INTRODUCTION

Within psychotherapy, little study has been made of the neural processes underlying successful talk therapies. Those studies that have evaluated talk therapies have not examined the neural processes that occur within the therapy session itself. As an empirically supported treatment for substance abuse (Hettema, Steele, & Miller, 2005), motivational interviewing (MI) is a strong candidate for such a study.

A growing body of evidence indicates promising support for a change talk (statements indicating a client’s desire, ability, willingness, need, or commitment to change their behavior) as a mechanism of change in MI (Amrhein et al., 2003; Gaume, Gmel, & Daeppen, 2008; Houck & Movers, 2008; Movers, Martin, Houck, Christopher, & Tonigan, 2009; Vadder et al., 2010).

The present effort is a preliminary exploration of the brain activity underlying participants’ perception of their own change talk from an MI session using magnetoencephalography (MEG), a technique that uses superconducting sensors to infer the timing and location of electrical activity within the brain.

METHOD

Participants were six individuals who were ambivalent about their substance use. Each participant had a recorded MI session with Dr. Theresa Movers. Following each session an experienced language coder (J.H.) coded the session for CT and ST, including all utterances of Desire, Ability, Reason, Need, Commit, Taking Steps, and Other. The precise time of each change talk (CT) or sustain talk (ST) utterance was noted, and these utterances were extracted from the digital audio recording as separate files for use as stimuli during the MEG scan. These individual utterances were reviewed and those that would not be recognizable as change language outside of the session context, such as an endorsement of a therapist reflection, were excluded from use as experimental stimuli. CT utterances were generally longer (\( M = 3.10 \) s, SD = 1.50) than were ST utterances (\( M = 2.19 \) s, SD = 1.11).

During the MEG scan participants heard approximately 200 repetitions of these utterance types, intermingled and presented in a random order. Participants were instructed to listen for an infrequent neutral phrase and to respond with a button press whenever they heard it. Because eye movements generate large signal artifacts in MEG measurements, participants were also given visual blink prompts during the measurement session. MEG data were sampled at 1000 Hz using a 306-channel MEG array (Neuromag, Elekta AB) at the Mind Research Network (Albuquerque, NM). MEG data were co-localized to the anatomical MRI of each subject using a Polhemus head position device.

Using Elekta Neuromag Maxfilter software, signal artifacts and the effects of participant head movements were removed. In order to examine the spectral correlates of change talk, inter-trial coherence (ITC) was computed off-line in EEGlab (Delorme & Makeig, 2004) for a 1500 ms epoch relative to the onset of each change or counter-change talk utterance.

RESULTS

ITC plots showed significant activation in the theta (4-8 Hz), alpha (8-12 Hz), and beta (12-25 Hz) bands of oscillatory activity during the perception of both change and counter-change talk utterances. Significant differences between CT and ST were observed in the theta band in sensors over frontal (Figure 1a), temporal (Figure 1b), and posterior sites (Figure 2). Two general patterns were observed; in some sites theta activity was greater in CT than in ST (Figure 2a), while at others ST was greater than CT (Figure 2b), suggesting the presence of at least two different oscillatory networks. In contrast, sites over primary auditory areas (Figure 1b) showed no evidence of theta activity.

REFERENCES


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