DO INDIVIDUALS TRAINED IN MOTIVATIONAL INTERVIEWING SHOW AN ATTENTIONAL BIAS TOWARDS CHANGE TALK?

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ATTENTIONAL BIAS TOWARDS CHANGE TALK

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Abstract

Motivational Interviewing (MI) is a counselling method used to strengthen and encourage behaviour change that is centered on an individual’s own intrinsic motivation to do so. Attempts have been made to measure skilfulness in Motivational Interviewing (MI), however the most valid and reliable current methods are resource demanding and difficult to administer and score. During MI, the practitioner listens for statements by the client that are directional towards or away from positive change in their behaviour, referred to as Change Talk (CT) and Sustain Talk (ST). Using two attention bias tasks, the present study was conducted to test if MI practitioners showed attentional bias to CT and ST as evidenced by slower response to CT in a modified Stroop task, and faster response towards CT and ST in a dot-probe task compared to individuals who had no MI training. If this were found to be true, then there would be the potential to develop a new means of measuring practitioner skilfulness in MI. Participants consisted of three groups, those with no MI training (N = 36), some MI training (N=22), and Motivational Interviewing Network of Trainers (MINT) members (N=15) with considerable training in MI. The Stroop task showed that MINT members were significantly slower in responding to all words regardless of their meaning compared to the control group (None). This difference no longer existed between groups when age was removed as a co-varying factor. It is recommended that an easier, user-friendly means to measure MI practitioner skill and fidelity and continue to be explored and tested. If the Stroop or dot-probe were to be utilized again to attempt to measure attentional bias towards CT and ST, using age matched participants, and the implementation of supraliminal exposure or priming may present more desirable findings.
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Overview and Rational

Fidelity is the adherence to, and practicing of, the methodological strategies that are necessary for the accurate implementation of a given treatment (Bellg et al., 2004; Stone, 2015). If there is large variance in therapist fidelity when delivering a treatment then conclusions about the efficacy of an intervention are dubious at best (Bellg et al., 2004; Imel, Baer, Martino, Ball & Carroll; 2011). Stone (2015) argues that despite its importance and value in increasing treatment outcomes, and for replications in research, treatment fidelity has only recently become an important issue in the literature with little attention paid to this notion before the 1980’s.

Adherence and constancy to an intervention, along with therapist competency, are essential in treatment delivery for efficacious outcomes. Miller and Rollnick (2014) suggest three conditions that should be present in the delivery of an intervention for the best outcomes. Firstly, treatment should contain the components that align with the theoretical foundations of the intervention. Second, practitioners should meet a required standard of proficiency before treating clients. Lastly, treatment fidelity should be assured by measurements that are reliable and comparable to other skill levels in other studies.

As practitioners endeavour to best deliver evidence-based practices, the need for accessible and reliable measures that ensure treatment fidelity is evident (McMaster & Rosnicow, 2014; Stormont & Reinke, 2013). When developing and delivering behavioural treatments, monitoring treatment and therapist fidelity is fundamental in
ensuring best practice (Bellg et al., 2004).

Research has found that accurate treatment adherence and therapist competence in MI reflects positive change in client motivation and behavioural goals (Madson & Campbell, 2004; Martino, Ball, Nich, Frankforter & Carroll, 2008; Miller & Rollnick, 2014). Yet, Imet et al. (2011) found that the variance in adherence and competence within treatment providers of MI to be equal to or above adherence and competence to the MI between therapists. As MI continues to grow as a practice, there remains room for more cost effective and easily implemented ways to evaluate and measure practitioner skill and fidelity (Rosengren, 2009). The current study aims to explore a novel means of potentially measuring practitioner skilfulness in MI.

**Motivational Interviewing and its Application**

Motivational Interviewing is an increasingly popular evidence based person-centered counselling method used to help resolve ambivalence about change and to strengthen an individual’s own motivation to change (Miller & Rollnick, 2013). There is strong evidence for the efficacy of MI (Apodaca & Longabaugh, 2009; Lundahl, Kunz, Brownell, Tollefson & Burke, 2010; Miller & Rollnick, 2013; Rosengren, 2009). Research on MI was initially focused on its use as an intervention for alcohol abuse and other addictive behaviours (Armhein et al., 2003; Forsberg et al., 2010; Fu et al., 2015; Gaume, Bertholet, Faouzi, Gmel & Daeppen, 2013; Josephson, Carlbring, Forsberg, & Rosendahl, 2016; Miller & Rollnick, 2013; Moyers, Martin, Christopher, Houck, Tonigan & Amrhein, 2007; Shorey, Martino, Lamb, Larowe & Ana, 2015). In addition, research has found MI to be effective in promoting behaviour change in a number of other areas such as weight-loss and exercise (Pollak et al., 2016), chronic pain (Alperstein & Sharpe, 2016), medication adherence (Atkins Steyvers, Imel &
Smyth, 2014; Palacio, Garay, Langer, Taylor, Wood & Tamariz, 2016), preventative sexual health measures (Kahler et al., 2016; Seng & Lovejoy, 2013), gambling (Josephson, et al., 2016), and as a preparation for engagement in other treatments (Ibáñez, Vallespi, Sevillano, & Hernando, 2016; Lee, Choi, Yum, Yu & Chair, 2016; Miller & Rollnick, 2013; Romano & Peters, 2014; Zoffman et al., 2015).

Miller and Rollnick (2013) describe the ‘spirit’ of MI, in which practitioners are encouraged to guide clients collaboratively. The spirit stems from the heart of the practitioner and underlies one’s mindset when MI is practiced. The spirit includes developing a partnership with the client, acceptance (shown by the practitioner communicating the worth of the client, empathy, affirmations, and autonomy in support), compassion (prioritizing the well-being of the client), and evoking the client’s own motivation for change. It is highlighted that MI is done with a client to help them activate their own motivation, rather than a technique that is done to a client (Miller & Rollnick, 2013).

The fundamental processes of MI are: engaging and developing a trusting relationship with the client, focusing on and evoking Change Talk (CT; speech that favours moving towards positive behaviour change), and the planning and integration of a future direction. Research has shown that spirit and evocation of CT are crucial to MI (Miller & Rollnick 2013; Miller & Rose 2009). To achieve these processes, the practitioner uses core micro-counselling skills of open ended questions, affirmations, reflections and summaries.

Lundahl and colleagues (2010) found the above factors were essential towards positive outcomes in their meta-analysis investigating 119 studies across 25 years of empirical research of MI. Particularly, they found the quality of MI spirit and the
frequency of evocation of CT to be the strongest components of MI associated with positive behaviour change (Lundahl et al., 2010). Further, research on the mechanisms of change in MI and their effectiveness has found that the best predictor of positive behaviour change is the frequency and strength of CT used in a MI conversation (Apodaca & Longabaugh, 2009; Lundahl et al., 2010; Miller et al., 2008; Miller & Rose, 2009; Moyers, et al., 2007; Romano & Peters, 2014).

Change Talk and Sustain Talk

During MI, the practitioner listens for statements by the client that are directional towards or away from positive change in their behaviour, referred to as CT and Sustain Talk (ST) respectively. There are different types of CT. Some CT is preparatory, consisting of statements that reflect a ‘Desire to change’, an ‘Ability to change’, ‘Reasons to change’, and statements by a client that communicate a ‘Need to change’. Other CT are described as mobilising CT. These consist of statements by the client that indicate a ‘Commitment to change’, ‘Activation to change’, and ‘Taking steps to change’ (Apodaca & Longabaugh, 2009; Miller et al., 2008; Miller & Rollnick, 2013). In detail, ‘Desire to change’ statements express that the client wants to change towards the target behaviour. These include key words such as ‘want’ and ‘like’ in positive statements such as “I want to quit”. ‘Ability to change’ statements indicate how able the client feels they are to make the change, reflected in words such as ‘can’, ‘possible’ and ‘able’. ‘Reasons to change’ are the expected consequences of making a change such as “I will get cancer if I don’t stop smoking”. ‘Must’, ‘have to’ or ‘need’ such statements as “I need to do exercise” are included in ‘Need’ CT. Commitment to change encompasses the words ‘will’ and ‘can’ and is portrayed by the client in utterances such as “I am going to do this”. ‘Activation to change’ words
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may be ‘willing’, ‘ready’, and ‘prepared’ verbalised in statements, such as “I am ready go to the gym” that show that the client is ready to make changes in their behaviour. Finally, ‘Taking steps to change’ language signifies that the client has attempted or begun to change their behaviour. “I went to a gym class this week”, or “I didn’t buy any beer this week” are examples of a client implying that they are taking steps to change (Miller et al., 2008; Miller & Rollnick, 2013).

Conversely, ST is a statement made by the client that implies no intention of change, a negative attitude towards change, or complacency about one’s current situation (Magill et al., 2014; Miller & Rollnick, 2013). Sustain talk follows the same seven categories of statements as CT however it consists of antonyms of positive behavioural intentions. For example, a CT ability to change statement such as “I can change” would be “I can’t change” were it a ST statement.

Just as an increase in CT signals a positive change in behaviour, it has been found that an increase in ST is associated with less desirable outcomes (Apodaca et al., 2015; Barnett et al., 2014; Guame et al., 2013; Magill et al., 2014). Motivational interviewing involves the practitioner listening for these statements, selectively responding to CT and ST, and guiding the conversation to evoke and strengthen CT and soften or quieten ST.

Change Talk as a Predictor of Change

Change talk has been widely found as a stable predictor of behaviour change in MI (Lundahl et al., 2010; Magill et al., 2014; McMaster & Resnicow, 2015; Miller et al., 2008; Miller & Rollnick, 2013; Miller & Rose, 2009; Moyers et al., 2007; Romano & Peters, 2014). Miller and Rose (2009) argue that a major component of MI effectiveness is due to a practitioner’s distinct skill in recognising, eliciting, and
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strengthening CT. They posit that MI practitioners should be particularly attuned to CT and respond to it by either asking for elaboration or reflecting the CT in order to strengthen the clients motivation to change to (Lundahl et al., 2010; Miller & Rollnick, 2013; Miller & Rose, 2009).

The frequency and strength of CT is indicative of the likelihood of an individual to engage in behaviour change (Amrhein, Miller, Yahne, Palmer & Fulcher, 2003; Apodaca & Longabaugh 2009; Gaume, Apodaca, Walthers, Mastroleo, Borsari & Longabaugh, 2014; Miller & Rollnick, 2013; Miller & Rose, 2009; Moyers et al., 2007; Rosengren, 2009). Research has also found practitioner’s reflections of client CT to be a predictor of change (Atkins et al., 2014; Apodaca, Jackson, Borsari, Magill, Longabaugh, Mastroleo, & Barnett; 2015; Barnett, Spruijt-Metz, Moyers, Smith, Rohrbach, Sun & Sussman, 2014; Bricker & Tollison, 2011; Romano & Peters, 2014). Actively listening for CT is important for a practitioner as it allows the practitioner to reflect the CT, which encourages and evokes further CT from the client, strengthening the likelihood of positive behaviour change (Atkins et al., 2014; Bricker & Tollison, 2011; Lundahl et al., 2010; Miller & Rollnick, 2013).

It is also important that practitioners are able to hear and respond appropriately to ST as research has found that as ST increases, the likelihood of positive behavioural change decreases (Apodaca et al., 2015; Barnett et al., 2014; Guame et al., 2015; Miller & Rollnick, 2013; Rosengren, 2009). When ST is noticed a practitioner has the ability to soften or quieten this talk, thereby reducing it (Apodaca et al., 2015; Guame et al., 2015; Rosengren, 2009).

Apodaca et al. (2015) conducted an evaluation of MI therapist fidelity that was measured by their ability to elicit CT during 92 intervention sessions for alcohol
dependence. Therapists differed greatly in their capacity to direct client language
towards or away from change by focussing on CT and ST statements, and reflecting
or softening these respectively. Therapists’ MI Consistent Behaviour (MICO) led to
an increase in CT, which then predicted positive outcomes (a reduction in alcohol
consumption).

In a study of the effectiveness of MI in reducing substance use in teenagers,
Barnett et al. (2014) also found that reflecting CT elicited further CT, and reflecting a
client’s ST increased the likelihood of further ST. They found reflections of CT were
eleven times more likely to be followed by CT and less likely to be followed by ST.
Reflections of ST were 19 times more likely to be followed by ST, and less likely to
be followed by CT (Barnett et al., 2014).

In a study of the underlying mechanisms of MI, Romano and Peters (2014) found
that specific components of CT were particularly predictive of a positive behaviour
change. They reviewed 39 studies of MI and found CT to be a strong predictor of
positive outcomes. Usage and frequency of CT predicted reduced alcohol
consumption, increased healthy eating, and improved medication adherence (Romano
& Peters, 2014).

Some studies have found particular components of CT to elicit more positive
outcomes than others. In the same review study as above, Romano and Peters (2014)
found ‘preparatory’ and ‘taking steps to change’ subcategories of CT often predicted
further ‘commitment to change’ CT, resulting in a higher likelihood of positive
behaviour change overall.

Guame et al. (2013) investigated the effect of CT as a predictor of change
towards alcohol consumption in 127 young male soldiers after a brief (single session)
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MI intervention. They found that the frequency and strength of ‘ability’ and ‘desire’ (preparatory), and ‘need’ (commitment) CT predicted a positive change in drinking behaviours after six months. After the brief intervention however, at follow-up there was no overall effect for CT as a predictor for a reduction in drinking.

Amrhein and colleagues (2003), and Campbell, Adamson, and Carter (2010) found the strength of CT to be a stronger predictor of positive behaviour change than the frequency of CT during MI sessions. Additionally, both studies found particular subcategories of CT had more effect on these outcomes than others. Amrhein et al. (2003) coded frequency and strength of client speech over 84 video recorded MI sessions in a sample of illicit substance users also finding commitment language strength to predict days abstinent from drug use. Like Romano and Peters (2014) and Guame et al. (2013), commitment strength was predicted by ‘ability’ and ‘need’ language, as well as ‘desire’ utterances. Campbell et al. (2010) examined 28 client’s language (coded from audiotaped recordings), and behaviour change after three to four sessions of motivational enhancement therapy (an adaption of MI) for alcohol dependence. In addition to an increase of CT leading to positive outcomes (less drinking) after 6 months, they found commitment language had increased significantly over sessions in individuals who showed the most positive outcomes. Unremitted drinkers exhibited an increase of ST, and lower commitment and ability language strength compared to participants who had reduced their alcohol intake (Campbell et al., 2010).

Magill et al. (2014) reviewed 12 studies to compare therapist MI consistent skills with the outcomes of 1004 individuals who (primarily) exhibited problematic alcohol consumption. They too found client CT predicted behaviour change when MI
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was correctly practiced. Also inline with the aforementioned studies, they found that four of the six studies that measured subcategories of CT to report commitment change as the best predictor of positive change. Magill and colleagues’ study (2014) corroborates previous research showing the predictive value and the weight that CT and ST hold in outcomes of MI. Due to these findings, the authors argue that further advancements are warranted and necessary to understand the mechanisms of CT as a precursor to change (Magill et al., 2014).

The effect of CT at a neurobiological level has also been explored. Houck et al. (2013) recorded the MI sessions of ten participants who presented with ambivalent attitudes toward troublesome drinking behaviours and modified them by randomly repeating any CT and ST statements that were made. Participants were played the modified version of the recording and neural responses to their own CT and ST were monitored using Magnetoencephalography (MEG) neuro-imagery. Houck et al. (2013) found that the right hemisphere of the brain, particularly in areas which are synonymous with addiction, self-perception, and emotion control, were activated when the participants heard their own CT and ST in MI. Additionally, when a participant’s own ST was heard, neural activity in reward centres of the brain were also activated. This finding suggests that a client who hears or repeats his or her own CT is capable of stimulating neural responses that are perhaps fundamental for behaviour change.

These studies highlight the importance of CT as a key mechanism linked to behaviour change in successful MI interventions. This also highlights the importance for practitioners to be attuned to both CT and ST so that they can respond appropriately in order to strengthen CT or soften ST.
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MI Training: What We Know About Training and Outcomes

Demand for MI is growing, as is the need for more training to occur as it is applied more widely and in a variety of settings (Apodaca & Longabaugh, 2015; Isenhart, Dieperink, Thuras, Fuller, Stull, Koets & Lenox, 2013; Lord et al., 2015; Miller & Rollnick, 2013; Zoffman et al., 2015). In a review of MI training, Madson, Loignon and Lane (2009) found a wide variability in training held by practitioners of MI. Across 28 studies, training hours observed ranged from 9-16 hours on average, and in one study over 24 hours.

Alongside training, it is critical that the extent of a practitioner’s skilfulness in MI is measured to ensure that MI is delivered in a way that facilitates optimum outcomes for the clients (Madson et al., 2009; Miller & Mount, 2001, Schwalbe, Oh & Zweben; 2014). Forsberg et al. (2010) found that despite MI seeming a simple approach to helping individuals quit smoking tobacco, counsellors who found MI difficult to learn and retain. Despite improving their skills over a two-and-a-half year period with practice and ongoing supervision, there was great variance and fluctuations between the counsellors’ performance throughout the duration of the study (Forsberg et al., 2010).

The skilfulness of the MI practitioner is a major factor that contributes to the differences in behaviour outcomes (Bellg et al., 2004; Madson & Campbell, 2006; Miller & Rollnick, 2013; Miller and Rosengren, 2009; Sphor et al., 2016; Stone, 2015). Attempts have been made to measure skilfulness in MI, however as the most valid and reliable current methods are resource demanding they are not implemented as often as would be most beneficial (McMaster & Rosnicow, 2014; Moyers, Manuel & Ernst, 2014; Rosengren, 2009).
Despite a number of existing measures, an efficient and simple means to measure MI practitioners’ skilfulness continues to be sought (Atkins et al., 2014; Bellg et al., 2004; Madson & Campbell, 2006; Moyers, Miller & Hendrickson, 2005a; Sphor et al., 2016; Stone, 2015; Xiao, Imel, Georgiou, Atkins & Narayanan, 2015).

**Current Methods To Measure MI Skilfulness**

A number of measures have been developed to assess therapist skill and fidelity in MI. These include the Motivational Interviewing Treatment Integrity Code (MITI; Moyers, Martin, Manuel, Hendrickson & Miller, 2005b; Moyers, Martin, Manuel, Miller, & Ernst, 2010), the Manual for the Motivational Interviewing Skill Code (MISC; Glynn & Moyers, 2008; Miller, Moyers, Ernst, & Amrhein, 2008), the Video Assessment of Simulated Encounters (VASE-R; Orsengren, Baer, Hartzler, Dunn, Wells, Ogle, 2009), One Pass (McMaster & Rosnicow, 2014), and the Global Rating of Motivational Interviewing Therapist (GROMIT; Moyers, 2004).

Atkins et al. (2014) and Xiao et al. (2015) argue that current methods of measuring MI competency are time and energy exhaustive. Atkins et al., 2014 state that there is no ‘gold standard’ of measuring fidelity of MI and that hundreds of hours are spent dissecting, critiquing and meticulously assessing recorded sessions or transcripts of sessions by the existing methods. Pérula et al. (2013) and Lord et al. (2015) also call for more efficient approaches to assess practitioner competency in MI. They propose that the measurement of MI skilfulness should be applied by using computerized or programmed approaches, rather than the laborious and strenuous human coded techniques that currently dominate the assessment of MI skill and fidelity.
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The Motivational Interviewing Skills Code was the first tool developed to measure the effectiveness of MI training and the processes that occur within an MI session (Miller, Moyers, Ernst & Armhein, 2003; Moyers, Martin, Catley & Harris, 2003). Assessment of MI using the MISC 2.5 involves coding an entire session three times, each time evaluating different components of the session (assessing overall ‘global’ ratings of the session, language, and behaviours). Thus, although comprehensive, the MISC’s limitation is that it requires much time and resources, which deem it impractical for frequent use as an assessment tool for MI (Moyers et al., 2014; Moyers, Rowell, Manuel, Ernst & Houck, 2016).

The Motivational Interviewing Treatment Integrity code (Moyers et al, 2005b; Moyers et al., 2010; Moyers et al., 2014) is the most frequently used tool for assessing MI fidelity and practitioner skilfulness. Now at version 4.2.1, the MITI is a regularly updated and revised measure that demonstrates good sensitivity for practitioner improvement (Moyers et al., 2014). The MITI (version 4) requires an audio sample of a MI session, and a coder to undertake 20 hours of training and 20 hours of practice before coding (Moyers et al., 2016). Similar to previous MITI versions, the large amount of training and resources required limit its ease of use and decreases the likelihood of it being implemented as a re-test measure of practitioner skill over time (Dunn et al., 2014; Lord et al., 2015; Moyers et al., 2005a; Pérula et al., 2012; Seng & Lovejoy, 2013).

Pencil-paper based tools have been developed to measure MI skill and knowledge such as the Video Assessment of Simulated Encounters-Revised (VASE-R), the Helpful Responses Questionnaire (HRQ), and the MI knowledge and Attitudes Test (MIKAT), however there are limitations to the applicability of these measurements.
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The MIKAT does not measure skilfulness, but rather knowledge and attitudes consistent with MI, and has not been updated along with recent understandings of MI. The HRQ does provide a measure of skill, although this is limited to measuring reflective responses only. The VASE-R is a 35 minute video assessment that measures practitioner skills in Reflective Listening, Responding to Resistance, Summarizing, Eliciting CT, and Developing Discrepancy subscales, in addition to offering an overall skill global rating score of MI skill (Rosengren, Baer, Hartzler, Dunn, Wells & Ogle, 2009). To assess these skills, 18 items are coded from three video presented vignettes about substance use behaviours. Although the VASE-R has high inter-rater reliability, and concurrent validity with the HRQ and some measures of the MITI (Rosengren, Hartzler, Baer, Wells & Dunn, 2008), it too is resource demanding and is limited in its ability to reliably measure MI proficiency (Rosengren et al., 2008). The VASE-R guidelines require a specifically trained proctor to administer it to examinees. Trained scorers of the VASE-R must be familiar (although the level of familiarity is not measured or stated) with the general principles and specific techniques used in MI. Trainers are required to undertake four to eight hours of training to qualify to score the VASE-R and scoring of each examinee takes additional time to complete (the length of which is not clearly stated in the manual). The standard of MI proficiency required to ‘pass’ the VASE-R is tentative. The current interpretation states an acceptable level of proficiency of the VASE-R is a minimum cut off score of 75% correct for each of the five subscales and for the overall global rating. Rosengren et al. (2009) caution that this interpretation should not be relied on as a stand-alone measure of MI skilfulness and acknowledge the need for normalised proficiency rating scales.
Worthy of mention, although less often employed in the literature, are the GROMIT and the One Pass measures of practitioner skilfulness. The GROMIT (Moyers, 2004) consists of 15-items measured on a 7-point Likert scale. It is used to evaluate a practitioner’s overall skill with a particular focus on MI-spirit. While the GROMIT has produced good inter-rater reliability, over and above the four global ratings of the MISC (2.0), there are no studies as of yet that test its validity as a measure of MI skilfulness (Dobber et al., 2014; Resko, Walton & Cunningham, 2011). The One Pass is a more recent tool designed to measure MI skilfulness with relative ease and low cost compared to other measures (McMaster & Resnicow, 2015). The One Pass consists of 23 items measured on a 7-point Likert scale. Coders must read a training manual and it is preferable that they have undertaken basic MI training, thought this is not necessary (McMaster & Resnicow, 2015). The developers of the One Pass compared the One Pass to the MITI using 27 sessions of enacted MI. They found the One Pass’ assessment of Spirit was akin to the MITI. The One Pass showed good inter-rater reliability compared to the MITI, however its second rater’s coding was not included in the analysis as their ratings did not adequately correlate with the other two raters (rater two’s observations did not correlate with rater one or rater three). The percentage noted of open and closed questions, and reflection to question ratios during MI showed excellent reliability between the two tests for two of the three raters. Comparisons showed that the One Pass was only moderately correlated with the MITI in validity testing (McMaster & Resnicow, 2015).

More recently, there has been interest in computerised, or computer-assisted, methods of measuring MI skilfulness. Xaio et al. (2015) developed a speech and language processing tool to measure practitioner empathy by way of Automated
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Speech Recognition (ASR). Preliminary results showed the computerised programme was able to efficiently measure high and low levels of MI practitioner empathy (using the MITI version 3.0) across 200 MI sessions using ASR when compared to human coded ratings. Atkins et al. (2014) have developed a preliminary approach to assess MI by processing and calculating transcripts (using the MISC 2.1) through a text classification programme called The Labelled Topic Model (LTM). In their study, the LTM classified text from 148 MI session transcripts across five studies and results were compared to human rated codes of the same transcripts. The 148 transcripts took five weeks and 300 hours to assess, and 11 sessions were spent training the individuals doing the assessing (Atkins et al., 2014). Across sessions the model-based codes produced an accurate assessment of particular MI speech (such as open ended questions, giving information, and complex reflections) when compared to human rated codes. However, more work is to be done on the LTM as it failed to correctly identify open questions, and accurately discriminate between practitioner and client turns at talking within each MI session (Atkins et al., 2014).

As mentioned, practitioner ability to evoke and respond to CT appropriately is a key aspect of MI and its effectiveness. To-date there are no tools which specifically measure this skill, although aspects of it are assessed in the VASE-R and in the Cultivating CT scale in the latest revision of the MITI.

The aim of the current study is to measure if there is attentional bias towards CT in practitioners trained in MI, by utilizing a simple computer program that can be administered efficiently and produce easily calculated results. This is based on the assumption that good training in MI should produce practitioners who are attuned to CT and therefore may show attentional bias to CT. If an attentional bias in MI
practitioners is observed, this research may contribute to the development of a low
cost, low resource, and objective means to measure an important aspect of MI
skilfulness - attention to CT.

**Attentional Bias**

In this study, the extent to which CT and ST can elicit a measurable cognitive
response in MI practitioners is measured by observing response latencies in
attentional bias tasks towards CT, ST and neutral words. Attentional bias refers to the
process of selective allocation of attention resources towards specific information in
the environment. It is an automatic process that can occur very quickly and without
conscious awareness (Macleod, 2005; Williams, Mathews & Macleod, 1996). To be
efficient in information processing of the environment, individuals have a tendency to
automatically and unintentionally draw their attention to stimuli that is pertinent to
their own goals or circumstances rather than neutral stimuli (Williams et al., 1996).
Such biases are often investigated in relation to threat, however research has found
evidence for attentional bias in studies of particular psychological features and
behaviours (e.g. frowning, anxiety, attractiveness), occupationally relevant stimuli
(e.g. alcohol related words for individuals who work in an alcohol rehabilitation),
workplace safety compliance (e.g. safety related words such as ‘careful’ and
‘cautiousness’) (Macleod, 2005; Ryan, 2002; Williams et al., 1996; Xu, Li, Wang,
Yuan, Ding, & Sheng, 2014).

The current study will employ two cognitive visual attention tasks. A modified
Stroop task will measure potential attentional bias towards CT; and a dot-probe task
will be used to measure attentional bias toward CT and ST. Response times in these
tasks will be recorded to determine if any attentional bias occurs. It is hypothesised
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that individuals who are trained in MI will exhibit a bias towards CT and ST as a result of being distracted by their meaning compared to a control group, and compared to words that are neutral in meaning.

As MI involves listening and responding verbally, this study also sought to employ an auditory attention task, the Dichotic Listening task. The dichotic listening task is used primarily to show the phenomenon of how an individual is likely to show a bias in attention towards a familiar word or a word of interest, such as their name or a word signifying threat, compared to other words that are of a neutral meaning (Cherry, 1953; Moray, 1959; McDermott, 2009; Techentin & Voyer, 2010). The literature, however, does not provide robust findings for the context in which this research aimed to use it (an ‘expert’ context) and therefore this task was discarded from the current study (Colflesh & Conway 2007; Dupoux, Kouider & Mehler, 2003; Hugdahl, 2011; Techentin & Voyer, 2010a; Techentin & Voyer, 2010b).

**The Stroop Task**

The Stroop task is a simple yet sophisticated paradigm that has been used since 1935 to investigate attentional processing in cognitive psychology, with its practical use extending to the clinical setting (Macleod, 2005; Stroop, 1935). In the original Stroop task, the participant was asked to name the colour of a typed word, on a card. It was found that a lapse in response time occurred when the word colour was incongruent with the colour of the printed word. For example, the word ‘black’ printed in red ink. The differing colour word caused a distraction for the participant and slowed down their cognitive processing, therefore creating a longer response time in naming the colour of the ink (Stroop, 1935; Williams et al., 1996).
Today computers are employed for the Stroop task allowing individuals to respond verbally or via a keyboard to the stimuli presented in the task. Modified Stroop task words differ in content depending on their relevance to the topic that is being researched. For example, if one were investigating eating disorders, a target word might be ‘plate’, ‘muffin’, or ‘hunger’. These target stimuli are likely to cause a disturbance in a participant’s cognition and reaction thereby slowing the participant’s response time (for example pressing a key to signify detection) to the word as they have relevance to the individual compared to neutral words (Macleod et al., 1986; Macleod, 2005; Macleod & Macleod, 2005; Williams et al., 1996).

Research using modified emotion-based versions of the Stroop shows that words which imply threat take longer to name, evoking a slower response time than words that are of no relevance to an individual. During a modified Stroop task, the meaning of the word that is presented is not overtly important or attended to during the experiment, instead it is the colour of the word that the participant is asked to respond to. It has been repeatedly shown that words that imply threat foster an increase in cognitive processing, and emotional response to the word’s content and thus slow down the response time to name the colour of the threat word compared to naming the colour of a neutral word (Macleod et al., 1986; Macleod, 2005; Macleod & Macleod, 2005; Matthews & Klug, 1992; Williams et al., 1996). Additionally, many studies have shown that individuals with certain psychopathologies (e.g. depression, anxiety, eating disorders) take longer to name words that are related to their disorder compared to neutral words or a control group due to the distraction caused by the meaning of the word to the individual which consequently slows the colour-naming response time (Macleod, 2005; Williams et al., 1996).
Mathews and Klug (1993) employed a modified Stroop task to investigate clinically anxious participants’ attentional bias, towards emotional and threatening words. They found the target stimuli (threat related words) that were personally relevant to each individual participant elicited a greater attentional bias, regardless of the words positive or negative valence. They attributed the interference observed to the semantic significance of a word and the participants’ existing emotional concerns. Mathews and Klug (1993) concluded that the matching of words with personally relevant meaning may, in future tests, be a superior predictor of interference than general lexical examples of a given condition.

In addition to the emotional and pathological uses for the Stroop task, it has also been successfully employed in non-pathological, or ‘expert’ contexts. Imbrosciano and Berlach (2005) found a modified Stroop task predicted academic performance, intelligent quotient (IQ), general behaviour in the school setting, and socio-economic status in young students. They posit that a modified Stroop task may be a robust and precise tool to employ in a non-pathological context that warrants further investigation (Imbrosciano & Berlach, 2005).

Similarly, Dalgleish (1995) used a modified Stroop to test and compare the attentional bias of groups of clinically anxious individuals with a group of experts in their field (of ornithology) and found ‘expertise effects’ (p.344). The ornithologists were equally attuned to words that were relevant to their field of expertise (such as ‘Quail’ and ‘Mallard’) as were the anxious group towards words associated with threat (such as ‘Fear’ and ‘Tense’). No significant difference was found between the test groups (‘anxious’ and ‘expert’) and both groups exhibited significantly elevated
response times towards the target stimuli compared to the control group (Dagleish, 1995).

Interestingly, in a study of attentional bias and alcohol dependence, Ryan (2002) found that staff from a rehabilitation clinic showed a bias in attention to alcohol related words which was not significantly different to the clinical population who displayed problem-drinking behaviours. Like Dagleish (1995), he argues that expertise in a given field, or words with particular relevance to an individual can, like emotionality or psychopathological meaning, create an interference in Stroop performance.

These findings provide evidence for the use of the Stroop test as a valid means to investigate the attentional bias of individuals in a non-emotional context by using words that are typically relevant to a participant’s areas of expertise as target stimuli. It is hypothesised that MI practitioners will exhibit an attentional bias towards CT stimuli compared to neutral stimuli, as measured by a slower response time in naming the ink colour of the word, than the control group.

The Dot-Probe Paradigm

Traditionally, like the Stroop task, dot-probe tasks have been used to measure the emotional bias of word processing in populations of people presenting with anxiety, phobias, sexual dysfunction, and chronic pain (Beard & Amir, 2010; Dear, Sharpe, Nicholas & Refshauge, 2011; Haggman, Sharpe, Nicholas & Refshauge, 2010; MacLeod, Mathews & Tata, 1986; Mogg, Bradley, Dixon, Fisher, Twelftree & McWilliams, 2000; Putwain, Langdale, Woods & Nicholson, 2011; Schoth, Delgado Nunes & Liosis, 2011; Sutton & Altarriba, 2011). Additionally, it has been used to
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identify selective attention towards non-clinical demographics investigating attentional bias towards racial features, attractive faces and romantic appeal, and the lure of financial success (Al-Janabi, MacLeod & Rhodes, 2012; Ma, Zhao, Tu & Zheng 2015; Sigurjónsdóttir, Björnsson, Sigurbjörg, Ludvigsdóttir & Kristjánsson, 2015). In this task a series of words in short statement pairs appear in the centre of a computer screen, one atop the other. Participants respond to a visual probe (a ‘dot’), which appears in the same spatial location as was either a neutral or a target statement (or image) as fast as possible. The dot-probe is similar to the Stroop task as a participant’s response latency demonstrates a distraction from the target stimuli for the participant. Different to the Stroop, however, attentional bias is shown by a faster response latency to the probe. It is hypothesized that if the probe appears in the position of a target stimulus, the participant will respond much faster to this stimuli, as attention is already directed to the target’s spatial position due to personal or emotional relevance to the participant (MacLeod, Mathews & Tata, 1986).

The Stroop and Dot-Probe Task Employed Together

There are many experiments that have employed both a modified dot-probe task and a modified Stroop task to measure attentional bias. These tasks have been used together in both a pathological context such as in experiments containing emotion-related stimuli, and in expert contexts (Egloff & Houck, 2003; Johansson, Ghaderi & Andersson, 2004; Mogg et al., 2000; Xu et al., 2014).

Mogg et al. (2000) used both a modified Stroop task and a dot-probe task to investigate attention bias towards threat in a normal population by measuring participants response times when presented with physically related (such as ‘mutilated’, or ‘cancer’) and socially threatening words (such as ‘despised’ and
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‘pathetic’). In their study main effects were found in both the Stroop and dot-probe tasks for words that indicated social threat, however there was no relationship between the Stroop task and the dot-probe task for the overall main effect of threat bias. They argue that the difference in the results suggest that the tasks target and elicit responses from different parts of the brain. Similarly, Xu et al. (2014) employed two modified Stroop tasks and a dot-probe task in an expert context to measure attentional bias towards safety related stimuli as a predictor of safety awareness in the workplace. They investigated employees’ bias towards safety behaviour with a goal of minimizing workplace accidents. Significant results were found demonstrating attentional bias towards safety related stimuli during the modified Stroop tasks, however not in the dot-probe tasks (Xu et al., 2014).

On the other hand, Egloff and Houck (2003) employed both of the above measures of attentional bias to measure 53 undergraduate participants’ reactions to threat-related stimuli. They found similar results in both the emotional Stroop and the dot-probe task which they concluded was perhaps due to the underlying mechanisms of these tests being alike, despite the differences in procedures.

Johansson et al. (2004) assessed sensitivity to food and body focused stimuli using a Stroop task and a dot-probe task. An overall attentional bias on the dot-probe task was found, but only when the target stimuli were situated on the lower half of the computer screen. Additionally, instead of high external eaters directing their attention towards food related cues as hypothesized, they found the opposite to be true with attentional bias diverted away from the food stimuli in the dot-probe task. They also found a trend toward greater Stroop interference for participants who presented as high external eaters compared to those low external eaters when detecting food

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stimuli. No significant differences were found in attentional bias towards food and body related words between the Stroop task and the dot-probe task (Johansson et al., 2004).

Thus, previous studies that have employed both the dot-probe and a Stroop task to measure attentional bias have reported mixed findings. Some studies have found both tasks to work similarly in detecting and measuring attentional bias towards emotional threat, and some studies have reported that the Stroop and dot-probe elicit dissimilar outcomes, or fail to produce significant findings in either task (Egloff, 2003; Everaert, 2013; Johansson et al., 2004; Mogg et al., 2000; Xu et al., 2014).

The current will employ both measures of attentional bias with the same sample of MI practitioners and controls in each task. By employing both tasks of attentional bias, this paper aims to explore if attentional bias towards CT (Stroop task) and CT and ST (Dot-probe task) exists, and if so, which is the best method to provide a simple and effective way to measure MI practitioner bias towards CT and ST.

The Current Study

The purpose of the current study is to measure if there is attentional bias to CT or ST by practitioners trained in MI using a modified Stroop task and a dot-probe task. It is hypothesized that a CT statement will elicit a longer response latency for individuals who are trained in MI on the modified Stroop task compared to individuals who have no MI training due to the effect of being distracted by the meaning of the word. During the dot-probe task, it is hypothesised that MI practitioners will respond faster than controls to target stimuli when it is congruent with the positioning of the probe (dot) as a result of their gaze being fixed on a CT or
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ST statement. Furthermore, it is hypothesised that CT will elicit a faster response than ST for individual’s who are trained in MI compared to the control group.

The study has the potential to add to development of a novel means of measuring MI practitioner skilfulness and the effectiveness of MI training by assessing attention to CT, a crucial component of MI.
Method

Design

The study is a between groups and within groups design. In the modified Stroop task, the factors that vary within groups are reaction times towards the CT and neutral words. Within group factors that differ in the dot-probe task are reaction times towards CT, ST and neutral statements. Between groups differences are the three levels of MI training of the participants, that is, no MI training (None), some MI training (Some), and highly trained in MI (MINT).

Participants

Seventy-three participants (49 females, 24 male), with ages ranging between 18 and 72 (M=31.7, SD = 14.1 years) participated in the study. Participants were recruited between August 2015 and October 2016. Participants (N=73,) comprised of 15 MINT practitioners, 22 individuals who have completed some MI training (a minimum of one hour to one days training, up to three to four days training) and 36 undergraduate students from the University of Canterbury who had not received any training in MI (i.e., control). The undergraduate students received course credit for their participation. Individuals who had some training in MI received a $10 retail voucher for their time. Members of MINT did not receive any compensation for their time. Their participation was voluntary as helping the MI community is a core value of MINT. Participants were recruited in Christchurch and Auckland in New Zealand, and in Vancouver, Canada. All participants appeared proficient in English and clearly stated they understood the conditions of the study. Exclusion criteria were if the participant could not understand the information sheet or the tasks’ instructions, or if the participant experienced visual difficulties during the experiment.
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Apparatus

The experiment was run using E-Prime® 2.0. Stimuli for the tasks were displayed on a Lenovo T500 laptop computer with a 14.1 inch colour screen display and 1280 x 800 pixel screen resolution. Stimuli were drawn in lowercase letters, which were presented in Calibri font, size 36. All stimuli were centered vertically and horizontally on the screen. Red, yellow, blue and green sticker patches were placed on z, x, n, and m letter keys respectively for use in the Stroop task. Keys were used to signify top (‘t’) or bottom (‘b’) in the dot-probe task. The same computer was used for each task and for each participant.

**Modified Stroop Task.** Words were randomly selected through E-Prime® 2.0 and were presented for 500ms, followed by a mask (XXXXXXX) for 500ms. Stimuli consisted of twenty neutral and twenty CT words. Neutral words were selected from an online random word generator (creativitygames.net). Change talk words were selected from the Revision for Client Language Coding: MISC 2.1 manual (Miller et al., 2008), and from Miller and Rollnick’s book, Motivational Interviewing: Helping People Change (2013). Words were matched for frequency (wordcount.org) to ensure familiarity to participants was equal between both CT and neutral words. Word frequency was tested for the CT and neutral categories using t-tests for independent means to ensure they were consistent across groups (all p’s > 0.05). This ensured that if an effect is found this will be due to the experimental intent as opposed to a words salience in everyday language (Spiegelhalder, Espie, Nissen & Riemann, 2008; Techentin & Voyer, 2010).

**Dot-probe task.** The CT, ST, and neutral statements were checked for frequency and syllable length using wordcount.org. T-tests for independent means
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were again employed to ensure consistency in familiarity and syllable length across conditions in reading task demand (all $p$’s > 0.05) (Spiegelhalder, Espie, Nissen & Riemann, 2008; Techentin & Voyer, 2010). Like the Stroop task, CT and ST words were selected from the Revision for Client Language Coding: MISC 2.1 manual (Miller et al., 2008), and from Miller and Rollnick (2013). Two hundred and sixty trials were presented to each participant. Each time stimuli consisting of a CT or an ST, and a neutral statement, appeared across in the centre of the computer screen for 500ms, one above the other. After a 500ms interval, a ‘dot’ shape then appeared in the position of the previously displayed CT, ST or neutral statement. Participants were instructed to press a corresponding key to the position of the dot as fast as possible (‘t’ for on top of the fixation cross and ‘b’ for below the fixation cross). Response latency was measured as the time taken for the participant to respond to the target dot-probe. This involved a target statement (CT or ST) followed by a probe in the form of a dot that replaces either the target statement (“congruent” trials) or a neutral statement (“incongruent” trials). All 260 trials were randomly presented in the combinations seen below in Table 1.
Table 1

Congruency and Combinations of Positions of Target (Change and Sustain) Statements and Neutral statements for dot-probe task

<table>
<thead>
<tr>
<th>Congruency</th>
<th>Statement Combination</th>
<th>Positioning of Target Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>[Change Statement]</td>
<td>Top Response</td>
</tr>
<tr>
<td>No</td>
<td>[Change Statement]</td>
<td>Bottom Response</td>
</tr>
<tr>
<td>No</td>
<td>[Neutral Statement]</td>
<td>Top Response</td>
</tr>
<tr>
<td>Yes</td>
<td>[Neutral Statement]</td>
<td>Bottom Response</td>
</tr>
<tr>
<td>Yes</td>
<td>[Sustain Statement]</td>
<td>Top Response</td>
</tr>
<tr>
<td>No</td>
<td>[Sustain Statement]</td>
<td>Bottom Response</td>
</tr>
<tr>
<td>No</td>
<td>[Neutral Statement]</td>
<td>Top Response</td>
</tr>
<tr>
<td>Yes</td>
<td>[Neutral Statement]</td>
<td>Bottom Response</td>
</tr>
</tbody>
</table>

Procedure

Ethical approval was granted by the University of Canterbury (Appendix A). All participants received an information sheet outlining the details of the study (Appendix B). All participants signed a consent form confirming their understanding of the study and their consent to take part (Appendix C).

For the Stroop Task participants sat approximately 50 centimetres from the display screen. First, the participants completed a practice Stroop task consisting of twenty trials of neutral (non MI related) words that were not then presented in the experimental task (see Appendix F.1). Participants were instructed to press the colour key presented on the keyboard (red, yellow, blue and green) that was analogous to the colour that a word presented in on their computer display. Participants then completed the experimental modified Stroop task of 240 trials from a twenty-word selection (see Appendix F.2), pushing the corresponding key on their keyboard to the colour that the written stimuli appeared as practiced. This task took approximately 10 minutes to
complete. Participants were then instructed to wait for the experimenter to continue to
the next task.

For the Dot-Probe Task participants were instructed to look at a fixation cross
(+) in the middle of their screen for the dot-probe task. Twenty trials with neutral
statements different to those in the experimental task were completed by each
participant to practice the task and familiarise oneself with the instructions (see
Appendix F.3). During this time the participants were made aware of any mistakes
they had made and were quick to self-correct. Two hundred and sixty trials were then
presented from a sixty-word selection consisting of twenty CT, twenty ST, and twenty
neutral statements (see Appendix F.4). This task also took approximately 10 minutes
to complete.

Once the experiment was completed, participants completed a questionnaire
(Appendix D) regarding their level of MI training, handedness, and specified whether
or not visual impairment was experienced during the task. A debriefing form
explaining the experiment was then presented to participants (Appendix E.) and an
opportunity to ask any questions was offered, as required by the Ethics Committee of
the University of Canterbury.

Data Analysis

Data were analysed using IBM SPSS Statistics (Version 22.0) for Windows.
Before conducting the statistical analyses of the Stroop data, the response latency data
was investigated for outliers. Response latency was measured as the time taken for the
participant to respond to the word colour. As with previous research, reactions that
were faster than 200ms or longer than 1000ms were not recorded in the data
collection (Dagliesh, 1995; Imbrosciano & Berlach, 2005; Macleod, 2005; Williams
et al., 1996). The data were checked for correlations with age, handedness and gender. A one-way Analysis of Variance (ANOVA) was run to determine if the relationship between Age and Group were significant. Assumptions were met for normality, sphericity, and homogeneity of variance, which meant a repeated-measures Analysis of Covariance (ANCOVA) could be conducted controlling for age. Tukey post hoc tests were employed as group sizes were under 50.

The data were examined for normality and a Shapiro-Wilk test was employed as this best assesses normality of data skewed to the right (Field, 2013). A log transformation was performed on the data to remedy the skewness. A further Shapiro-Wilk test of the transformed data showed that it no longer violated this assumption ($p > .05$) and a repeated-measures ANOVA was run to analyse potential effects between groups and the stimuli conditions of CT and Neutral stimuli.

As with the Stroop, pre-analyses the dot-probe response latency data were investigated for outliers. Akin to previous research, all reaction times under 200ms or exceeding 1500ms were omitted from the data. It is posited that responses under 200ms are too fast for the participant to have engaged with the stimulus, and a response over 1500ms is not an automatic response to the exposed stimuli as use of the dot-probe aims to elicit (Beard & Amir, 2010; Dear et al., 2011; Johansson et al., 2004; Ma et al., 2015; Mogg et al., 2000). The data were checked for correlations of reaction times with age, handedness and gender, of which there were none.

The data were examined for normality using a Shapiro-Wilk test. Outliers over 3 standard deviations were identified and removed. A further Shapiro-Wilk test of the remaining data showed that it no longer violated this assumption ($p > .05$) for the majority of the data and a multi-factorial repeated-measures ANOVA could be run to
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analyse potential effects between groups and the stimuli conditions of CT, ST, and Neutral stimuli. A Games-Howell post hoc test adjusting for unequal variances was used as this test is most robust for small data sets containing unequal variances (Field, 2013).

Attention bias scores were calculated by subtracting reaction times from congruent trials (target word and probe) from incongruent trials (neutral word and probe) for each of the four conditions (top positioning change, bottom positioning change, top positioning sustain, bottom positioning sustain). Friedmans two-way analysis variance of ranks non-parametric test was employed to analyse the data within the groups as the data were not normally distributed despite the removal of outliers. To measure between group differences a Kruskal-Wallis non-parametric test was employed. One-Sample Wilcoxon Signed Rank Tests were employed to test if the bias scores differed from zero, thus indicating whether a bias is observed or not (Beard & Amir, 2010; Haggman et al., 2010; Mathews & MacCleod, 1986). An ANOVA was run to investigate if there were any difference in the dot-probe errors.
Results

Modified Stroop Task

All participants completed the Stroop task. Three participants experienced difficulty in the dot-probe task and their results were withdrawn only from the dot-probe task data. Table 2 below provides demographic information of the 73 participants that took part in the Stroop task by previous MI training experience. Overall, sixty-five (89%) participants were right hand dominant and 8 (11%) were left hand dominant.

Table 2

*Participants' Demographics by Level of MI Training Group*

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Some</th>
<th>MINT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total in Study</strong></td>
<td>36 (49%)</td>
<td>22 (30%)</td>
<td>15 (21%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>23 (64%)</td>
<td>18 (86%)</td>
<td>8 (50%)</td>
</tr>
<tr>
<td>Male</td>
<td>13 (36%)</td>
<td>3 (14%)</td>
<td>8 (50%)</td>
</tr>
<tr>
<td><strong>Age, Years (SD)</strong></td>
<td>21 (6.6)</td>
<td>39.7 (12.44)</td>
<td>47.5 (4.7)</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>18-49</td>
<td>25-72</td>
<td>37-54</td>
</tr>
<tr>
<td><strong>Handedness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>30 (83%)</td>
<td>20 (91%)</td>
<td>15 (100%)</td>
</tr>
<tr>
<td>Left</td>
<td>6 (17%)</td>
<td>2 (9%)</td>
<td>0</td>
</tr>
</tbody>
</table>

Correlations between reaction time to CT or Neutral stimuli and demographic factors were inspected. Older participants had a tendency for longer reaction times in both the CT \((r (73) = .54, p < .01)\) and Neutral \((r (73) = .55, p < .01)\) conditions. Reaction times can be seen below in Table 2.
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Age differed between groups (one-way ANOVA; \( F (2,70) = 62.60, p < .001 \)). The group with no previous training (None) was younger than both the Some and MINT groups (post-hoc Tukey; \( p < .01 \)) The MINT group was older again than Some training group (\( p < .05 \)).

Table 2

<table>
<thead>
<tr>
<th>Training Level</th>
<th>CT</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M (SD) )</td>
<td>( M (SD) )</td>
</tr>
<tr>
<td>None</td>
<td>586 (68)</td>
<td>583 (78)</td>
</tr>
<tr>
<td>Some</td>
<td>668 (72)</td>
<td>669 (69)</td>
</tr>
<tr>
<td>MINT</td>
<td>673 (61)</td>
<td>679 (71)</td>
</tr>
</tbody>
</table>

Due to the correlations between age and reaction time, and group differences in age, a 3 x 2 (Training level x Stroop condition) repeated-measures ANCOVA controlling for age was used. Age was a statistically significant covariate \( F (1,69) = 4.97, p < 0.05 \), overall explaining 68% of the variance in reaction times. There was no main effect of type of training or the variant of Stroop task used \( (F < 1.49, p > 0.1, \) and \( F < 0.36, p > 0.1 \) respectively). Additionally, there was no interaction between training group and stroop variant \( F (2,69) = 0.03, p > 0.1 \). Thus, reaction times did not differ in the Stroop task when age was accounted for.

Modified Stroop Task Errors

Descriptive statistics of the error rates in each condition by training level group can be seen in Table 3. Visual inspection of box plots indicated the data was
skewed which was corroborated by Shapiro-Wilk’s tests for normality. All groups in both CT and Neutral stimuli conditions were non-normal \((p < .05)\). Means, medians, and skewness also can be seen in Table 3. In order to meet the requirement of normally distributed data for repeated-measures ANOVA a log transformation was used. After transformation, all data was normally distributed.

Table 3

*Participants’ errors, and Mean, Medina, Range, and Skewness of errors for Change Talk (CT) and Neutral words by group*

<table>
<thead>
<tr>
<th></th>
<th>No MI training (N= 37)</th>
<th>Some MI training (N=20)</th>
<th>MINT training (N=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total of responses</td>
<td>6.94%</td>
<td>5.77%</td>
<td>11.03%</td>
</tr>
<tr>
<td>M (SD)</td>
<td>16.7 (9.6)</td>
<td>13.9 (13.3)</td>
<td>26.5 (24.7)</td>
</tr>
<tr>
<td>Median</td>
<td>15</td>
<td>9.5</td>
<td>19</td>
</tr>
<tr>
<td>Skewness (SE)</td>
<td>1.63 (.39)</td>
<td>2.15 (.49)</td>
<td>1.93 (.58)</td>
</tr>
<tr>
<td>Total CT errors M (SD)</td>
<td>17.9 (15.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total of responses</td>
<td>6.54%</td>
<td>6.55%</td>
<td>11.11%</td>
</tr>
<tr>
<td>M (SD)</td>
<td>15.7 (9.4)</td>
<td>15.7 (14.5)</td>
<td>26.7 (24.4)</td>
</tr>
<tr>
<td>Median</td>
<td>14.5</td>
<td>10.5</td>
<td>19</td>
</tr>
<tr>
<td>Skewness (SE)</td>
<td>2.39 (.39)</td>
<td>1.96 (.49)</td>
<td>2.23 (.58)</td>
</tr>
<tr>
<td>Total Neutral errors M (SD)</td>
<td>18 (15.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Training group had a statistically significant effect on errors in the Stroop task overall \((F (2,70) = 3.54, p < .05)\), but there was no effect of Stroop task version, nor an interaction between the two \((F (2,70) = 0.88, p > .10)\), and \((F (2,70) = 1.35, p > .10)\)
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respectively). A post hoc Tukey’s HSD test on the main effect of Training group indicated the MINT training group made statistically significantly more errors than the group with Some training ($p < .05$). The group with No training did not differ to either of the other groups, having an average error score between the two.

As the Stroop task results were accounted for by age, it was anticipated this may be the case for errors also, however no correlation was evident between Age and Stroop errors. Thus, unlike reaction times, differences in Stroop errors were not explained by age.

**Dot-probe Task**

Table 4 provides demographic information of the 70 participants whose data was included for analysis for the dot-probe task by previous MI training experience. Unlike the Stroop data, there was no relationship between age, group, or condition of significance in the dot-probe task (all $p$’s > 0.05). Additionally, there was no correlation between handedness or gender with reaction times.
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Table 4

Participants' Demographics by Level of MI Training Group

<table>
<thead>
<tr>
<th></th>
<th>None N (%) or M (SD)</th>
<th>Some N (%) or M (SD)</th>
<th>MINT N (%) or M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total in Study</td>
<td>36 (51%)</td>
<td>20 (29%)</td>
<td>14 (20%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>23 (64%)</td>
<td>13 (65%)</td>
<td>7 (50%)</td>
</tr>
<tr>
<td>Male</td>
<td>13 (36%)</td>
<td>7 (35%)</td>
<td>7 (50%)</td>
</tr>
<tr>
<td>Age, Years (SD)</td>
<td>21 (6.7)</td>
<td>39.7 (13)</td>
<td>45.4 (8.9)</td>
</tr>
<tr>
<td>Range</td>
<td>18-49</td>
<td>25-72</td>
<td>37-54</td>
</tr>
<tr>
<td>Handedness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>31 (86%)</td>
<td>18 (90%)</td>
<td>13 (93%)</td>
</tr>
<tr>
<td>Left</td>
<td>5 (14%)</td>
<td>2 (10%)</td>
<td>1 (7%)</td>
</tr>
</tbody>
</table>

Mean probe reaction latencies for each condition and training level group can be seen below in Table 5. Upon visual inspection of box plots of the data it was apparent that it was not normally distributed, with reaction times skewing to the left. This observation was corroborated by a Shapiro-Wilk test for normality with groups for the CT and Sustain talk (compared to Neutral Stimuli in the congruent and incongruent conditions) violating this assumption ($p < .05$). Data was checked and a student residuals test found 13 outliers (2.3% of the total mean scores) across both the CT and ST conditions. When these outliers were removed from the data distributions of reaction times were similar for all groups, as assessed by a visual inspection of the boxplots. A further Shapiro-Wilk test of studentised residuals found the removal of the outliers changed the distribution and normality was no longer violated for 21 of the 24 test conditions ($p < .05$). The three scores that violated the assumption of
normality lay in the None training group, non-congruent bottom position for change talk and sustain talk (both \( p < 0.01 \)), and in the None training congruent bottom position sustain talk. Thus the data was approximate enough to normal distribution to employ a multi-factorial repeated-measures ANOVA (Field, 2013; Laerd Statistics, 2016).

A 2 (congruency: yes, no) x 2 (probe position: top, bottom) x 2 (talk type: change, sustain) by group (None, Some, MINT) repeated measures ANOVA was run. No main effect was found in a congruency x talk type x position interaction (\( F(2,63) = .252, p = 0.617 \)), however a main effect was found in a congruency x talk type x position x group interaction (\( F(2,63) = 3.265, p = 0.045 \)). A between group main effect was found for group type, \( F(2,63) = 4.261, p = 0.018 \), with the None group (\( M = 452.7, SE = 14.2 \)) reacting fastest over all compared to the Some training group (\( M = 477.9, SE = 20 \)), and the MINT group the slowest (\( M = 535.2, SE = 24.5 \)). Follow up analyses using Games-Howell post hoc test adjusting for unequal variances however, found no statistically significant differences between these groups (all \( p > 0.05 \)).
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Table 5

Mean and range of reaction time (ms) towards Change talk, Sustain talk, and Neutral statements in each MI Training Level Group.

<table>
<thead>
<tr>
<th></th>
<th>No MI training</th>
<th>Some MI training</th>
<th>MINT training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congruent- top</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CT M (SD)</strong></td>
<td>465.7 (84.9)</td>
<td>476.3 (60.5)</td>
<td>553.8 (171)</td>
</tr>
<tr>
<td>Range</td>
<td>348.7 – 670</td>
<td>395.7 – 1070.7</td>
<td>342.4 – 854.2</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>463.3 (76.8)</td>
<td>490.7 (69.6)</td>
<td>529 (133.2)</td>
</tr>
<tr>
<td>Range</td>
<td>347 - 628</td>
<td>399 – 598</td>
<td>358 – 847</td>
</tr>
<tr>
<td>Congruent- bottom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CT M (SD)</strong></td>
<td>440.2 (60.7)</td>
<td>466.7 (57)</td>
<td>525.1 (147.7)</td>
</tr>
<tr>
<td>Range</td>
<td>325 - 549</td>
<td>381 - 585</td>
<td>344 – 824</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>450.3 (94.2)</td>
<td>461.5 (68.1)</td>
<td>549.1 (137.4)</td>
</tr>
<tr>
<td>Range</td>
<td>328 - 756</td>
<td>353 – 589</td>
<td>333 – 810</td>
</tr>
<tr>
<td>Incongruent - top</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CT M (SD)</strong></td>
<td>441.1 (62.6)</td>
<td>477.6 (70.4)</td>
<td>532.6 (171.2)</td>
</tr>
<tr>
<td>Range</td>
<td>344 - 580</td>
<td>370 - 595</td>
<td>317 - 964</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>444.1 (53.9)</td>
<td>462.7 (57.6)</td>
<td>540.5 (169.2)</td>
</tr>
<tr>
<td>Range</td>
<td>332 – 542</td>
<td>366 – 561</td>
<td>344 – 907</td>
</tr>
<tr>
<td>Incongruent - bottom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CT M (SD)</strong></td>
<td>465.1 (81.3)</td>
<td>490 (71.3)</td>
<td>536.6 (148.1)</td>
</tr>
<tr>
<td>Range</td>
<td>365 – 678</td>
<td>369.4 – 688</td>
<td>347 - 879</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>452 (73.8)</td>
<td>497 (76.9)</td>
<td>537 (131.2)</td>
</tr>
<tr>
<td>Range</td>
<td>346 – 709</td>
<td>386 - 648</td>
<td>359 – 825</td>
</tr>
</tbody>
</table>
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For talk type there was no main effect ($p > 0.05$), nor were there any main effects for congruency ($p < 0.05$), position ($p > 0.05$), or group ($p > 0.05$). Similarly there were no further interactions between talk type, congruence, probe position or group (all $p > 0.05$).

To further explore the results, attention bias scores were calculated in a method first described by MacLeod & Mathews (1988). Reaction times from trials in which the probe replaced the change (or sustain) word were subtracted from trials in which the probe replaced a neutral word. A positive bias score represents attention towards CT words, and a negative bias score demonstrates attention away from change words (ST) and towards neutral words.

As with the above data, visual inspection of box plots showed the data was not normally distributed. A Shapiro-Wilk test for normality confirmed this observation ($p < 0.05$). Data was checked and a student residuals test revealed 12 outliers (data greater than 3 standard deviations) from the 280 total mean bias scores (4.3%). When these outliers were removed from the data distribution the Shapiro-Wilk test for residuals continued to be violated for seven of the twelve test conditions showing that the data was not normally distributed. As the bias scores were on a z-score scale a log transformation could not be performed as some scores were equal to or above zero which this function does not permit (Field, 2013), thus non-parametric tests were employed to analyse the bias data. Means, medians and skewness can be seen below in Table 6.
Table 6  
_Bias scores for CT and ST, median, range and skewness._

<table>
<thead>
<tr>
<th>CT Bias</th>
<th>No MI Training</th>
<th>Some MI Training</th>
<th>MINT Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td><em>Mean (SD)</em></td>
<td>-3.4 (49.4)</td>
<td>13.4 (46.2)</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>-1.2</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>Skewness</td>
<td>-.852</td>
<td>.966</td>
</tr>
<tr>
<td>Bottom</td>
<td><em>Mean (SD)</em></td>
<td>1.5 (38.9)</td>
<td>2 (51.4)</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>3.7</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>Skewness</td>
<td>-.079</td>
<td>-1.418</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ST Bias</th>
<th>No MI Training</th>
<th>Some MI Training</th>
<th>MINT Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td><em>Mean (SD)</em></td>
<td>-6.3 (31.9)</td>
<td>-2.3 (42.6)</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>-8.4</td>
<td>-6.6</td>
</tr>
<tr>
<td></td>
<td>Skewness</td>
<td>.417</td>
<td>-2.834</td>
</tr>
<tr>
<td>Bottom</td>
<td><em>Mean (SD)</em></td>
<td>-7.8 (75.1)</td>
<td>4.8 (30.2)</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>3.3</td>
<td>-3.3</td>
</tr>
<tr>
<td></td>
<td>Skewness</td>
<td>-3.0</td>
<td>1.2</td>
</tr>
</tbody>
</table>

A Friedman’s Two-Way analysis of variance by ranks found no attention bias within any of the three training level groups towards CT or ST or towards the position of the probe (None, $p = 0.18$; Some, $p = 0.77$; MINT, $p = 0.51$). Kruskal-Wallis tests showed no differences across the groups for reaction times towards CT compared to Neutral words as reaction times failed to reach significance when the probe target was both above ($p = 0.34$), and below the fixation cross ($p = 0.96$). Additionally, there were no statistically significant differences in group reaction times towards ST when the probe was above ($p = 0.24$), or below the fixation cross ($p = 0.81$).
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Following previous research, whether each group’s attention bias score differed statistically significantly from zero was examined (Beard & Amir, 2010; Haggman et al., 2010; Mathews & MacCleod, 1986). One-Sample Wilcoxon Signed Rank Tests revealed that the median reaction times towards CT and towards ST were no different from zero, indicating no attentional bias towards these words compared to neutral words (all $p > 0.05$).

**Dot-probe task errors**

The data from three participants were removed from analysis of the dot-probe as they expressed great difficulty during the task, and had trouble understanding it. Upon visual inspection of the data this difficulty was apparent as their missed responses accounted for 47%, 57% and 54% of stimuli presented. Remaining participants’ mean and standard deviations, and medians for each group and condition can be seen below in Table 7. Visual inspection of box plots indicated the data was skewed which was corroborated by Shapiro-Wilk’s tests for normality. All groups in both CT and ST stimuli conditions for congruent and incongruent probe positions were non-normal ($p < .01$). Data was checked and a student residuals test revealed 6 outliers (data greater than 3 standard deviations) from the total error data. When these outliers were removed from the data distribution the Shapiro-Wilk test for residuals continued to be violated for all of the test conditions showing that the data was not normally distributed. Thus, non-parametric tests were used to examine the dot-probe error data. Unlike the Stroop data, a series of Friedman’s Two-Way analysis of variance by ranks found no difference in errors within any of the three training level groups towards CT or ST (all $p’s > 0.05$). Additionally, there were no statistically
significant differences found in the number errors between the three groups as determined by a Kruskal-Wallis test ($p > 0.05$).
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Table 7

*Mean, median and skewness of total errors in the dot-probe task*

<table>
<thead>
<tr>
<th>Congruent</th>
<th>No MI training</th>
<th>Some MI training</th>
<th>MINT training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top CT M (SD)</strong></td>
<td>1.9 (1.7)</td>
<td>1.7 (1.3)</td>
<td>1.7 (2.3)</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.168</td>
<td>1.416</td>
<td>2.603</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>1.8 (1.4)</td>
<td>0.8 (1.2)</td>
<td>1.3 (1.4)</td>
</tr>
<tr>
<td>Median</td>
<td>2.0</td>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.982</td>
<td>1.580</td>
<td>0.623</td>
</tr>
<tr>
<td><strong>Bottom CT M (SD)</strong></td>
<td>1.5 (1.7)</td>
<td>0.9 (1.0)</td>
<td>2.2 (2.6)</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.477</td>
<td>0.604</td>
<td>0.876</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>1.8 (1.7)</td>
<td>0.8 (1.2)</td>
<td>1.4 (1.9)</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.415</td>
<td>1.580</td>
<td>2.116</td>
</tr>
<tr>
<td><strong>Incongruent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Top CT M (SD)</strong></td>
<td>1.7 (1.8)</td>
<td>0.5 (0.8)</td>
<td>1.4 (2.0)</td>
</tr>
<tr>
<td>Median</td>
<td>1.5</td>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.247</td>
<td>2.047</td>
<td>2.032</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>1.8 (1.9)</td>
<td>0.4 (0.7)</td>
<td>1.0 (1.8)</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.381</td>
<td>2.695</td>
<td>3.027</td>
</tr>
<tr>
<td><strong>Bottom CT M (SD)</strong></td>
<td>1.5 (1.7)</td>
<td>0.8 (1.1)</td>
<td>1.4 (2.6)</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>Skewness</td>
<td>2.082</td>
<td>1.477</td>
<td>3.139</td>
</tr>
<tr>
<td><strong>ST M (SD)</strong></td>
<td>1.7 (1.9)</td>
<td>0.8 (0.9)</td>
<td>1.3 (2.1)</td>
</tr>
<tr>
<td>Median</td>
<td>1.0</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Skewness</td>
<td>1.438</td>
<td>1.017</td>
<td>2.750</td>
</tr>
</tbody>
</table>
Discussion

The present study was conducted to test if MI practitioners showed attentional bias towards CT and ST as evidenced by slower responding to CT in a modified Stroop task, and faster responding towards CT and ST in a dot-probe task compared to individuals who had no MI training. If this were found to be true, then there would be the potential to develop a new means of measuring practitioner skillfulness in MI in terms of their attentional bias to CT and ST. While MI is an empirically supported approach to promote behaviour change, a measure of practitioner skill in MI that is efficient and resource friendly is yet to be established. There are also currently no measures that specifically assess a MI practitioner’s attention to CT. This study aimed to contribute to a solution employing two attention bias tasks.

Previous research has provided both robust, and mixed findings in attention bias studies utilising modified versions of the Stroop task and the dot probe task. Primarily, the dot probe and the Stroop tasks are used to measure threat responses in clinically anxious population, however, exploration of their use has extended to ‘expert’ contexts.

In the Stroop task, it was hypothesised that a bias in attention towards CT would be evident in the two groups whom had had training in MI compared to the control group of whom had not had any MI training. It was hypothesised that during the dot-probe task, individuals trained in MI would respond faster to the probe when it was in the place of a statement that was CT or ST compared to a neutral statement. Furthermore, for individuals with some MI training, it was hypothesised that CT would elicit a faster response than ST. Across both tasks it was hypothesised that the
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MINT group would show more of an attention bias towards the target words and statements than individuals with some MI training. Overall, both tasks failed to exhibit evidence of attention bias. Thus, the hypothesis that MINT members would be the most distracted by CT words compared to Some training and control group was not confirmed. Nor was the hypothesis that the Some training group would show some distraction towards CT but not as much as the MINT were not confirmed.

**Modified Stroop**

On the Stroop task MINT members were significantly slower in responding to all words regardless of their meaning compared to the control group (None). Further analysis, however, showed that this difference no longer existed between groups when age was removed as a co-varying factor. Ages differed greatly between the three groups which may have been a function of comparing highly trained individuals to individuals with less experience and training, and undergraduate students. The MINT group also made significantly more errors than the None and Some training groups, however this difference was not attributed to age. This finding is unusual as previous research in attention tasks rather robustly finds a trade-off between speed and error (Agam et al., 2013; Fairbrother, 2010; Gruszka, Matthews & Szymura, 2012). That is, in cognitive attention tasks, participants are more likely to make more errors the faster they respond to a target stimulus and produce less errors when responses are slowed (Fairbrother, 2010).

Thus, the current study did not replicate the findings of Dalgliesh (1995) and Ryan (2002) in that the Stroop task did not produce an attention bias in experts towards stimuli that is synonymous with their field. The findings do however support the literature on the effects of cognitive slowing in older age in the Stroop task.
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Studies have reported slower reaction times in the Stroop task as participant age increases (Bugg, DeLosh, Davalos & Davis, 2007; Troyer, Leech & Strauss, 2006; Wolf et al., 2014; Zysset, Schroeter, Neumann & Cramon, 2006). Additionally, the effect of slower reaction times, and no Stroop effect in an older sample have also been observed in modified emotional Stroop tasks (Dunajska, Szymanik & Trempala, 2012; Lautenbach, Laborde, Angelidis, & Raab, 2016; Wurm, Labouvie-Vief, Aycock, Rebucal & Koch, 2004).

In a modified brief version of the Stroop colour-word test, the Victoria Stroop test, age, and speed were negatively correlated, and older participants produced more errors (Troyer et al., 2006). The 272 participants were also from a non-clinical sample, ranging in ages 18 to 94. Slowing was highly correlated with age, and accuracy decreased also. Troyer et al (2006) argue that the increased interference with age is not wholly due to general cognitive slowing and suggest the reaction times and error rates suggest difficulty in response disinhibition instead.

Similar to these findings, Bugg et al. (2007) found age negatively correlated with reaction time and accounted for 74% of the variance in reaction times. In their sample of 938 participants aged 20 to 89, there was no longer an effect of attention bias once age was controlled for in the analysis. These results were compared to the same samples results in another cognitive flexibility task, the Wisconsin Card-Sorting Test (WCST). The WCST was employed to measure the effect that age may have on processing speed and problem solving strategies, and the preservative errors on the test which are a reflection of an individual’s ability to inhibit their responses. Thus, the WCST also measured attentional bias, but using different cognitive processes. From comparing the results from the two tasks, they concluded that the age-related
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Decline in the Stroop task was characteristic of both diminishing processing speed as could be expected with general aging, in addition to influences more specific to the Stroop task, namely inhibition and task-specific attention.

Wolf et al. (2014) reported an age related disruption in the Stroop task in their study researching the underlying neural processes that were activated as participants carried out a Stroop task and another speed-reliant cognitive task, a trail making test. Diffusion Tensor Imaging (DTI) was used to map the neuronal networks that were stimulated during the task by analysing the quantity of white matter integrity activation in the brain for each participant (Wolf et al., 2014).

As in the present study, the effects they found were attributable to age and not the interference of the target words. Diffusion Tensor Imaging showed older participants (aged 60-70), who had a longer response latency, appeared to use more of their brain than their younger (aged 22-37) and faster counterparts and employed more of the frontal pathways, and verbal part of the brain. From the DTI it was shown that distinct parts of the brain, separate to those which are effected by general aging, showed a decline in processing speed causing the increases in Stroop interference (Wolf et al., 2014).

Zysset et al. (2006) posit general slowing, and the use of compensatory strategies are the reason for the observed effects of aging on decreased reaction times in the Stroop task. Like the current study, they found no attentional bias towards target words but found older participants elicited longer response times overall. As participant age increased, reaction time slowed in responses to both the neutral and target stimulus. Also like this study they found no effect of age on error rate between or within groups. Functional Magnetic Resonance Imaging (fMRI) conducted as
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participants completed the Stroop task showed increased activity in the verbal component of the brain in middle-age participants (45-75 years old, mean age 57.1) compared to younger (22-36 years old, mean age 26.6) participants. This difference correlated strongly with age as the older a participant was the more pronounced the activity in the left side of the brain specific to language. Additionally middle-aged participants (45-72 years of age) produced a larger haemodynamic response when executing the task, suggesting that the slowed processing of information may be due to the higher expenditure of cognitive resources.

In a modified emotional Stroop task of a non-clinical sample age-related differences were also found. Dunajska et al, (2012) reported no attention bias towards positive or negative words in an older sample of participants aged 60 to 85 years old. Interestingly, they found the participants who were 60 to 69 were significantly slower in responding than the group of individuals who were ages 70 to 85. The current study’s oldest participant was 72 years old, therefore the findings are not comparable to this study and an increase in reaction time which Dunajska et al. (2012) found for older (70-85 years) individuals is not likely to be relevant to the current study.

There are other possible explanations for findings of the current study supporting the null hypotheses. It may be that the CT used in the present research did not capture the attention of trained MI practitioners as the words were too simplistic and not personally salient, as in contrast to previous research which has used examples of threat related emotional Stroop tasks. For example, Wurm et al. (2004) employed two modified emotional Stroop tasks that were performed by a healthy adult sample divided into two groups of younger and older adults with mean ages of 27 and 72 respectively. The target stimuli were words that held strong personal
meaning to the individual of both a positive and negative nature. Based on previous research in cognitive processing and aging, it was hypothesized that older individuals would show great interference towards target words as they would demand high levels of cognitive resources than younger participants due to limited automatic and controlled cognitive processing. In the first task, participants appeared to be perplexed by the incongruent information that was presented in the Stroop task, that is words were aurally presented yet the tone of the voice was mismatched to the word. For example, a person might say ‘lovely’ in an aggravated tone. In the second task, no Stroop effect was found for low and mid arousal words, however there was an apparent interference in the high arousal condition for the older adults. No Stroop effect was found for the younger age group. These results show that in order to elicit an emotional Stroop interference effect in an older population, tasks may require stimuli that provoke a very strong response, in this case confusion, as a means to stimulate higher level processing resources.

Lautenbach et al. (2016) studied the responses of professional athletes in a modified Stroop task. Attention bias was only found in reactions to negative words, those that were of ‘threat’ to the athletes’ success such as ‘doping’ or ‘fail’. Other athlete relevant words did not create a Stroop effect. Thus although all words were valence-related, it was only those that posed a threat towards the participants that elicited an interference effect as measure by a slower response in the Stroop task.

Ryan (2002) and Dagliesh (1995), however, both reported attentional bias in individuals who were not under any threat or danger. Rather, attention biases in both studies were assumingly due to the frequency of the usage and exposure to words synonymous to their occupation (birds, and alcohol dependence).
Spiegelhagder et al. (2008), measured reaction times in a modified Stroop task completed by individuals that work at a sleep clinic and by patients of the clinic with insomnia. Reaction times towards sleep related stimuli was significantly slower for the patients than the clinicians at the sleep clinic indicating that the bias was not just due to the frequency and familiarity of their usage, but instead due to an emotionality or deeper cognitive meaning of the word due to the lived experience of insomnia.

Although the aim of the current study was not to explore the mechanisms of the Stroop task and its variations, particularly in regards to the effect of aging on the cognitive processes it requires, it is apparent that more research is required to better understand what causes the Stroop effect (MacLeod, 2005). It appears that there is a vast array of concepts and proposed theories that strive to explain the Stroop effect. This component of the study can confirm, however, that no Stroop effect was found in an ‘expert’ context towards CT. Additionally, the current study found a robust effect of overall slowing in response time, which could be attributed to general cognitive slowing or Stroop specific disruptions in cognitive ability in older participants.

**Dot-probe**

Despite previous research stating the dot-probe has successfully measured attentional bias across a variety of contexts (Al-Janabi et al., 2012; Egloff & Houck, 2003; Haggman et al., 2010; MacLeod et al., 1986; Ma et al., 2015; Sigurjónsdóttir et al., 2015) the present study did not produce any significant findings. Unlike the Stroop task which measures bias as a slowed reaction to the target stimuli, an indication of attention bias in the dot-probe is demonstrated by a faster response to the probe after it is presented in the same position as the target stimuli. The dot-probe results however, showed no significant differences in reaction times between the
training level groups, or within the groups towards CT or ST statements. Unlike the Stroop task, the longer (yet non-significant) response latencies produced by the MINT group were not accounted for by age and there were no difference in errors between groups. These differences between the Stroop and the dot-probe findings are akin to previous research that has reported dissimilarities between the two tasks. Mogg et al. (2000) found an effect in the Stroop however not in the dot-probe and suggest that the tasks may elicit different neural activity in participants. Xu et al. (2014) also found attentional bias to workplace safety stimuli in a non-clinical population on a modified Stroop task, but no attentional bias was found on the dot-probe task measuring the same topic (workplace safety). They too posit that due to these differences in results, different cognition processes must be employed when completing a dot-probe task and a Stroop task.

Schmulke (2005) examined the test-retest reliability of two variations of an emotional dot-probe task in a non-clinical sample. He found the dot-probe to be an unreliable means of measuring attention bias as when employed again after one week the findings were inconsistent for both tasks. This may be a reason as to why no bias was found in the current study. This finding by Schmulke (2005) was corroborated by Price et al. (2015), who state that the further the target stimuli in a dot-probe task deviates from a basic threat context, the more reliability and validity is compromised. In a study conducted to improve the test-retest reliability of the dot-probe, they found the most reliable data was that taken from when the probe and target stimuli were congruent and positioned in the bottom position. The current study analysed potential differences in top and bottom positioning of congruent (target) and incongruent (neutral) stimuli but unlike Price and colleagues (2015), no difference was found.
Price et al. (2015) also suggest rescaling outliers as opposed to eliminating them from the data set, however the removal of the outliers in the current study was minimum, and at a liberal parameter of three standard deviations.

The reporting of null findings is rare in the literature, however in the past two years, Jacoby and colleagues published two papers to report this with both studies using a dot-probe. In a clinical sample of patients presenting with obsessive compulsive disorder and elevated levels of scrupulosity, Jacoby, Berman, Graziano and Abramowitz (2015) found no attentional bias on a dot probe task towards scrupulosity words compared to threat words and neutral words. Additionally Jacoby, Wheaton and Abramowitz (2016) found no effect on a dot-probe task measuring a potential threat-related bias in participants whom presented with illness anxiety by measuring reaction times towards health related words such as ‘cancer’ compared to neutral words.

Schoth, Delgado Nunes and Liossi (2012) examined attentional bias in participants who suffered from chronic pain with differences in the presentation times of target and neutral words. In their modified dot-probe task, some stimuli were exposed to the participant for 500ms, and some for 1250ms. Both exposure times created an effect, however this was significantly stronger for the longer exposure time of the target words.

Waechter, Nelson, Wright, Hyatt and Oakman (2014) measured attention bias to threat using a dot-probe task and by observing participant eye movements when a target stimulus was presented. Participants were individuals who presented with high and low social anxiety as measured by a psychometric test, the Social Interaction Anxiety Scale. Dot-probe responses and eye movement towards or away from
pictures of different facial expressions were measured. They found that in both tasks a longer presentation of the stimuli resulted in better outcomes and excellent reliability; that is attentional bias was found when stimuli was presented supraliminally for up to 5,000ms and was consistently found upon further trials. Stimuli viewed for 1,500ms or less produced unsatisfactory reliability. Given these results, it may be that the current study ought to have presented stimuli longer than the 500ms that was used.

Despite findings in favour of non-threat related bias in the dot probe, there is also evidence to suggest that it is not a robust measure of bias towards clinically or personally relevant information. The current study corroborates the latter. These contradictory findings appear to be a result of the large numbers of modifications made to the dot-probe such as the differences in sample populations, the time frames and modalities in which they are presented, and the contexts of the target stimuli.

Methodological Issues

There are a number of limitations to the present study. There were a small number of participants in both the Some and MINT groups. Because of the underrepresentation in both groups, statistical power was less than anticipated when the study was first designed. Additionally, three participant’s data in the dot-probe were omitted as they were unable to perform the task appropriately, further decreasing sample size and consequently the power of the dot-probe task.

Participants in the control varied greatly in age to the experimental groups. Future research should control for age effects by matching the age of the control group participants to the age of experimental participants. Future research should also consider a longer exposure time of the target stimulus for a potentially greater effect,
and select stimuli with the necessary properties that previous research has found appropriate for the evocation of an attentional bias.

The results of the current study may also have been different had the stimulus been presented for longer. Although the current study replicated successful methodologies from previous research (Beard & Amir, 2010; Haggman et al., 2010; MacLeod, 1986; Putwain et al., 2011) there is some research which suggest that longer exposure to the target stimulus may generate a more salient attentional bias (Bar-Haim, 2007, Jacoby et al., 2015; Schoth, Delgado Nunes & Liossi, 2012).

The current stimuli in both tasks were presented at a subconscious level to evoke subliminal automatic processing. As no effect was found it is not clear whether the CT and ST or natural words and statements were semantically processed. There is evidence however that supraliminal presentations of stimuli in both a Stroop task and a dot-probe task have elicited attentional biases between target and neutral stimuli. Exposing participants to target stimuli for a longer time period may elicit an attentional bias, particularly to stimuli such as that in the current study, are not threat or emotionally valenced and therefore perhaps do not evoke an immediate unconscious attention bias as swiftly as information that may endanger ones safety or wellbeing (Harkness, Harris, Jones, and Vaccaro, 2012; Wurm et al., 2009).

Bar-Haim (2007) investigated this difference in a study of threat related subliminal and supraliminal exposures. Bar-Haim (2007) reported that in the modified Stroop studies, although both conscious and unconscious processing of words produced large effect sizes, the consciously noticeable condition produced the largest effect. The opposite findings were true in the dot-probe task, with unconscious exposures producing an effect size close to double of the consciously perceived
ATTENTIONAL BIAS TOWARDS CHANGE TALK

stimuli. This finding supports the previous literature that cognitive and attention processes are different in the Stroop and dot-probe tasks, and the current studies differences in age related differences in answering between both tasks. These discoveries ought to be considered in future research when employing either task.

Jiang, Bailey, Xiang, Zhang, and Zhang (2016) compared the neural correlates of conscious and unconscious processing in participants while they were completing a Stroop task. They found that an effect was elicited by both a conscious and an unconscious prime that was presented before the target stimuli. Functional Magnetic Resonance Imaging results showed the same regions in the brain were activated when completing the task, regardless of the conscious or unconscious stimuli. The only significant difference noted were differences in blood oxygenation level dependent (BOLD) signals as the unconscious stimuli elicited much less BOLD and the range was more restricted than in the conscious condition.

Future Research

It is recommended that an easier, user-friendly means to measure MI practitioner MI skill and fidelity continue to be explored and tested. If the Stroop or dot-probe were to be utilized again to attempt to measure attentional bias towards CT and ST, the implementation of supraliminal exposure and/ or priming may present more desirable findings.

Another alternative to the current study’s methodology is to prime participants with a MI related scenario, such as a short video or a vignette of a therapy session before doing a task. Priming consists of showing some stimulus with the aim of evoking a mood or thought. How the prime affects an individual’s consequent behaviour can then be measured, for example by participants’ responses in an
attentional bias task. (Cameron, Brown-Iannuzzil & Payne, 2012). In a meta-analysis of the relationship of priming on behaviour across 167 studies, Cameron et al. (2012) concluded that priming tasks are a good means of eliciting thoughts and memories after associations are made to exposed primes. They concluded that primes were reliable indicators of predicting subsequent attention allocation and associations to related behaviours and explicit attitudes in a variety of psychological contexts and methodologies.

Priming with a short video or a vignette of a therapy session may allow for the experiment to be more akin to a therapeutic setting as when a MI practitioner is with a client they are aware of the context and their role as a practitioner going into a session. As Houck et al. (2008) found in their study investigating neural responses towards participants own CT and ST when observing a previously recorded MI session, it may be that a simulation of a MI session will elicit activity in the same regions of the brain and thus produce attention biases towards CT and ST in those trained in MI.

Conclusions

The current study aimed to create a new means of measuring of MI skill. This was attempted by experimenting with two attentional bias tasks and modifying them for use in an ‘expert’ context. The study examined potential differences between training levels in MI, and attention towards components of language used in MI, CT and ST. Although analyses did not reach significance as hypothesised, in the Stroop task, there was a significant finding. That is, the participants in the MINT group were much slower in responding to all stimuli than the other two groups regardless of the stimuli condition. However, this difference was accounted for by age with the MINT
ATTENTIONAL BIAS TOWARDS CHANGE TALK

group being significantly older than the group who had received some MI training and the undergraduate control group. This finding corroborates other cognitive research on aging and slowed latencies in such tasks. Questions remain as to the exact mechanisms that create this effect and different theories suggest other task specific reasons in addition to the natural process of aging.

Methodological limitations in the current study may have diminished the possibility of significant findings such as participant numbers in the MI groups, and age differences. Additionally it is suggested future research considers using priming and longer exposure times when using an attention bias task in a non-threat related context.
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ATTENTIONAL BIAS TOWARDS CHANGE TALK


doi:10.1016/j.jpsychores.2014.10.010


ATTENTIONAL BIAS TOWARDS CHANGE TALK


ATTENTIONAL BIAS TOWARDS CHANGE TALK


ATTENTIONAL BIAS TOWARDS CHANGE TALK


Jiang, J., Bailey, K., Xiang, L., Zhang, L., & Zhang, Q. (2016, 06). Comparing the Neural Correlates of Conscious and Unconscious Conflict Control in a
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Masked Stroop Priming Task. *Frontiers in Human Neuroscience, 10.*

doi:10.3389/fnhum.2016.00297


doi:10.7717/peerj.1899


doi:10.1037/spy0000073

ATTENTIONAL BIAS TOWARDS CHANGE TALK


doi:10.1016/j.ijnurstu.2015.09.010


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[http://casaa.unm.edu/download/misc2.pdf](http://casaa.unm.edu/download/misc2.pdf)


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Appendix A

HUMAN ETHICS COMMITTEE
Secretary, Lynda Griffin
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2015/46/LR

5 August 2015

Candice Roulston
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Candice

Thank you for forwarding your Human Ethics Committee Low Risk application for your research proposal “Do individuals trained in motivational interviewing have an intentional bias towards change talk?”.

I am pleased to advise that this application has been reviewed and I confirm support of the Department’s approval for this project.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 30 July 2015.

With best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair, Human Ethics Committee
Attentional Bias Study

Information Sheet

My name is Candice Roulston and I am a postgraduate student at the University of Canterbury. I am looking for people who are willing to participate in a research project investigating Attentional Bias. Participation in this study involves completing two tasks of word detection and target detection that are presented on a computer screen. Those who participate will receive a $10 Westfield voucher for their time. Participation is voluntary and you have the right to withdraw at any stage without penalty. The results of the study may be published in scientific journals, but you may be assured of the complete confidentiality of data gathered in this study. To ensure anonymity and confidentiality, you will receive a participant identification number for the duration of the study. Any identifying information (name and email address) will be stored separately from your questionnaire in a secure office in the Department of Psychology at the University of Canterbury. Only my two supervisors and I will have access to the data. The data will be kept for 5 years and then destroyed. Participation is voluntary and you have the right to withdraw from the study at any point. If you withdraw, I will remove all the information you have provided. You may receive a copy of the project results by contacting the researcher at the conclusion of the project.

The project is being carried out as a requirement for an Masters in Science in Psychology by Candice Roulston (candice.roulston@pg.canterbury.ac.nz) under the supervision of Dr Eileen Britt and Dr Mark Wallace-Bell. They will be pleased to discuss any concerns you may have about participation in the project. The project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

Candice Roulston
I have been given a full explanation of this project and have had the opportunity to ask questions.

I understand what is required of me if I agree to take part in the research.

I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.

I understand that any information or opinions I provide will be kept confidential to the researcher Candice Roulston and her supervisors Dr Eileen Britt and Dr Mark Wallace-Bell, and that any published or reported results will not identify the participants.

I understand that all data collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.

I understand the risks associated with taking part and how they will be managed.

I understand that I am able to receive a report on the findings of the study by contacting the researcher at the conclusion of the project.

I understand that I can contact the researcher Candice Roulston at, chr26@student.canterbury.nz or (03) 364 2987 ext 3401 for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

By signing below, I agree to participate in this research project.

Name __________________________________________________

Signature _______________________________________________

Date ______________________

Candice Roulston
Questionnaire

Name: __________________________

Date of Birth: _____________________

Handedness: LEFT/ RIGHT/ AMPIDEXTROUS (circle one)

Have you received any Motivational Interviewing Training: YES/ NO (circle one)

If yes, please tick which training you have completed:

- Individual Study and Self-Training
- Introduction to Motivational Interviewing (1 hour to 1 day)
- Introductory Workshop (2-3 days)
- Intermediate and Advanced Training (2-3 days)
- Training for New Trainers (TNT, 3-4 days)
- MI Supervisor Training (2-3 days)
- MI Coder Training (2-3 days)

Did you experience any vision or hearing impairment during the experiment? YES/ NO (circle one)

Date: __________________________

Signature: ________________________

Thank you,

Candice Roulston
Do individuals trained in Motivational Interviewing have an attentional bias towards change talk?  
Debriefing Form

This study is interested in the attentional bias of individuals trained in Motivational Interviewing (MI) towards particular types of client talk that is called ‘change talk’, compared to individuals with no training in MI. In order to measure attentional bias, we used two different attention tasks, a Stroop task, which required naming colours of words and the dot-probe task, which required seeking a target after brief statements were visually present.

We also sought information regarding if people had had any training in MI. This is because we have three groups of participants we wish to compare. The first group are individuals who are MI trainers and belong to the Motivational Interviewing Network of Trainers (an international collective which promotes good practice in the use, research and training of motivational interviewing). The second group are individuals who have completed some training in MI. The third group is a control group, that is, individuals who have no MI training.

We are interested in whether the individuals trained in MI display more attention towards the components of the tasks that involved change talk compared to neutral material. We hypothesise that MINT members will have a higher attentional bias to change talk compared to controls, or those individuals who have a lesser amount of MI training. It is hypothesised also that individuals who have had some MI training will be more attuned to change talk than control participants, however not to the same extent as the MINT members are, as the latter are more experienced in listening for and attending to change talk.

If you feel the need to talk to anyone about the effect that this study has had on you, or if you have any questions, you are welcome to talk further to Candice Roulston or Eileen Britt, via the contact details below.

Contact details for the researchers are as follows

- Candice Roulston candice.roulston@pg.canterbury.ac.nz 03 366 7001 ext. 3024
- Dr Eileen Britt eileen.britt@canterbury.ac.nz 03 366 7001 ext. 7195

Thank you for your participation

Regards,
Candice Roulston
Neutral words used in Stroop practice trial

printer
read
remain
request
rib
ruin
sand
measure
and
walk
leg
wisdom
wallet
alarm
drive
hope
elephant
olive
the
bacon
for
hour
in
news
### Appendix F.2

Words used in the Stroop task

<table>
<thead>
<tr>
<th>Change Talk</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>able</td>
<td>allow</td>
</tr>
<tr>
<td>can</td>
<td>lay</td>
</tr>
<tr>
<td>consider</td>
<td>appear</td>
</tr>
<tr>
<td>could</td>
<td>said</td>
</tr>
<tr>
<td>desire</td>
<td>band</td>
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<tr>
<td>do</td>
<td>become</td>
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<tr>
<td>have</td>
<td>benefit</td>
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<td>intend</td>
<td>more</td>
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<td>like</td>
<td>open</td>
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<td>may</td>
<td>let</td>
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<td>must</td>
<td>claim</td>
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<tr>
<td>need</td>
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<tr>
<td>ought</td>
<td>knew</td>
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<tr>
<td>plan</td>
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<td>promise</td>
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</tr>
<tr>
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<td>first</td>
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<tr>
<td>should</td>
<td>right</td>
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<tr>
<td>started</td>
<td>look</td>
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<tr>
<td>want</td>
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<tr>
<td>will</td>
<td>type</td>
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<tr>
<td>wish</td>
<td>which</td>
</tr>
<tr>
<td>possible</td>
<td>former</td>
</tr>
<tr>
<td>try</td>
<td>maker</td>
</tr>
<tr>
<td>manage</td>
<td>perceived</td>
</tr>
</tbody>
</table>
Appendix F.3

Neutral statements used in dot-probe practice trial

It is tiny
It is cold
It was a dream
It is clay
She plays piano
He is an agent
It's at the rodeo
I am nervous
It was a chorus
There is rainfall
I stapled it
It is clay
It was a chorus
It is fragile
I want a muffin
I rode a bike
It was a dream
It is tiny
It is a jingle
It's from space
## Appendix F.4

Statements used in the dot-probe task

<table>
<thead>
<tr>
<th>Change talk</th>
<th>Sustain talk</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have quit</td>
<td>I want to smoke</td>
<td>I need a fork</td>
</tr>
<tr>
<td>I should quit</td>
<td>I'll still drink</td>
<td>I have a cough</td>
</tr>
<tr>
<td>I can quit</td>
<td>I'm incapable</td>
<td>It was picked up</td>
</tr>
<tr>
<td>I'll start now</td>
<td>Now's not the time</td>
<td>I'm in a hurry</td>
</tr>
<tr>
<td>I will quit</td>
<td>I got drunk</td>
<td>I saw it</td>
</tr>
<tr>
<td>I am capable</td>
<td>I'm fine like this</td>
<td>I am talking</td>
</tr>
<tr>
<td>Now's the time</td>
<td>I bought smokes</td>
<td>I rested</td>
</tr>
<tr>
<td>I'd like to quit</td>
<td>I can't now</td>
<td>It wasn't cheap</td>
</tr>
<tr>
<td>I will succeed</td>
<td>It's hard</td>
<td>It won't be warm</td>
</tr>
<tr>
<td>It's good to stop</td>
<td>I'll still smoke</td>
<td>It was found</td>
</tr>
<tr>
<td>It's time</td>
<td>I'm too busy</td>
<td>I am excited</td>
</tr>
<tr>
<td>I am ready</td>
<td>I won't quit drugs</td>
<td>I have a hat</td>
</tr>
<tr>
<td>I must quit</td>
<td>I'll still use</td>
<td>I held the dog</td>
</tr>
<tr>
<td>I will be clean</td>
<td>I'm scared to try</td>
<td>I will sit</td>
</tr>
<tr>
<td>I'll do it</td>
<td>I'm not trying</td>
<td>It's hot</td>
</tr>
<tr>
<td>I want to stop</td>
<td>I won't change</td>
<td>I drove to town</td>
</tr>
<tr>
<td>I will not smoke</td>
<td>I don't care</td>
<td>I wrote it down</td>
</tr>
<tr>
<td>It's time to change</td>
<td>I can't yet</td>
<td>I got up</td>
</tr>
<tr>
<td>I should change</td>
<td>I'll fail</td>
<td>I jumped</td>
</tr>
<tr>
<td>I need to stop</td>
<td>I need to smoke</td>
<td>It's boring</td>
</tr>
</tbody>
</table>