treatment. Accordingly, our analytic strategy was to examine how much the extent of use of each of the treatment components described above in any given counseling session (Component_t) was prospectively associated with the likelihood that participants had achieved smoking abstinence in the next counseling session (Smoking Status_{t+1}).

To account for the repeated measures within subjects, we utilized a logistic regression with random intercepts (Gelman & Hill, 2007). Our regression models adjusted for all ACT components, baseline levels of smoking, and for number of cigarettes smoked per day at the current counseling session. To rule out the potential cumulative effects of participants' exposure to ACT techniques from previous calls, we also adjusted for number of counseling sessions. Our adjusted model was of the form.

$$\begin{aligned} \text{logit}(\text{Pr}[\text{Next session smoking status}_{it+1}]) \\ = \beta_0 + \beta_1 \text{Openness}_t + \beta_2 \text{Awareness}_t + \beta_3 \text{Activation}_t \\ + \beta_4 \text{Baseline smoking} + \beta_5 \text{Smoking levels}_t \\ + \beta_5 \text{Number of calls}_t + \varepsilon_{it} + \mu_i \end{aligned} \quad (1)$$

where *i* indexes individuals and *t* measurement occasion. A second set of analyses was conducted to examine the effect of each component without adjusting for baseline levels of smoking, number of cigarettes smoked per day at the previous counseling session, and number of counseling calls. These unadjusted models have been recommended in the literature (Austin, Manca, Zwarenstein, Juurlink, & Stanbrook, 2010). Statistical significance was set at the $\alpha = .05$ level. Regression models were conducted with the lme4 package (Bates, Maechler, & Bolker, 2011) and graphics with the rmeta (Lumley, 2012) and ggplot2 packages (Wickham, 2009) in R-3.0.1 (R Core Team, 2013).

Results

Counselors conducted a total of 139 calls. The average number of counseling sessions per person was 3.2, each with an average duration of 23.6 min. All adherence ratings were on a 10-point scale. The openness component had an average extensiveness rating of 7.2 (SD = 1.6), the awareness component an average rating of 5.8 (SD = 2.2), and the activation component an average rating of 8.1 (SD = 1.7). For the activation component 47.5% of ratings were 8 or above. Visual inspection of histograms (see Fig. 1) confirmed that as compared to the other variables, the activation component had low variability and a negatively skewed distribution.

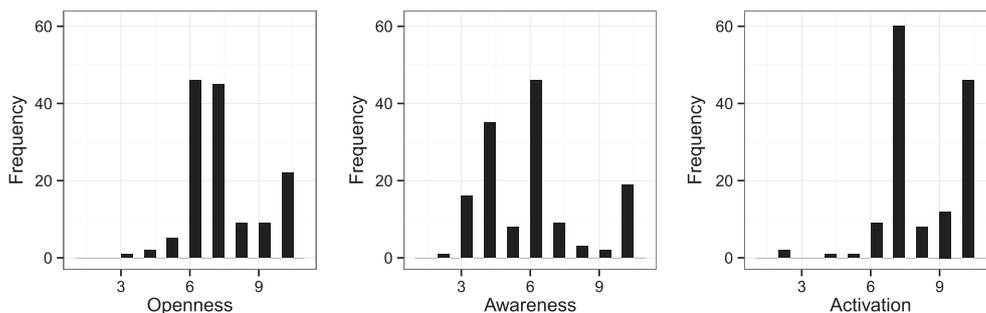


Fig. 1. Histograms of adherence ratings to each ACT treatment component.

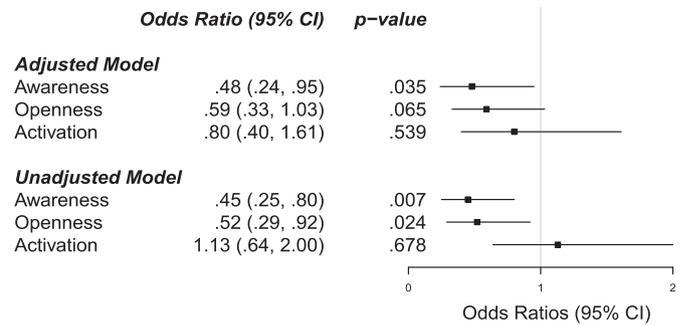


Fig. 2. Odds of not smoking by the next counseling session with and without adjusting for baseline smoking, cigarettes per day at the current counseling session, and number of counseling sessions.

Our regression model indicated that a 1-unit increase in counselors' use of exercises to promote awareness predicted a 52% lower odds of smoking at the following counseling session (OR = .482; 95% CI = .238, .977; *p* = .043). Similarly, a 1-unit increase in counselors' use of openness techniques in one session predicted a non-significant trend of 42% lower odds of smoking at the following counseling session (OR = .585; 95% CI = .338, 1.011; *p* = .055). Finally, the extent of use of activation techniques did not significantly predict smoking at the following counseling session (OR = .804; 95% CI = .362, 1.784; *p* = .592). The results of the unadjusted model were consistent with the main model, but in this case, both openness (OR = .515; 95% CI = .31, .855; *p* = .01) and awareness (OR = .447; 95% CI = .27, .742; *p* = .002) reached statistical significance, and the activation component remained non-significant (OR = 1.129; 95% CI = .599, 2.13; *p* = .707). Fig. 2 presents a summary of these findings and the results of the unadjusted model.

Discussion

Process analyses of counselor-level behavior are rare in the cognitive behavioral literature, and no studies to date have examined the effect of counselor techniques on smoking cessation over the course of treatment. To address this gap, the study examined the degree to which specific ACT counseling techniques prospectively predicted smoking cessation at the subsequent counseling session. Mostly supporting our hypothesis, counselors' use of awareness and openness (at a trend level) techniques prospectively predicted smoking cessation at the following counseling session. In contrast, activation techniques did not contribute significantly to the odds of being abstinent from smoking. Finally, the magnitude and direction of our estimates were robust to the adjustment of number of cigarettes smoked the prior week, baseline levels of

smoking, and number of ACT counseling sessions. The persistence of these predictive patterns reflects on the importance of the counselor-level processes examined in this study.

This study is the first to investigate the direct role of key modifiable variables, such as the use of counseling techniques, on smoking cessation during the course of treatment. Previous studies only targeted the content of participants' statements (e.g., Amrhein et al., 2003) or the effect of therapists' techniques on clients' statements (e.g., Boardman et al., 2006). In addition, this study builds upon the results of a previous study published in this journal (Hesser et al., 2009) by exploring the full range of processes of change proposed by the ACT model, and by prospectively focusing on a fine-grained analysis of counselor-level session-to-session components and participant outcomes. Furthermore, as discussed by others (Forman et al., 2012; Hesser et al., 2009), overreliance on global self-report measures to assess processes of change limits our ability to understand key factors responsible for behavior change, and therefore this study adds to the growing body of literature examining the role of adherence to counseling techniques in behavior change processes and outcomes (e.g., Amrhein et al., 2003; Calero-Elvira et al., 2013; Tollison et al., 2013). Lastly, the fact that the study population consisted of a sample of uninsured and low socio-economic status individuals shows the promise of ACT counseling techniques in predicting smoking cessation in a challenging treatment population.

The lack of a predictive relationship between activation and smoking might be explained by a number of possibilities. First, a low range of activation techniques in ACT could have led to consistently high adherence ratings and lack of variability in this component. For example, if commitment was conceptualized as simply encouraging participants to take specific steps towards values-driven behaviors, this could easily lead to high ratings in this category. However, values-driven behaviors can be promoted in a variety of ways, such as creating a hierarchy of actions consistent with patient's values, or the application of principles of behavior change to promote successive approximations towards those values-driven behaviors. This possibility needs to be further examined in future studies, since our adherence rating scale did not take into account those counselor behaviors. Second, although not part of our initial hypothesis, a possible interpretation is that activation techniques are more likely to succeed when awareness and openness skills have already been established, since those skills could be helping individuals to cope effectively with the discomfort of being put in contact with their own personal values and the discrepancy between their values and actions; a process suggested by recent Relational Frame Theory research (Hooper, Stewart, Duffy, Freegard, & McHugh, 2012). Finally, while there is an increasing number of ACT studies examining the important role of activation in individual's functioning (e.g., Chase et al., 2013; Kashdan & McKnight, 2013), there is still a small number addressing the role of values and commitment as compared to other ACT processes (Levin, Hildebrandt, Lillis, & Hayes, 2012). Thus, these non-significant findings should motivate further study of activation — a central process of the ACT model.

The study has key limitations. First, and as discussed earlier, the restricted range of the activation component had an impact on the reliability of the regression estimates and their interpretation. Second, we cannot rule out the possibility that a third, unmeasured variable, both influenced the use of counselor techniques and smoking cessation outcomes, thereby leading to potentially inflating the observed association between counseling techniques and smoking outcomes. Possible examples of third variables include participants' self-efficacy and/or intention to reduce smoking the following week. Both variables might lead to greater engagement with ACT techniques following and ACT counseling

session and to higher likelihood of quitting before the following session, raising the question of to what extent counselor behaviors had a causal influence on participants' smoking behavior. Third, although the aim of this study was to examine the effect of manipulable variables (i.e., ACT counseling techniques) on treatment outcomes, statistical power limited alternative analytic strategies, such as the analysis of moderating or mediating variables. One such variable could have been participants' willingness to experience smoking urges and cravings in response to the ACT intervention. In addition, the use of openness, awareness and activation techniques could be driven by participants' responses to such techniques in prior sessions. Future studies with more statistical power might consider examining these associations or the identification of alternative variables influencing the outcomes. Fourth, coding openness, awareness and activation components in the non-ACT arm of this randomized controlled trial would have shed light into the use of these treatment components in standard telephone quitline counseling. However, coding standard telephone quitline counseling was not possible for security reasons, since state quitline call recordings are only kept on file for 30 days as part of their operating procedures. Fifth, this observational design was limited by the lack of experimental manipulation of independent variables. This lack of experimental manipulation limits the interpretation of the time effects inherent in our intervention. Our model indicated that adjusting for prior exposure to these ACT components (i.e., counseling calls) did not change the pattern of relationships observed in the unadjusted models. However, adjusting to number of calls does not inform about the role of specific ordering of effects. A more rigid treatment protocol could have helped us understand these effects, but it would have also limited its "real-world" clinical utility. Future research might consider alternative methodological strategies that can address these questions more directly, such as dismantling studies, single case designs (Hayes, 1981), SMART designs (in which specific ACT components are switched and their effects observed in the following sessions; Collins, Murphy, & Strecher, 2007), or the use of moderated-mediation process analyses in larger samples.

Tobacco addiction is a serious public health problem that calls for the development of more effective behavioral interventions. A better understanding of the processes of change of behavioral smoking cessation treatments helps meet this need. This study provided a prospective evaluation of the effects of manipulable treatment components and adjusted for important covariates, such as number of cigarettes smoked during the previous counseling session, baseline level of smoking, and counseling calls. This is the first study to suggest that a counselor's focus on ACT's openness and awareness processes has the potential to improve the effectiveness of behavioral interventions for smoking cessation. Overall, results highlight the theoretical and clinical value of examining therapists' techniques as predictors of outcomes during the course of treatment.

Acknowledgments

This study was supported by the National Institutes of Health (T32MH082709 to RV, K23DA026517 to JLH, R21DA030646 to JB) and the Fred Hutchinson Cancer Research Center.

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