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PRIMING CHANGE TALK: THE EXPERIMENTAL MANIPULATION OF CLIENT SPEECH

by

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BACHELORS OF ARTS

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ABSTRACT

Previous research has supported the link between client language in favor of change (change talk) during Motivational Interviewing sessions and subsequent substance use outcomes. The present study investigated whether the frequency of change talk can be increased using a pre-treatment priming paradigm. Eighty six current cigarette smokers were randomized into one of three priming manipulations: change talk, sustain talk, or a neutral condition. After completing a version of the Scrambled-Sentence test (change, sustain, or neutral) intended to prime or suppress change talk, participants engaged in a pseudo-therapeutic encounter with a research assistant who asked them a series of open-ended questions about their smoking behavior. These sessions were audio recorded and coded for instances of change and sustain talk. Nicotine dependence and ambivalence toward smoking were assessed using self-report questionnaires. Results indicated that the three groups did not differ in the proportion of speech they gave in favor of changing their smoking, even after controlling for ambivalence and dependence. Strengths and weaknesses of the priming manipulation and study design are discussed.

Keywords: change talk, motivational interviewing, priming

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Motivational Interviewing

Motivational Interviewing (MI) is a "client-centered, directive method for enhancing a client's intrinsic motivation to change a problematic behavior by exploring and resolving ambivalence" (Miller & Rollnick, 2002, p. 25). Originally developed for use with problematic drinkers, MI has been adapted to address a wide range of target behaviors, including substance use, health behaviors, and treatment engagement. Since its inception, MI has received substantial empirical support for numerous target behaviors showing that it is more efficacious than no treatment and equally as efficacious as other active treatments (Lundahl & Burke, 2009). Because of this amalgamation of empirical support, MI has been established as an evidence-based practice for the treatment of alcohol use disorders (National Registry of Evidence-Based Programs and Practices, 2007).

Mechanisms of Change in MI

There is a paucity of research on mechanisms of change in behavioral treatments, and recent contributions have highlighted the need for advancement in this area of psychotherapeutic research (Kazdin, 2007; Kazdin & Nock, 2003; Longabaugh et al., 2005). One hypothesized mechanism of change in MI is the client's language in treatment sessions, called "change talk". Change talk is a broad linguistic category composed of statements reflecting a person's movement toward changing a problematic behavior (Miller & Rollnick, 2002). The counterpart of change talk, "sustain talk", represents the other side of ambivalence. Sustain talk is composed

of utterances reflecting the maintenance of the status quo, or the continuation of the problematic behavior.

Self-perception theory posits that individuals come to know what they believe through observing their own behavior (Bem, 1972). An outside observer infers the internal states (e.g., hunger) of others through observations of their overt behavior (e.g., witnessing them eating food or saying "I'm hungry"). Drawing from this theory, one hypothesis regarding how MI works is that as individuals openly discuss topics about which they are ambivalent, it is their observation of their own speech that allows them to draw conclusions about their intent. While it may seem as if individuals have privileged access to their own internal states, self-perception theory posits that this is not necessarily the case. Since internal cues are often ambiguous and unclear, so too may individuals infer their own thoughts and feelings by examining how they behave in certain situations (Bem, 1972).

From self-perception theory it follows that the spontaneous emergence of language, rather than simply being a reflection of an innerstate, plays a role in determining what an individual believes (Bem, 1972). If this is indeed the case, it is easy to see why change talk has received special attention as a causal mechanism. Ambivalent clients have not decided how they feel about their problematic behavior; rather, they feel two ways. One way they can reach a final conclusion and decide on a course of action is to discuss their behavior with another person. As they hear themselves talk, they come to believe something based on what they hear themselves say. This has a direct implication for therapy: instead of arguing their own views about change to a client, MI insists that therapists allow the client to "tip the balance" and argue themselves into change (Miller & Rollnick, 2002). The therapist's goal is to structure the session in a way that actively facilitates client change talk.

Change Talk as a Causal Mechanism

Moyers and Martin (2006) theorized a causal chain for MI whereby change talk mediates the relationship between MI-consistent therapist behaviors and improved client outcomes. The first link addresses the issue of therapist behaviors and client change talk. If change talk is a mechanism of change, then it is plausible that it might be influenced by particular therapist behaviors (Baron & Kenny, 1986; Moyers & Martin, 2006). It is hypothesized that, through the use of MI-consistent behaviors, such as emphasizing the client's autonomy, and the avoidance of MI-inconsistent behaviors, such as confronting the client, therapists should be able to influence the amount of change talk produced by a client within a session (Miller & Rose, 2009; Moyers & Martin, 2006). Kazdin and Nock (2003) refer to this as the "intervention test." For the second link, the "mediator and change test," there should be a relationship between client change talk and outcomes. Particularly, higher levels of change talk and lower levels of sustain talk within a session should be associated with better outcomes, since this sort of speech mobilizes the client to make a change. Furthermore, there should also be a relationship between MI-consistent therapist behaviors and outcomes, such that greater fidelity to MI is associated with better outcomes. This link, typically established first, is referred to as the "efficacy test".

Change talk and outcomes. A number of studies have provided empirical support for the second link in the chain, that clients' verbal behavior within session is associated with distal outcomes. Initial support showed that client resistance behaviors strongly predicted drinking at 12 months post-treatment (Miller, Benefield, & Tonigan, 1993). The more a client argued, resisted, or expressed unwillingness to change, the more the client drank a year after the intervention.

The first evidence linking change talk with outcomes came when Amrhein and colleagues (2003) coded MI therapy sessions and measured the strength and trajectory of client change talk. They found that the pattern and strength of change talk predicted substance use levels post-treatment. Additional support for the connection between change talk and client outcome has since been found, and the positive evidence continues to grow (Baer et al., 2008; Gaume, Gmel, & Daeppen, 2008; Moyers et al., 2007; Strang & McCambridge, 2004). The predictive ability of change talk has also been supported for drug abuse (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008) and problematic gambling (Hodgins, Ching, & McEwen, 2009). This suggests that the role of change talk may generalize to numerous target behaviors, and it has been hypothesized that this causal mechanism is shared by different substance abuse treatments (Moyers & Martin, 2006).

A recent review of mechanisms of change in MI supported the role of change talk in influencing outcomes (Apodaca & Longabaugh, 2009). However, the relationship between change talk and sustain talk is still largely unclear. One study has shown that change talk and sustain talk make independent contribution to behavioral outcomes, and should thus be considered separate constructs (Moyers et al., 2007). These areas provide fertile ground for future research.

Therapist behaviors and change talk. Given that change talk has been identified as one possible causal mechanism, and that higher levels of change talk and lower levels of sustain talk are associated with better distal outcomes, it is important to determine what other variables influence this verbal behavior. Using a sequential analysis, Moyers and Martin (2006) showed that certain therapist behaviors are more likely to be followed by particular kinds of subsequent client speech, thus providing strong temporal evidence for the first link in the causal chain. In

4

particular, MI-consistent behaviors were more likely to be followed by change talk, and MI-inconsistent behaviors were less likely to be followed by change talk. A number of studies have produced similar findings using sequential analyses, allowing for conclusions regarding the temporal order of client-therapist interactions that were lacking from correlational studies (Gaume, Gmel, Faouzi, & Daeppen, 2008; Houck & Moyers, 2008; Moyers et al., 2007).

Glynn and Moyers (2010) investigated a therapist's influence over client speech using an experimental design. Within a single session, therapists alternated between two therapeutic styles, one designed to elicit change talk, the other to conduct a functional analysis, and the amount of change talk was measured for each portion. When therapists were actively encouraging and responding to statements favoring change, the amount of change talk offered by the client increased. When the therapists switched and stopped actively evoking and reinforcing change talk during the functional analysis condition, the amount of change talk decreased. This study provides strong evidence that therapists have influence over the amount of change talk clients emit during a session.

Moyers and colleagues (2009) sequentially coded both client and therapist language during 118 Motivational Enhancement Therapy sessions. Using a mediational analysis, this study found that client change talk mediated the relationship between specific therapist behaviors and distal drinking outcomes, accounting for approximately 30% of this effect. This study provided the strongest evidence yet for the causal chain explained in Miller and Rose (2009).

Given the consistent positive relationship between change talk and outcome and the evidence that change talk can be experimentally manipulated by therapist behaviors (Glynn & Moyers, 2010), it is essential to know in what other ways this mechanism can be influenced in

order to make change more likely. All research thus far has focused on what a therapist can do to evoke change talk. However, since not all clients are willing to actively explore their ambivalence during a therapy session, the emergence of this sort of language will depend heavily on the therapist's ability to facilitate this type of interaction. Unlike the example of chemistry, where the combination of two chemicals will result in the same product regardless of the chemist combining them, the effect of psychotherapy heavily depends on the therapist providing the service (Najavits & Weiss, 1994; Project MATCH Research Group, 1998). Furthermore, there is substantial variability in therapist competence, with some lacking the finely tuned skills that others employ readily. Even after receiving identical training not all therapists will implement an MI intervention equally (Carroll et al., 2006; Miller, Yahne, Moyers, Martinez, & Pirritano, 2004; Moyers et al., 2008).

Leaving the evocation of change talk solely in the hands of the therapist may explain variable outcomes in clients receiving MI. Clients who see mediocre therapists might voice fewer arguments in favor of change, thus decreasing the probability of making a behavior change. How might one compensate for the inability of these therapists to evoke change talk, and thereby increase the chances that an MI intervention will be successful? Might there be a way to increase the probability that clients will produce change talk regardless of the therapist's ability to pull for it? Rather than focus solely on what therapists can do to evoke change talk, a new line of research could focus on what can be done with the client to achieve this goal.

Priming

Priming studies offer insight into how change talk might be evoked from the client, even in the absence of the ideal therapist. Priming refers to the activation of mental representations

6

caused by the presentation of a stimulus (Bargh & Chartrand, 2000). Typical priming studies investigate the impact that stimuli presented outside of conscious awareness, either subliminally or supraliminally, have on subsequent behaviors. Subliminal primes occur below the threshold of conscious awareness. Supraliminal primes, on the other hand, are fully accessible, though the individual is unaware of their effect on behavior. The existence of a priming effect has received overwhelming support in influencing a variety of behaviors (Bargh & Ferguson, 2000).

Priming experiments typically have two separate stages: afferent and efferent (Fiedler, 2003). During the afferent stage a stimulus is presented to activate related mental representations. Then, during the efferent stage, the participant engages in an activity where the activated mental representation influences a response to a related target stimulus. It is hypothesized that the afferent stage enhances the accessibility of the primed construct, and that constructs with higher accessibility are more likely to be used when responding to a target during the efferent stage (Förster & Liberman, 2007). For example, the presentation of the word *chair* activates other concepts conceptually or semantically related, such as *couch*. Then, when asked to decide if a briefly presented string of letters is a word or nonword, individuals are much quicker to categorize *couch* as a word than *fox*, which is not as closely related to *chair*.

Priming and Behavior

Priming of mental representations has been shown to influence behaviors much more complex than a lexical decision. In three separate experiments, Bargh, Chen, and Burrows (1996) showed that the effect of priming a construct can be seen on a wide range of behavioral outcomes. In the first experiment, participants primed with the concept of rudeness interrupted the experimenter more quickly and frequently than participants whose concept of politeness had

7

been primed. In the second experiment, participants whose elderly concept had been primed walked more slowly down a hallway than did those who received neutral primes. In the third experiment, participants who were primed with an African American stereotype responded with more hostility when a research assistant explained that the participant's data had been lost and that the lengthy experiment would have to be restarted. Other studies have shown that participants who were primed with the stereotype of a professor answered more Trivial Pursuit questions correctly than a control condition, and participants who were primed with the stereotype of soccer hooligans answered fewer questions correctly than did a control condition (Dijksterhuis & van Knippenberg, 1998). Similarly, students in an introductory social psychology course primed with intelligence related words performed better on both a practice exam and an actual midterm than did students primed with neutral words (Lowery, Eisenberger, Hardin, & Sinclair, 2007). Thus, numerous dependent variables can be used when evaluating the influence of a primed concept.

Present Study

The goal of the present study was to evaluate the potential of evoking change talk and sustain talk through the use of a priming paradigm. The sample consisted of college students who currently smoked cigarettes. After undergoing one of three priming conditions (neutral, change, or sustain), a sample of the participants' language about their smoking was gathered via a pseudo-therapeutic interaction. It was hypothesized that participants in the change talk condition would produce higher levels of speech in favor of changing their smoking behavior than participants in the neutral condition. It was also hypothesized that participants in the sustain talk

condition would produce the lowest levels of speech in favor of changing their smoking behavior.

METHODS

Participants

This study was approved by the University of New Mexico's Institutional Review Board. A total of 94 students enrolled in Psychology courses at the University of New Mexico participated in the study. The recruitment advertisement depicted the study as an investigation of individual's feelings toward their own smoking behavior, and included participation in a separate study on language ability. Individuals were eligible for study participation if they were at least 18 years old and used tobacco products daily. In order to determine sample size, an effect size of f = .33 was used based on prior studies employing a similar priming manipulation. Entering this effect size into G*Power (Erdfelder, Faul, & Buchner, 1996) and setting α=.05 yielded N=90 participants to achieve a power of .8.

As originally planned, the first eight participants were intended to pilot test study procedures. Their audio-recordings served as an initial reliability sample for the coders; however, data from these eight participants were not included in the final analyses, leaving a final sample of 86 participants. Twenty-nine participants were randomly assigned to the Change Talk and to the Neutral condition, with 28 in the Sustain Talk condition.

Materials

Scrambled-Sentence Test. The experimental priming procedure was the Scrambled-Sentence Test (Srull & Wyer, 1979) and was presented to participants as a test of language ability. Each of the 30 items on the SST contained five words, and the participant was instructed to use four of the words to construct a grammatically correct sentence as fast as they could. For each item, the five words were presented in a scrambled order (e.g., angry man find was the).

Three versions of the scrambled-sentence test were constructed especially for this study: to prime change talk, sustain talk or neither (neutral priming condition; see Appendix A). To form sentences for the change and sustain conditions, an initial list of words was generated to reflect the two content areas of each experimental condition: a) reasons for changing or maintaining smoking behavior and b) commitment to changing or maintaining smoking behavior. As suggested by Bargh and Chartrand (2000), a thesaurus was then consulted to attain additional synonyms. Cigarette expectancy literature was reviewed for additional content (Myers, MacPherson, McCarthy, & Brown, 2003; Rohsenow et al., 2003). Based on this list, fifteen of the most relevant words for each condition were selected and a four word sentence was constructed for each; an additional "distractor" word was then added to each sentence. The distractor words were chosen in such a way that no grammatically correct sentence could be constructed if they were chosen.

Half of the items within this scrambled-sentence test contained words or phrases semantically related to the construct to-be-primed and no items on the neutral form contain words explicity related to change talk or sustain talk. The change talk form contained the following words: *family, health, clear air, money, sick, accomplished, cough, determined, heart, unattractive, smell bad, unhealthy, inconsiderate, successful, quitting.* The sustain talk form contained the following words: *friends, buzz, after dinner, coffee, deal with anger, flavor, calms*

down, taste, deal with anxiety, reduces tension, helps cope, hands stay busy, relaxed, perks up,

difficult to quit. Fifteen items from the neutral form were added to both the change and sustain

talk forms to create a total of 30 items per form.

Based on feedback from the first eight participants, it was determined that the change talk

scrambled sentence test contained several sentences that were obviously related to smoking.

These sentences were edited to be less conspicuous, and a final version of the change talk test

was administered to the study participants.

Measures

Ambivalence. An adapted version of the Change, Ambivalence, and Sustain Emotion

Scales (CASES; Rice, 2010) was used to measure participant ambivalence toward cigarette

smoking. CASES was originally developed to measure ambivalence toward alcohol use. Scores

near zero signify that an individual is ambivalent about their behavior. More positive scores

indicate greater motivation to change their behavior. Preliminary results suggest that the measure

has two interpretable factors, cognitive and emotional aspects of ambivalence, each having high

internal consistency (α=.84 and .89, respectively). The measure has demonstrated good

convergent validity, correlating with the difference between change and sustain talk frequency

produced by participants during an MI session (Rice, 2010). Items were reworded to inquire

about cigarette smoking.

Smoking Behavior. Data regarding participant smoking behavior was gathered using an

eight item questionnaire constructed specifically for this study. This questionnaire included items

regarding the age at which they started smoking, years of smoking, the average number of

cigarettes per day, the number of quit attempts, and the longest duration of abstinence since

becoming a smoker (see Appendix B).

Nicotine Dependence. Smoking dependence was assessed using the Nicotine Dependence Syndrome Scale (NDSS; Shiffman, Waters, & Hickcox, 2004). The NDSS has been shown to have high test-retest reliability (r=.81; Shiffman et al., 2004), and good internal consistency (Cronbach's α=.84). The NDSS scoring is comprised of an overall score and five subscale scores (Drive, Priority, Tolerance, Continuity, and Stereotypy). For the purpose of this study, only the overall score was used.

Behavioral coding system

CLEAR. Participant language concerning their smoking was coded using the Client Language Easy Rating (CLEAR) coding system (Glynn & Moyers, 2009). The CLEAR is a coding system that works within an MI framework to classify client language in reference to a target behavior. When coding, client speech is first divided into complete thoughts, referred to as utterances. These utterances are then given a behavioral code based on the content of that utterance. This coding system separates client language into two broad categories: change talk and sustain talk. Broadly defined, change talk includes language signifying a move in the direction of change ("Cigarettes are bad for my health"); sustain talk is language that advocates maintaining the status quo ("I couldn't quit smoking even if I tried").

The CLEAR was used to code participant language that occured during the pseudotherapy session, and the amount of change talk offered by the participant during the pseudotherapy session was the main outcome variable in this study. Based on previously established conventions, the metric used was percent change talk in session. Percentage change talk represents an individual's motivation to change their behavior in a way that controls for both differences in the participant's verbosity and session length. Percent change talk was computed for each individual by dividing all change talk statements by the sum of all change talk and

sustain talk [i.e., change talk/(change talk + sustain talk)]. Client discussion of smoking was elicited during a post-priming interview using a number of open-ended, ambiguous questions (See Appendix C). Responses were recorded, and these recordings were coded by undergraduate research assistants using the CLEAR.

Coder Training. A stepped learning process was used to train two undergraduate students in the honors program to code the participant's responses to questions regarding their smoking. Coders were first provided with an overview and rationale of the coding system, and then taught to differentiate change talk, sustain talk, and neutral statements. Coders then practiced distinguishing between these three categories during practice sessions. The initial training took approximately 10 hours distributed over several days. Prior to coding recordings from the study, an initial reliability check was performed using data from the eight pilot participants. Weekly coder meetings were held to prevent coder drift and allow for the resolution of discrepancies.

Procedures

Prior to their arrival, participants were randomized into one of three equal-sized priming conditions using Random Allocation Software (Saghaei, 2004). This randomization was conducted by the principal investigator who then assembled a sealed packet containing the correct version of the scrambled-sentence test and an unused envelope. This was done to ensure that the research assistant conducting the study remained unaware of the participants' priming condition during the study.

Participants completed the study individually in a private office. Upon arrival, following the example set by Bargh and colleagues (1996), research assistants explained that the individual would be taking part in two unrelated studies. They were told that the first was a test of language ability, and the second, main study concerned their smoking. After allowing the opportunity for

questions, the research assistant gave the participant a sealed envelope containing one of three versions of the scrambled sentence tests, told them to seal it in the unused envelope when finished, and then left the room.

Upon completion of the scrambled sentence tests, the research assistant thanked them for their participation and notified them that the second study would now begin. Given that priming effects are the strongest immediately after the presentation of the subliminal stimuli (Bargh et al., 1996), in order to minimize the time between the priming procedure and the collection of data related to the study's main outcome, the smoking study began with the open-ended, audio-recorded conversation about the participant's smoking. During this conversation, the research assistant asked a predefined series of questions aimed at eliciting language related to cigarette use. The research assistant was instructed to employ a set of specific prompts (e.g., "What else can you tell me about that?") aimed at facilitating a genuine exploration of the participant's smoking (see Appendix A).

After the audio recorded portion of the study was completed, the research assistant handed the participant a packet containing demographic and smoking-related questionnaires. When completed, the research assistants then used a funneled debriefing procedure (see Bargh et al., 1996; Appendix D) aimed at assessing the participant's awareness of the priming manipulation. Participants were then fully debriefed, thanked for their participation in the study, and asked not to share study-specific information with their peers.

Data Analysis

Statistical Assumptions. Before conducting the statistical tests, the distributional assumptions of outcome variables were examined. Deviations from normality were conducted by

dividing skewness and kurtosis values by their respective standard errors. Results of the z tests were non-significant for both skewness ($z = 1.61$, $p > .1$) and kurtosis ($z = 0.75$, $p > .3$).

Coding Reliability. Reliability for change and sustain talk frequency along with the main outcome percentage change talk was estimated with the intraclass correlation coefficient (ICC; Shrout & Fleiss, 1979). The ICC is an ANOVA based statistic used to break down the variability in coding scores into two components: variability due to participants, and variability due to raters. To estimate reliability for this study, a two-way, random ICC for absolute agreement was calculated. Using previously established conventions (see Cicchetti, 1994), ICCs below .40 are poor, .40 - .59 are fair, .60 - .74 are good, and ICCs from .75 – 1.00 are excellent. Twenty five of the 86 tapes (29 %) were double coded for the reliability analysis.

Awareness of Priming Impact. The funneled debriefing procedure was used to determine if the participant was aware of the impact of the priming manipulation on the subsequent task.

Random Assignment to Groups. A set of one-way ANOVAs and chi-square tests was performed on demographic and smoking variables to test the equivalence of priming groups on baseline characteristics.

Main Effect of Research Assistant. Based on the design of the study it was thought that individual RAs would not be a source of error variance. That is, the participants would respond to the open-ended question by producing a certain percentage of change talk regardless of which RA was asking the questions. To test this assumption, a series of one-way ANOVAs were performed on the four coding variables (i.e., CT, ST, PCT, and Importance) with the RA as the grouping variable.

Experimental Manipulation of Client Speech. To test the influence of the priming manipulations, a one-way ANCOVA was conducted with percentage change talk as the dependent variable. Ambivalence and nicotine dependence were entered as covariates. Two *a priori* pairwise comparisons were conducted using Bonferroni's correction for multiple comparisons to maintain the experimentwise error rate (α_{EW}) at .05. Thus, *p*-values less than .05/2 = .025 were deemed significant. These simple comparisons tested the difference between the change talk and neutral groups, and the change talk and sustain talk groups.

RESULTS

Participant Characteristics. Data from 86 participants are included in these analyses. See Table 1 for demographic and smoking characteristics.

Reliability. The reliability of coding data was estimated in order to determine the signal to noise ratio. For this analysis, a single measures, absolute agreement, two-way random ICC was used. The main outcome variable, Percentage CT, fell in the "excellent" range according to Cicchetti (1994), ICC = .879, 95% CI [.659, .952]. The components of this variable, CT and ST frequency, fell in the "excellent" and "good" range, CT ICC = .674, 95% CI [.334, .850] and ST ICC = .768, 95% CI [.071, .926], respectively.

Awareness of Priming Impact. Priming awareness was determined via a funneled debriefing procedure. For the participants who received CT or ST versions of the scrambled sentence test (n = 57), five participants (9%) were able to correctly explain the connection between the two ostensibly separate studies. However, the results for the main analyses were the same when these participants' data was removed, and a decision was made to use the data of all 86 participants for the analyses.

16

Random Assignment to Groups. Though a randomization procedure was used, a series of one-way ANOVAs and chi-square tests were used to evaluate the equivalency of baseline groups, see Table 2. ANOVAs were performed on the Ambivalence and NDSS scales as well as the Smoking Behaviors questionnaire. Chi-square tests were performed on gender and ethnicity variables. There were no significant between-group differences on any of these variables.

Main Effect of Research Assistant. Prior to performing the main analysis, we sought to determine if answers given during the pseudo-therapeutic interaction were related to the Research Assistant asking the questions. The main effect of research assistant was non-significant (smallest $p > .2$), suggesting that participants did not respond differently to the open-ended questions as a result of the interviewer.

Experimental Manipulation of Client Speech. The main goal of the study was to determine if the experimental manipulation had an effect on client speech during the pseudo-therapeutic interaction. The outcome variable, PCT, was analyzed using an ANCOVA with priming condition as a factor and both ambivalence and nicotine dependence as covariates. Within group means and standard deviations are presented in Table 3. Correlations between the dependent variable and covariates are presented in Table 3. An initial step was to determine if the regression slopes for ambivalence and nicotine dependence were significantly different across the three priming conditions. These tests were non-significant, suggesting that the assumption of homogeneity of regression was tenable. The main effect of priming condition was non-significant, $F(2, 81) = 0.688$, $p = .505$, partial $\eta^2 = .017$, suggesting that there was insufficient evidence for the impact of the priming condition on the proportion of statements for or against smoking (see Figure 1 for plot of adjusted means). The main effect of ambivalence was significantly related to the outcome, $B = 0.333$, $F(1, 81) = 24.007$, $p < .001$, partial $\eta^2 = .229$.

Individuals who were less ambivalent tended to exhibit a higher proportion of CT than ST.
Nicotine dependence was not significantly related to the outcome ($p > .3$).

A Priori Contrasts. The first *a priori* contrast assessed the difference between the adjusted means
for the CT and Neutral groups. This test was non-significant, $t(81) = 1.04$, $p = .299$. The second
contrast tested the difference between the CT and ST groups, and was also non-significant, $t(81)$
$= 0.04$, $p = .968$.

Given the similarity in PCT means for the CT and ST groups, an additional analysis
involved combining these groups and comparing them to the neutral group via an independent
samples t-test. This exploratory analysis found insufficient evidence for a between-group
difference in mean PCT, $t(84) = 1.67$, $p = .099$, $d = 0.38$. Though non-significant, the between-
group difference represents a small to medium effect.

Exploratory Analyses. To explore the possibility that the frequency of language categories, rather
than proportion, was influenced by the priming manipulation, two additional analyses were
performed using CT and ST frequency variables. Priming condition was related to neither CT
nor ST frequency, $F(2, 81) = 0.268$, $p = .766$, partial $\eta^2 = .015$, and $F(2, 81) = 0.312$, $p = .733$,
$\eta^2 = .008$, respectively. Ambivalence was significantly associated with both CT, $B = 0.080$, $F(1,$
$81) = 5.590$, $p = .022$, partial $\eta^2 = .065$, and ST frequency, $B = -0.091$, $F(1, 81) = 11.393$, $p =$
$.001$, partial $\eta^2 = .136$. Higher ambivalence was related to higher frequencies of CT and lower
frequencies of ST. Nicotine dependence was unrelated to ST frequency ($p > .3$), but accounted
for a significant proportion of the variability in CT frequency, $B = 0.243$, $F(1, 81) = 5.974$, $p =$
$.017$, partial $\eta^2 = .069$. As this relationship was positive, individuals who were more dependent
on nicotine had higher CT frequencies than individuals less dependent on nicotine.

DISCUSSION

The findings in this study fail to support the a priori hypothesis that individual's speech regarding their smoking behavior can be influenced by priming certain types of language via a scrambled sentence test. Regardless of whether the participant received a CT, ST, or neutral prime, the proportion and frequency of their language in reference to cigarette use were not significantly different. Though not the first study to attempt to prime complex behaviors using this procedure, this appears to be the first study aimed at affecting non-syntactic, complex language production through a priming manipulation.

One implication of these findings is that CT is not trivial, and it cannot be readily influenced by a method as simple as a scrambled sentence test. A pleasant surprise of this study was the willingness of participants to openly discuss their thoughts and feelings toward their cigarette use. Though there were individual differences in the frequency of CT and ST, all participants were willing to give some personally relevant information about their smoking.

Several explanations are possible for the obtained results. One plausible explanation deals with the nature of the priming stimulus. Specifically, the ability of the scrambled sentence test to influence a multifaceted behavior such as human speech may have been weak. The scrambled sentence test was constructed according to recommendations (Bargh & Chartrand, 2000) and edited after trial administrations. However, prior to this study, it was not tested to ensure its ability to manipulate key internal states related to an individual's perception of their cigarette use. Also, the nature of this study's priming paradigm might not have been the best medium to influence language production. For instance, auditory primes or primes embedded within a story may have a stronger influence on human speech. Future studies seeking to experimentally manipulate the production of language should consider pre-testing multiple priming paradigms.

19

Though many studies have used this priming paradigm to influence human behavior, it is possible that this area of research could be suffering from the file drawer effect. In other words, while use of the scrambled sentence test has produced significant results, it is unclear how many experiments produced null results and remain unpublished (Rosenthal, 1979). Though many such studies remain unpublished, several recently published papers acknowledged their unsuccessful attempts to replicate several of the experiments cited in the current study (Doyen, Klein, Pichon, & Cleeremans, 2012; Pashler, Coburn, & Harris, 2012) On the other hand, our null findings are possibly influenced by the complexity of our outcome behavior. This study attempted to influence very specific types of language related to cigarette use, an outcome that is arguably more difficult to affect than reaction time or sentence structure. Drawing from Levelt and colleagues (1999) model of language production, Pickering and Branigan (1999) distinguish three separate levels of lexical representation: conceptual, lemma, and form. The encoding that occurs at each of these levels are semantic, syntactic, and morphological/phonological information, respectively. It has been shown that priming can influence all three of these levels, but never using as complex an outcome as in the current study.

Though we did not find evidence for our main hypothesis, several of the baseline covariates, as predicted, were significantly related to the participant's language during the pseudo-therapeutic encounter. In fact, ambivalence toward smoking was the strongest predictor of how an individual talked about their smoking. While much of our data is associational in nature, this does not rule out the possibility that the pseudo-therapeutic encounter fundamentally changed the participant's responses to the questionnaires. Since they were not measured at exactly the same time, the relationship between ambivalence and smoking-related language could have been an artifact of the study's structure. All individuals first completed the scrambled

sentence test, participated in the pseudo-therapeutic encounter, and then filled out the ambivalence measure. In other words, the treatment and covariate were no longer statistically independent, thereby violating the ANOCOVA assumption of independence (Maxwell & Delaney, 2004). Though included to reduce residual error, the result of using ambivalence as a covariate in this situation would be a reduction in the variance accounted for by priming condition. It is entirely possible that the manner in which they responded to the open-ended questions influenced how they answered questions regarding their ambivalence toward smoking. This is particularly relevant when an individual is unsure of, or ambivalent toward, a particular behavior. In these situations, making arguments either for or against smoking could play a role in helping an individual "make up their mind" (Bem, 1972; Miller & Rollnick, 2002). Future studies could employ a repeated testing strategy in which the ambivalence measure is administered before and after a therapeutic task. This would allow researchers to better understand the nature and malleability of ambivalence. Also, using a measure of ambivalence gathered at the beginning of the study would preclude the violation of ANCOVA's independence assumption.

The measurement of internal characteristics is a difficult task – one that has plagued the field of psychology in its quest to be recognized as a legitimate science (Fine, 1960). The classification and quantification of human speech in the context of psychotherapy is a relatively new measurement endeavor, and the units we use to describe "how much" of a behavior occurred are relatively underdeveloped. Though by no means the gold standard approach, this study chose to measure language regarding cigarette use through frequency counts due to its prevalence in the literature and our familiarity with this type of coding system. Other researchers have used strength ratings to assess an individual's propensity to change or maintain their behavior

(Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003; Karno, Longabaugh, & Herbeck, 2010). Neither approach should be preferred over the other at this point, as both strength and frequency measurements speak to different, albeit overlapping properties of an individual's perception of their cigarette use. Future research should include both strength and frequency measurements and explore their interrelationship. Can priming influence abstract levels of semantic information? That question has yet to be answered.

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APPENDICES

Appendix A: Priming Sentences

<u>Change Talk Condition</u>
1. The family ate dinner
2. His health is good
3. The *air* is *clear*
4. She has more *money*
5. We never get *sick*
6. He *accomplished* his goals
7. My *cough* is bad
8. The runner was *determined*
9. Her *heart* is strong
10. It makes her *unattractive*
11. The garbage *smells bad*
12. Spring is always *pretty*
13. He is very *inconsiderate*
14. The boy was *successful*
15. Elephants *never get sick*

<u>Sustain Talk Condition</u>
1. His *friends* were around
2. The *buzz* felt nice
3. They talk *after dinner*
4. It's *good with coffee*
5. Yelling *helps with anger*
6. The *flavor* is great
7. Swimming *calms her down*
8. It *tastes* really good
9. He *deals with anxiety*
10. Walking *reduces the tension*

11. It *helps me cope*
12. M*y hands stay busy*
13. I'm *relaxed* during movies
14. It *perks me up*
15. It's *difficult to quit*

Neutral Condition
1. The dog ran fast
2. He left at noon
3. The wind was cold
4. The flowers grew tall
5. The sun was hot
6. Today is not Saturday
7. The puzzle was colorful
8. It looks like rain
9. London is England's capital
10. The water is warm
11. Aliens do not exist
12. Where is your phone
13. Spain is in Europe
14. We went to Colorado
15. My eyes are green
16. The book is interesting
17. She bought ice cream
18. The store is far
19. The farmer eats corn
20. The comedian was funny
21. Wolverines live in Michigan
22. Leprechauns do not exist
23. Canada is always cold
24. Cheetahs run really fast
25. She works from home

Appendix B: Smoking Questionnaire

Thank you for participating in this survey. Please take a few minutes to fill out these 8 questions regarding your smoking behavior.

1. For how many years have you been smoking?

2. At what age did you first start smoking cigarettes consistently (more than just trying them)?

3. How many cigarettes did you smoke per day on average during your heaviest smoking periods?

4. How many cigarettes do you smoke per day on average now?

5. How many cigarettes have you smoked in the past 7 days?

6. Have you ever made a serious attempt to quit?

7. If so, how many times have you tried to quit smoking?

8. Since beginning to smoke, what is the longest period you've gone without a cigarette?

Appendix C: Questions for Pseudo-therapeutic Interactions

1. What are your thoughts and feelings about your smoking now?

2. Have you noticed any changes in your thoughts and feelings about smoking in the past six months? What influenced any of these changes in feelings?

3. Where do you think your smoking will go from here?

4. On a scale of 0-10, how important is it to you to change your smoking behavior? Tell me more about why you chose that number.

Appendix D: Funneled Debriefing

After completing the study, the RA will ask the participant the following questions:

1.   What do you think the purpose of this experiment was?

2.   What do you think this experiment was trying to study?

3.   Did you think that any of the tasks you did were related in anyway?

a.   (if "yes") In what way were they related?

4.   Did anything you did on one task affect what you did on any other task?
a.   (if "yes") How exactly did it affect you?

5.   When you were completing the scrambled sentence test, did you notice anything unusual about the words?

6.   Did you notice any particular pattern or theme to the words that were included in the scrambled sentence test?

Table 1.

Demographic and Smoking Characteristics

Variable	Mean (SD)
Age	21.9 (6.5)
Gender (% Female)	51.2%
Race	45.4% Hispanic, 40.7% White
Num. Years Smoking	4.8 (4.8)
Cigarettes per Day	6.2 (5.4)
Number of Quit Attempts	2.8 (2.4)

Table 2.

Between-Group Differences on Demographic and Smoking Behaviors

Variable	CT n = 29 Mean (SD)	ST n = 28 Mean (SD)	Neutral n = 29 Mean (SD)	Group Comparison
Gender (% Males)	48.28	53.57	44.83	$X^2 = 0.44$, p = .802
Race (% Euro-American)	34.48	42.86	53.57	$X^2 = 0.95$, p = .622
Ambivalence	27.1 (29.4)	30.8 (60.6)	21.9 (19.4)	$F = 0.79$, $p = .917$
NDSS	30.0 (8.7)	30.6 (10.1)	29.5 (8.6)	$F = 0.12$, $p = .891$
# years smoking	5.3 (6.5)	4.8 (3.6)	4.2 (3.9)	$F = 0.35$, $p = .709$
Age of initiation	16.8 (1.5)	17.5 (5.2)	17.2 (2.4)	$F = 0.33$, $p = .719$
Cigs/day[a]	11.6 (8.0)	11.7 (7.7)	10.9 (6.9)	$F = 0.09$, $p = .913$
Cigs/day[b]	6.0 (6.4)	6.7 (5.1)	5.9 (4.7)	$F = 0.16$, $p = .856$
Last 7 days[c]	38.8 (44.1)	37.4 (34.9)	38.6 (30.1)	$F = 0.01$, $p = .988$
# quit attempts	3.1 (2.7)	3.2 (2.7)	1.8 (1.1)	$F = 1.80$, $p = .176$
Longest period without cigarette	79.8 (238.0)	88.8 (160.3)	77.9 (153.8)	$F = 0.03$, $p = .973$

[a]Cigarettes per day during heaviest period. [b]Cigarettes per day during recent period. [c]Total number of cigarettes smoking in past 7 days.

Table 3.

Coding Data Means (SDs) by Priming Condition

	Priming Condition		
Coding Variable	CT	ST	Neutral
PCT	59.81 (14.79)	61.00 (18.58)	53.53 (20.61)
Frequency			
Change Talk	16.90 (14.79)	18.25 (7.34)	15.69 (8.78)
Sustain Talk	11.48 (6.45)	11.68 (6.22)	13.17 (6.93)
Covariates			
Ambivalence	27.14 (29.35)	30.82 (30.63)	21.93 (19.42)
Dependence	29.96 (8.67)	30.63 (10.08)	29.47 (8.59)

Note. PCT = Percentage Change Talk; CT = Change Talk; ST = Sustain Talk

Table 4.

Bivariate Correlation Matrix of Percentage
Change Talk with Covariates

	PCT	Dependence
Ambivalence	.480 **	-.234 *
Dependence	-.009	

Note. PCT = Percentage Change Talk
p < .05; *p* < .01

Figure 1. Covariate adjusted mean PCT plot for priming conditions. Ambivalence and Nicotine Dependence are evaluated at their mean.