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Understanding the process of Motivational Interviewing: A review of the relational and technical hypotheses

Abstract

Objective: The current study systematically reviews evidence for a causal chain model suggested by Miller and Rose (2009) to account for the efficacy of Motivational Interviewing. **Method:** Literature searches were conducted to identify studies delivering MI in an individual format to treat various problem areas. **Results:** Thirty-seven studies met inclusion criteria. The results suggest that when clinicians utilise MI consistent behaviours, clients are more likely to express language in favour of change. Furthermore, this client language was consistently related to positive client outcome across studies. **Conclusions:** While the results support some parts of the Miller and Rose model, additional research is needed to confirm the findings in diverse populations. Understanding the mechanisms of MI's effectiveness may maximise the implementation of MI, potentially contributing to better client outcomes.

Keywords: Motivational Interviewing; mechanisms; change talk; therapist behaviours; behaviour change; review

Motivational Interviewing (MI) is a client centred directive method of facilitating change that aims to enhance motivation through the exploration and resolution of ambivalence (Miller & Rollnick, 1991). MI was developed as a treatment for substance use disorders but the application of MI has extended to the treatment of a growing list of psychological and physical health issues. Meta-analytic research provides support for the efficacy of MI in the treatment of alcohol and drug use (Lundahl & Burke, 2009), diet, exercise, diabetes (Martins & McNeil, 2009), gambling and general health promoting behaviours (Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010). There is also promising research supporting the efficacy of MI as an adjunctive treatment for psychiatric disorders including anxiety (Aviram & Westra, 2011; Westra, Arkowitz, & Dozois, 2009; Westra & Dozois, 2006) and eating disorders (Cassin, von Ranson, Heng, Brar, & Wojtowicz, 2008; Feld, Woodside, Kaplan, Olmsted, & Carter, 2001).

While the usefulness of MI has been supported in a variety of physical and mental health domains, it remains uncertain as to the processes by which MI exerts its effects (Burke, Arkowitz, & Menchola, 2003). Understanding how MI contributes to positive client outcome can guide training and administration of MI, allowing MI practitioners to focus on elements that are vital to MI efficacy.

A number of social psychological and social cognitive models have been linked to MI to offer a theoretical framework for understanding its efficacy (Markland, Ryan, Tobin, & Rollnick, 2005). While theories such as Self-Determination Theory (Deci & Ryan, 1985) and Cognitive Dissonance Theory (Draycott & Dabbs, 1998) can shed light on underlying aspects of the MI process, these theories have not been empirically tested in the context of MI. There is some research that suggests that components of these theories may be relevant to MI, for example, participants assigned to MI perceived more autonomy support (a proponent of Self-Determination Theory) (Foote et al., 1999), and showed enhanced self-discrepancy (a

condition of cognitive dissonance) (McNally, Palfai, & Kahler, 2005), however such research

is too rudimentary to suggest that one theory or another truly explains the efficacy of MI.

Theories focusing on language processes in behaviour change, such as Speech Act Theory

(Austin, 1962) and Self-Perception Theory (Bem, 1972) may be more useful in that they offer

a suggestion for client in-session behaviours that may initiate behaviour change. However

these theories do not clearly elucidate the role of therapist behaviours or the interaction

between therapist and client behaviours during an MI session.

Both therapist and client behaviours are thought to be of importance to understanding

the efficacy of MI. Amongst the theoretical frameworks and empirical research surrounding

MI, there are two components consistently emphasised in Miller and Rollnick's MI text

(1991, 2002, 2013) thought to be fundamental to the efficacy of MI. The first is a client-

centered therapy style, a non-confrontational way of interacting with clients' that does not

force change upon them; and the second is the facilitation of client expression of change talk

(Miller & Rollnick, 1991, 2002, 2013). Miller and Rose (2009) propose two causal

hypotheses (relational and technical) arising from these components that may account for the

effect of MI. At present, these hypotheses appear to offer the most pragmatic account of how

MI may produce change.

The relational hypothesis suggests that a therapist/client relationship that is

characterized by empathy and MI spirit can evoke client behaviour change. MI spirit is an

interpersonal style that emphasises client autonomy for change, a collaborative partnership

between therapist and client, and evocation of the client's own motivation (Miller &

Rollnick, 2013). The premise is that, by engaging in this therapeutic style the client feels in

charge of the therapy process, and feels safe to work through their ambivalence about change

and arrive at their own choices regarding the changes they wish to make. In giving autonomy

to the client, behaviour change is not forced by the therapist or others, but something the

client themselves wishes for in order to achieve their own goals. This intrinsic striving for

change fostered by a supportive environment and assistance from the therapist is thought to

elicit actual behaviour change.

The technical hypothesis suggests that a therapist's directive and proficient use of MI

consistent behaviour will elicit and reinforce client language in favour of change (change

talk) and it is this change talk (CT) that is related to outcome. Apart from a fundamental

relational style that characterises interactions in MI, Miller and Rollnick (1991, 2002, 2013)

also suggest specific core counselling skills that are important in resolving client ambivalence

about change. These MI consistent behaviours (MICO) include, but are not limited to,

therapist use of reflections and open questions, offering affirmations and support, and

emphasizing client control. MICO behaviours are used both to engage the client in the

therapy process, for example the use of reflections and affirmations to develop rapport and

demonstrate an empathic understanding of client concerns, but are also used in a more

directive sense to elicit client change language. For example, offering a reflection to clarify

the client's intent to change, or subtlety nudging the client towards expression of

commitment language. Miller and Rollnick also emphasise behaviours that are proscribed in

MI, that is MI inconsistent therapist behaviour (MIIN), such as confrontation, warning, and

directing. MIIN behaviour is thought to impede the MI process, as it can relinquish the

client's feeling of autonomy and obstruct the collaborative relationship, potentially eliciting

client resistance and sustain talk (ST; arguments in favour of maintaining the status quo)

(Miller & Rollnick, 2013).

The technical hypothesis imparts the role of client change talk (CT) as a mediator of

change, that is, the therapist uses MI skills that are consistent with the principles of MI in

order to elicit CT, and it is the expression of CT that is thought to be related to client

behaviour change. Client CT refers to any client language which favours change, however

research by Amrhein, Miller, Yahne, Palmer, and Fulcher (2003) demonstrated that client CT

could be categorised into six facets of expression: reasons, desire, ability, need, readiness

(preparatory change talk categories) and commitment language. For example, an expression

of desire to change may be, "I really want to stop drinking", while an expression of

commitment might be "I am going to stop drinking". The preparatory change talk categories

were suggested to be precursors to the client's expression of commitment to change.

Furthermore, observation of client language in MI demonstrates that along with CT, clients

also express arguments that favour the status quo (arguments against change), that is, sustain

talk (ST). ST is thought to relate to worse client outcome, because it indicates that the client

may still be harbouring ambivalence for change or a lack of commitment to change. ST can

also be categorised in the aforementioned fashion (Amrhein et al., 2003).

To further elaborate on the relational and technical hypotheses Miller and Rose

present a model that depicts a variety of pathways through which MI may facilitate behaviour

change. Their model (presented in Figure 1) indicates that training clinicians in MI is related

to therapist empathy and MI spirit, therapist use of methods that are consistent with MI, and

client expression of CT and reduced resistance during MI therapy (Paths 8, 9, & 10). The

model also suggests that both the relational and technical attributes of MI can directly impact

client behaviour change (Path 6 & 7), or can contribute to outcomes when mediated by client

CT (Path 1 & 2 via 5). That is, both the therapeutic style of MI and the specific techniques

used in MI can directly affect client treatment outcome, or may facilitate client expression of

CT, which in turn, is related to client outcome. Client CT and resistance (here resistance is

conceptualised as sustain talk) are hypothesised to predict client commitment to change (Path

3), which in turn affects behaviour change (Path 4). Path 3 suggests that client expression of

preparatory CT language, such as statements of reasons and desire to change are related to

client expression or indication of commitment to change. While Path 4 suggests that this

indication of commitment is related to client behaviour change. Thus the model proposes that

both preparatory CT (or a lack of ST) and commitment language specifically are related to

actual behaviour change, as indicated by Path 5 and Path 4, respectively.

Though Miller and Rose's model intuitively captures the processes of MI suggested

by Miller and Rollnick, whether these pathways exist in reality is understudied. There is a

handful of MI process research that supports some aspects of the model, particularly the link

between therapist behaviours and client CT, and the relationship between client CT and

commitment to behaviour change (Miller & Rose, 2009). Meta-analytic research has also

provided evidence for elements of the technical hypothesis, demonstrating a positive

relationship between therapist MI consistent behaviour and client CT, and an association

between client ST and worse client outcome (Magill et al., 2014). Furthermore, in a meta-

analysis conducted in the substance use domain, CT was supported as a potential mediator of

MI's effectiveness (Apodaca & Longabaugh, 2009). However a review of each path of Miller

and Rose's model has not yet been undertaken and the aforementioned reviews of MI process

research were primarily conducted with substance abusing populations. Furthermore, the

rapid dissemination of research in the MI field requires an up to date examination of potential

process variables in order to offer continuous guidance to MI practice. Examining empirical

evidence for each path may allow for a better understanding of the processes through which

MI may affect client change, potentially providing an indication of client and therapist

behaviours that are of significance to client outcome.

+ Figure 1 near here

The aim of the current review is to systematically examine evidence for the putative

model proposed by Miller and Rose. The review will appraise studies that examine any of the

following relationships; the relationship between therapist style/behaviours and client CT and

resistance (Paths 1 & 2); the relationship between preparatory CT and commitment to

behaviour change (Path 3); and the relationship between both therapist and client behaviours

and outcome (Paths 4, 5, 6 & 7)[1]. The review will evaluate the validity of the relational and

technical hypothesis to account for the effect of MI in a range of problem areas.

Method

Inclusion criteria

Studies were included if they met the following criteria: (i) clients received a

therapeutic intervention referred to as 'motivational interviewing', 'motivational

enhancement therapy (MET)', 'motivational intervention' or 'brief intervention' (based upon

the principles of Motivational Interviewing as defined by Miller and Rollnick (1991, 2002,

2013)); (ii) the intervention was delivered individually and in person to adult participant's[2];

(iii) the study examined a link in Miller and Rose's (2009) causal chain (Paths 1-7); and (iv)

studies were reported in English.

In order to identify MI process research that met these criteria a variety of search

methods were employed. An electronic database search of PsycInfo, Embase, Web of

Science, ProQuest Dissertations and Theses, and Google scholar was conducted using the

following keywords: motivational interviewing, motivational enhancement therapy, brief

intervention, mechanisms of action, mediator, therapy process, change talk, and therapist

behaviours. Hand-searches of the online MI bibliography posted on the official motivational

interviewing website (http://www.motivationalinterview.org) were also conducted, as well as

hand-searches of relevant review and meta-analytic papers (Apodaca & Longabaugh, 2009;

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[1] Paths 8, 9, and 10 (the effect of training in MI on therapist and client behaviours) will not be

examined in this review.

[2] In some cases college/university/young adult samples included participants under the age of 18.

These studies were included if participants' were not referred to as "adolescents".

Burke et al., 2003; Lundahl & Burke, 2009; Lundahl et al., 2010). Database searches were

conducted up until March 2013.

Results

The search retrieved 384 studies of which 37 met the inclusion criteria. Figure 2

illustrates the search strategy and flow of information through different stages of the review.

The search retrieved many studies that resulted from larger RCT's. Multiple studies utilizing

the same sample source were included in the review if they investigated different links in the

causal chain or supplied additional information about the process variable (for example,

examined CT categories as opposed to overall CT). If two studies employed identical designs

and overlapping samples, either the most recent study, or the study that provided the most

information about the process variable was reviewed (for example, studies which examined

the effect of each specific MICO behaviour were included over those which analysed a total

MICO score by combining all therapist behaviours).

+ Figure 2 near here

Path 1 (the effect of MICO on CT) and Path 6 (the effect of MICO on outcome) were

the most widely examined paths. The majority of studies were conducted with alcohol users

(n = 22). Three studies examined illicit substance abusing populations and three studies

examined both alcohol and illicit substance users. Two studies were conducted with smokers

and four in the area of health promotion, including exercise, diet, and antiretroviral therapy

adherence. One study each was conducted in the areas of partner aggression, and mixed

mental health and substance use disorders.

The majority of studies examined elements of the model within a single MI session (n

= 32). In eight of the 32 studies, participants received more than one session, but only one

session was selected for analysis (six studies used the first session) and one study analysed

the first two sessions. In five studies participants received more than one session and all

sessions were coded. Across the studies, MI session length ranged from 7 minutes to 90

minutes. Of all the 37 studies, seven studies examined a portion of the total length, generally

examining 20 minutes of the session. Characteristics of MI for each study are presented in the

Appendix.

All but two studies utilised observer rated measures of therapist and client

behaviours[3]. Most studies chose to examine MI consistent (MICO) and MI inconsistent

(MIIN) behaviour in one of two ways; either all specific behaviours that fell into MICO and

MIIN categories were combined to create a total MICO or MIIN score; or specific behaviours

were examined separately. Total MICO was generally comprised of; advise with permission,

affirm, emphasise control, open questions, reflect, reframe, and support; Total MIIN was

comprised of; advise without permission, confront, direct, raise concern without permission,

and warn. Some studies also included an "other" category of behaviour that comprised of

behaviours typically demonstrated in MI but not specifically MI consistent or inconsistent;

facilitate, filler, giving information, and structure. In examining change talk (CT), studies

either; combined common CT categories (desire, reasons, need, ability, taking steps[4],

commitment, and "other" (any talk not fitting into aforementioned categories that indicates

movement towards change) to measure the effect of overall CT; or combined only

preparatory categories (desire, reason, need, ability); or examined each CT category

separately. This was also the case for sustain talk (ST), however total ST comprised client

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[3] Strang and McCambridge (2004) and Magill, Stout, and Apodaca (2012) utilised therapist-rated

measures of clinician behaviour.

[4] The readiness factor proposed by Amrhein et al. (2003) did not commonly occur in MI sessions.

Subsequent coding of client language suggested the additional dimension of "taking steps", which

relates to verbalization of action already being taken to change (Miller & Johnson, 2008).

language that reflected movement away from change[5]. Across the studies, CT was mostly

given strength (of the language expressed) or frequency ratings, and was measured either for

the session as a whole or per segment of MI.

Control conditions were often present in the larger RCT from which study data was

derived, however many of the reviewed studies did not compare therapist and client

behaviours across conditions. For clarity a comparison group is only identified if it formed

part of the reviewed study and was not solely relevant to the parent study.

Study characteristics are presented alongside results for each study in Tables 1, 2, 3,

and 4. Evidence for each link in the putative causal chain will now be examined.

Path 1: MI-Consistent Methods → Change talk/Resistance

Studies that examined Path 1 provide support for a link between therapist

MICO/MIIN behaviours and client CT/ST (results are presented in Table 1). Particularly

useful in examining this link were studies that generated transition probabilities to determine

the likelihood of client CT/ST occurring following therapist behaviours. Transition

probabilities describe the probability that a behaviour, such as client CT, will occur

immediately after another behaviour, such as a therapist reflection, has occurred. MICO was

associated with an increased probability of CT in two out of three studies (Gaume, Bertholet,

Faouzi, Gmel, & Daeppen, 2010; Gaume, Gmel, Faouzi, & Daeppen, 2008) and in one study

appeared to inhibit ST (Moyers, Martin, Houck, Christopher, & Tonigan, 2009). CT was

significantly less likely following MIIN behaviours (Gaume et al., 2010; Gaume, Gmel,

Faouzi, et al., 2008; Moyers et al., 2009), and ST was significantly more likely to follow

MIIN in one study (Gaume et al., 2010). Surprisingly two studies found that MICO also led

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[5] Some studies used "Counter-change talk" as a term to describe client arguments away from change,

but for clarity "Sustain Talk" (ST) is the term used in the results section.

to ST (Gaume et al., 2008; Gaume et al., 2010). In considering the remaining studies, further

support was achieved for Path 1. All 14 studies found some positive relationships between

MICO and client CT (Apodaca, Magill, Longabaugh, Jackson, & Monti, 2013; Catley et al.,

2006; Daeppen, Bertholet, Gmel, & Gaume, 2007; Fischer, 2012; Gibbons et al., 2010; Glynn

& Moyers, 2010; Martino, Ball, Nich, Frankforter, & Carroll, 2008; Morgenstern et al., 2012;

Moyers et al., 2009; Pirlott, Kisbu-Sakarya, Defrancesco, Elliot, & Mackinnon, 2012;

Prabhu, 2008; Sargeant, 2011; Tollison, 2010; Vader, Walters, Prabhu, Houck, & Field,

2010). Across the eight studies that examined specific MICO behaviours, therapist use of

reflections was most consistently and positively related to CT (Catley et al., 2006; Fischer,

2012; Gaume et al., 2010; Miller, Benefield, & Tonigan, 1993; Moyers et al., 2009; Prabhu,

2008; Tollison, 2010). CT was also sequentially related to reflections of CT (Gaume et al.,

2010; Moyers et al., 2009). In general MIIN behaviours did not share a relationship with

client CT (Catley et al., 2006; Daeppen et al., 2007; Pirlott et al., 2012; Tollison, 2010), if the

two were related this relationship was negative (Apodaca et al., 2013; Gibbons et al., 2010).

Overall, MIIN behaviours were also unrelated to ST. However one study did find that more

use of MIIN behaviour by the therapist related to increased ST (Prabhu, 2008), and one found

that therapist confrontation was strongly positively correlated with other client resistance

behaviours, such as arguing and denying problems (Miller et al., 1993).

Path 2: Therapist Empathy/MI Spirit → Change talk/Diminished Resistance

Overall the results of the included studies provide variable support for a relationship

between therapist MI spirit/empathy and client CT. Results for this path are presented in

Table 1. Two studies had results consistent with the model, showing that both MI spirit and

empathy were significantly positively correlated with client CT (Pirlott et al., 2012; Prabhu,

2008). One study showed the opposite; levels of acceptance, empathy and MI spirit did not

differ between clients who either intended to decrease alcohol use or not after an MI

intervention (Daeppen et al., 2007). The relationship between MI spirit/empathy and CT

among the remaining studies was more variable showing inconsistencies that may be related

to construct measurement (e.g., Tollison (2010) found that the relationship between empathy

and CT differed depending on the rate of open questions and reflections of CT offered by the

therapist). Two studies provided support for the role of an overall MI spirit and empathic

style in eliciting CT and reducing resistance (Miller et al., 1993; Morgenstern et al., 2012).

+ Table 1 near here

Path 3: Client Change Talk/Diminished Resistance $\rightarrow$ Commitment to Behaviour Change

Data for Path 3 (examining the link between client preparatory CT and commitment

to change) can be seen in Table 2. Results showed that taking steps CT and preparatory

language categories (desire, reasons, need, and ability) shared some significant relationships

with client commitment language (Amrhein et al., 2003; Martin, Christopher, Houck, &

Moyers, 2011; Sargeant, 2011; Tollison, 2010) and were related to client intention to

decrease alcohol use (Daeppen et al., 2007). CT was also related to client completion of a

change plan (Magill, Apodaca, Barnett, & Monti, 2010).

+ Table 2 near here

Path 4: Client Commitment to Behaviour Change $\rightarrow$ Behaviour Change

The relationship between commitment to behaviour change and actual behaviour

change was examined in 12 studies (results are presented in Table 3). Half of these studies

provided support for a positive relationship between commitment to change and outcome

measures (Amrhein et al., 2003; Campbell, Adamson, & Carter, 2010; Daeppen et al., 2007;

Morgenstern et al., 2012; Peterson, 2011; Tollison, 2010). Of the six studies though, one

study found that the relationship between commitment and reduced alcohol use was at trend

level only (Morgenstern et al., 2012), and one found that commitment language at two of the

ten time points assessed during MI was related to fewer alcohol problems at follow-up but no

other outcome variable (Tollison, 2010). Peterson (2011) also found that the relationship

between commitment language and outcome depended on assessment period and how

commitment language was measured. The remaining six studies did not support a link

between commitment language and positive client outcome (Gaume, Bertholet, Faouzi,

Gmel, & Daeppen, 2012; Gaume, Gmel, & Daeppen, 2008; Martin et al., 2011; Perry &

Butterworth, 2011; Sargeant, 2011; Walker, Stephens, Rowland, & Roffman, 2011).

Path 5: Client Change Talk/Diminished Resistance → Behaviour Change

Overall the studies provide support for the link between client CT and behaviour

change (shown in Table 3). In evaluating the effect of combined CT categories, five out of

seven studies demonstrated that positive client CT was related to better client outcomes at

end treatment or follow-up assessments, including reduced drinking (Bertholet, Faouzi,

Gmel, Gaume, & Daeppen, 2010; Miller et al., 1993; Moyers et al., 2009), increased fruit and

vegetable intake (Pirlott et al., 2012), and the amount of antiretroviral medication taken

(Peterson, 2011). One study showed no difference in the frequency of CT for remitted and

unremitted drinkers but found remitted drinkers to have engaged in less ST during MI

(Campbell et al., 2010). Eight studies examined CT categories, seven of which demonstrated

that one or more of the individual categories were related to client behaviour change

(Campbell et al., 2010; Gaume et al., 2012; Gaume, Gmel, & Daeppen, 2008; Martin et al.,

2011; Sargeant, 2011; Strang & McCambridge, 2004; Walker et al., 2011). Amrhein et al.

(2003) was the only study to find that preparatory CT categories (desire, reason, need, &

ability) were not related to outcome. As a category ability CT was the most consistent

predictor of client behavioural changes, with six of the seven studies that analysed ability CT

supporting a significant relationship to client outcome (Cambell et al., 2010; Gaume et al.,

2012; Gaume, Gmel, & Daeppen, 2008; Martin et al., 2011; Sargeant, 2011; Walker et al.,

2011). In four of these studies ability CT was a significant predictor of outcome after

controlling for multiple predictor variables, including other CT categories (Campbell et al.,

2010; Gaume, Gmel, & Daeppen, 2008; Martin et al., 2011; Sargeant, 2011). One study

examined general client resistance behaviours (a combination of ST and other behaviours

thought to impede the change process) and found that clients who showed increased

resistance had worse outcomes (Miller et al., 1993).

+ Table 3 near here

Path 6: Therapist Use of MI Consistent Methods → Behaviour Change

Results for Path 6 (the link between therapist behaviours and client behaviour change)

are presented in Table 4. When MICO behaviours (e.g., use of reflections, open questions,

affirmations, advising with permission, and support) were combined to predict outcome, one

out of four studies demonstrated a positive relationship, specifically, greater use of MICO

was associated with fewer drinks per week at follow-up (Moyers et al 2009). Two studies

examined overall adherence to the principles of MI, both showing that adherence to and

competence in executing fundamental and advanced MI skills were positively related to the

amount of negative drug screens achieved by the client (Gibbons et al., 2010; Martino et al.,

2008). In examining the presence of MI's directive elements, Morgenstern et al. (2012)

showed that the combination of directive elements (e.g., giving feedback, working on a

change plan, eliciting CT) with MI spirit and empathy did not reduce drinking more than an

MI spirit only condition. Overall, the relationship between specific therapist behaviours and

outcome was varied. Some behaviour's were consistently related to outcome across studies

while others were not. Only Gaume, Gmel & Daeppen (2008) presented results for each

MICO behaviour (significant or not), demonstrating that just two out of 13 therapist

behaviours (advising with permission and affirming statements) were associated with

decreases in heavy drinking episodes (Gaume, Gmel, Daeppen, 2008). Predictors of positive

outcome included; a higher ratio of reflections to questions (2/2 studies; Thrasher et al., 2006;

Woodin, Sotskova, & O'Leary, 2012); the number of affirming statements (2/2 studies;

Thrasher et al., 2006; Gaume, Gmel, & Daeppen, 2008); advising with permission (examined

in one study; Gaume, Gmel, & Daeppen, 2008); and therapist focus on client commitment

(examined in one study; Magill, Stout, & Apodaca, 2012). Therapist use of complex

reflections was not related to outcome in the four studies that examined it, and the use of

open questions showed one negative relationship to outcome (Tollison et al., 2013), and one

positive relationship but only for women in the sample (Woodin et al., 2012). With respect to

negative predictors, at one-year follow-up therapist use of confrontation predicted worse

drinking outcomes in two out of three studies (Karno & Longabaugh, 2005; Miller et al.,

1993), with a trend emerging in the third study (Gaume, Gmel, & Daeppen, 2008). Further

negative predictors of outcome included therapist use of closed questions (2/5 studies; Karno

& Longabaugh, 2005; Thrasher et al., 2006); the use of simple reflections (2/3 studies;

Tollison et al., 2008; Tollison et al., 2013); therapist focus on client ambivalence (2/3 studies;

Baird et al., 2007; Magill et al., 2012); interpretations, interpreting resistance, and

introduction of topics (examined in one study; Karno & Longabaugh, 2005). Karno and

Longabaugh (2005) also found that therapist level of directiveness was negatively related to

percent of days abstinent, but only for clients high in reactance[6]. Strang and McCambridge

(2004) showed a positive relationship between directiveness and outcome, however

directiveness in this study referred to the extent to which the therapist provided direction to

the MI session, as opposed to the confrontational/teaching type qualities measured in Karno

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[6] *Psychological reactance*, defined by Brehm and Brehm (1981) as the tendency to resist

relinquishing control in interpersonal situations.

and Longabaugh (2005).

Path 7: Therapist Empathy/MI spirit → Behaviour Change

Collectively the studies that examined Path 7 offered mixed support for the effect of MI spirit and therapist empathy on outcome (shown in Table 4). Four studies found that behaviour change was unrelated to levels of therapist empathy (Feldstein & Forcehimes, 2007; Magill et al., 2010; Pirlott et al., 2012; Tollison et al., 2013) or MI spirit (Gaume, Gmel, & Daeppen, 2008; Pirlott et al., 2012; Tollison et al., 2013; Woodin et al., 2012). Three studies supported a positive relationship between empathy and outcome (Gaume, Gmel, & Daeppen, 2008), though two of these only found this relationship in subsamples of participants (Thrasher et al., 2006; Woodin et al., 2012). Three studies showed that the combination of MI spirit and empathy were positively related to client outcome (Baird et al., 2007; Thyrian et al., 2007), though results of Thrasher et al (2006) were confined to a subsample. Overall, a clinician therapy style characterised by MI spirit and empathy was related to reductions in drinking (Miller et al., 1993; Morgenstern et al., 2012) and reduced blood alcohol concentration (Miller et al., 1993).

+ Table 4 near here

Discussion

The overall aim of this review was to examine evidence for the putative causal model suggested by Miller and Rose (2009) and to determine the validity of the relational and technical hypothesis to account for client outcome in MI.

Overall, the results provided support for the technical hypothesis encompassed in Miller and Rose's model. The technical hypothesis suggests that MICO behaviours affect client CT/resistance, and CT/resistance predicts behaviour change. In line with the meta-

analytic findings of Magill et al. (2014), generally therapist MICO behaviours were

positively related to client CT. In some cases a sequential pattern emerged whereby clients

were more likely to express arguments for change immediately following therapist use of

MICO behaviours and were unlikely to express CT following MIIN behaviours. The

relationship between MICO and CT and the decreased likelihood of CT following MIIN

behaviours indicates the usefulness of factors like affirmations, reflections and support in

encouraging client CT, and also points to behaviours that may hinder the expression of CT

(e.g., confrontation, advising without permission, and warning). Therapist use of reflections

was the one specific behaviour most often related to CT. Skilful use of reflections can

encourage self exploration and evoke thoughts about change (Miller & Rollnick, 2013) which

may explain the relatively consistent relationship found between reflections and change

language.

Therapist relational style variables were not consistently related to CT. Theory

suggests that MI spirit and empathy may be enough to foster behaviour change (Miller &

Rose, 2009) but perhaps these stylistic variables do not affect CT specifically. MI spirit and

empathy are beneficial in MI because they help to create a safe and supportive environment

where the client feels comfortable to express their concerns (Miller & Rollnick, 2013). While

this type of therapy style might facilitate client expression in general it may not be imperative

to the expression of CT and as suggested by results for Path 1, perhaps the directive (or

technical) elements of MI provide the principal catalyst for CT. It is also possible that

clinician interpersonal style may be more relevant to other positive client behaviours such as

engagement and involvement. Research has demonstrated a positive relationship between

clinician MI spirit and client engagement behaviours, for example, disclosure, involvement,

and cooperation (Boardman, Catley, Grobe, Little, & Ahluwalia, 2006; Catley et al., 2006;

Moyers, Miller, & Hendrickson, 2005; Pirlott et al., 2012).

A direct link between MICO behaviour and outcome was not consistently supported

by the studies. Of the specific behaviours, a higher ratio of reflections to questions and more

use of affirmations appeared to predict positive outcome most consistently, however only one

study presented both significant and non-significant findings for each behaviour category so

these conclusions may be imprecise. The inconsistent link between MICO and outcome may

support Miller and Rose's technical hypothesis, which proposes that CT mediates the

relationship between MICO and outcome. For CT to act as a mediator it should be directly

related to MICO (a link supported by aforementioned results) and should also relate to client

outcome. Generally it was the case that when clients uttered more positive change statements

they showed better results on outcome variables, for example reduced drinking and increased

fruit and vegetable intake. Regarding CT categories, ability language was the most consistent

predictor of outcome across the studies. Client's who expressed confidence in their capacity

to change were more likely to enact behavioural changes. Literature in the field of self-

efficacy supports the relationship between client perceived ability and actual change. A

higher level of perceived ability to overcome one's problem, or engage in positive change

behaviours has been associated with better outcomes for problem drinkers (Adamson,

Sellman, & Frampton, 2009), sufferers of bulimia nervosa (Steele, Bergin, & Wade, 2011),

anorexia nervosa (Pinto, Heinberg, Coughlin, Fava, & Guarda, 2008) and cocaine abusers

(Dolan, Martin, & Rohsenow, 2008). Moreover, individuals with higher nutrition self-

efficacy were shown to be more likely to act on their intentions and enact change plans

(Ochsner, Scholz, & Hornung, 2013), and greater changes in self-efficacy regarding social

situations have been related to better outcomes for socially anxious individuals (Gaudiano &

Herbert, 2003).

In examining each path separately, the majority of studies supported a positive

relationship between MICO and CT and between CT and outcome, but did not substantiate a

direct link between MICO and outcome. The results provide some evidence for the technical

hypothesis, which demarcates CT as a mediator of change. However, many of the studies

only provided correlational data, which does not provide evidence for the direction of the

relationship between CT and MICO. Furthermore, in studies that calculated transition

probabilities, a two-way relationship between CT and MICO was noted. That is, while CT

was more likely to follow MICO than MIIN, MICO was also more likely than MIIN to

follow CT (Gaume et al., 2010; Moyers et al., 2009). The transition probability findings

demonstrate the potential for client behaviour to affect clinician response during the therapy

session, however they also preserve the temporal relationship between MICO and CT which

provides stronger support for the technical hypotheses than does a correlational design

(Moyers et al., 2009).

While there is potential for bidirectional relationships to exist between model paths,

those studies that did analyse CT as a mediator provided additional support for the technical

hypothesis. For example, Moyers and colleagues (2009) found CT to mediate the effect of

therapist MICO behaviours on client drinking outcomes and Pirlott et al. (2012) demonstrated

that CT mediated the effect of both MICO and MI spirit on change in fruit and vegetable

consumption. CT was also found to mediate the relationship between condition (MI spirit or

MI with directive elements) and drinking outcome (Morgenstern et al., 2012). Furthermore

these analyses were conducted within a single MI session, which supports the temporal

relationship between MICO, CT, and client behaviour change.

The relational hypothesis suggests that therapist interpersonal style (i.e., MI spirit and

empathy) can evoke behaviour change. This hypothesis was not consistently supported in the

current review, however study methodology should be taken into account. Studies that

utilised experimental designs to isolate the effect of therapist style did demonstrate that an

overall client-centred style can alone affect behaviour change (Miller et al., 1993;

Morgenstern et al., 2012). One noteworthy study examined the effect of MI spirit and

empathy using an experimental paradigm that disaggregated therapist style (MI

spirit/empathy) from the directive elements of MI (that is, the specific behaviours utilized to

facilitate CT). The researchers found that the MI spirit condition had larger reductions in

drinking however this difference was not significant (Morgenstern et al, 2012). This study

suggests however that a specific relational style exhibited by the therapist can alone induce

behaviour change. Unfortunately, even in employing experimental paradigms it is difficult to

disaggregate the effect of therapist style from the effect of specific therapist behaviours.

MICO therapist behaviours such as the use of reflections are fundamental to both the

directive method of MI (i.e., reflections are utilised to encourage CT) and the relational style

(i.e., reflections help to establish an empathic relationship). Because MI fidelity measures

generally do not code the type of reflections it is difficult to determine whether specific

behaviours are used in a relational or directive sense, and thus determining how these

behaviours contribute to client outcome is problematic. For example, in examining Path 6

(the relationship between MICO and outcome) it was found that a higher ratio of reflections

to questions and greater use of affirmations was related to positive outcome however it is

uncertain whether these behaviours were used to convey MI spirit or to facilitate expression

of CT. Utilising measures that code for types of reflections such as reflections of CT and ST

(i.e. the Sequential Code for Observing Process Exchanges (Martin, Moyers, Houck,

Christopher, & Miller, 2005)) could help to reduce ambiguity.

While not specifically encompassed in the relational and technical hypotheses, Path 3

and 4 of the model suggest that client preparatory CT is related to commitment to behaviour

change and commitment to behaviour change is related to outcome, respectively. In light of

the studies reviewed it appears that greater preparatory CT is related to an increased level of

commitment to change by the client. These findings offer some support to Path 3 of the

Miller and Rose model and also the application of Self-Perception Theory as a framework to understand client behaviour change following MI. With regard to Self-Perception Theory, the expression of CT in MI is thought to facilitate behaviour change because in voicing and hearing their own arguments for change, clients adopt new attitudes and beliefs about change and essentially "talk themselves into" the change process (Miller, 1983). More expression of change language is likely to lead to higher levels of commitment as the client further strengthens their resolve to change. While the results for this Path 3 are promising, a larger sample size of studies is necessary to validate the reliability of the findings.

It is speculated that people who express commitment to change are more likely to show behavioural changes in the future (Miller & Rollnick, 2004). However the results were not consistent in supporting a relationship between client commitment and outcome (Path 4). The inconsistent results also question the link between Speech Act Theory and MI, which suggests that the obligatory nature of commitment language helps to drive behaviour change (Bricker & Tollison, 2013). However, it is possible that two methodological features of the studies contributed to the variable findings. Firstly, studies' that combined CT categories to predict outcome often combined preparatory language (desire, reason, need, & ability) and the taking steps category with client commitment language. Because the effect of commitment language was often not disaggregated from preparatory CT the real relationship between expressions of commitment and outcome was not captured. Alternatively, the measurement of commitment may explain differences in study results. Studies that measured total commitment strength or overall frequency generally found inconsistent relationships with outcome, however three studies demonstrated that when commitment language was measured throughout the session increases in commitment talk were positively related to outcome (Amrhein et al., 2003; Cambell et al., 2010; Peterson, 2011). These results suggest that a client's movement to a higher level of commitment during MI may be a better predictor

of outcome than the frequency or strength of commitment language overall.

Limitations

The current study has a number of limitations that may affect conclusions drawn. Firstly, many of the reviewed studies resulted from samples drawn from larger RCT's. Groups of authors often utilised the same sample in multiple publications to examine separate paths, which may have contributed to more positive or negative results overall depending on the sample. To limit any dependence in the results studies were excluded if they employed identical samples to examine the same path. However, this does not rule out the potential for publication bias. In order to more clearly ascertain the significance of the model paths, an ideal strategy would be to test the full model in a single large and representative sample.

Additionally, the majority of studies employed alcohol and other substance using populations, which limits the conclusions and validity of Miller and Rose's (2009) model to these groups. Nevertheless, the few studies that did employ non-substance abusing samples support parts of the model in a variety of problem areas, including diet and exercise (Pirlott et al., 2012), therapy adherence (Peterson, 2011; Thrasher et al., 2006) and partner aggression (Woodin et al., 2012).

Methodological quality of the studies was a further limitation. Many of the reviewed studies employed reliable MI fidelity measures, but six studies did not assess fidelity which compromises the quality and "purity" of the MI delivered. Also, in some cases fidelity measures lacked adequate inter-rater reliability. This was particularly the case when behaviours were infrequent, for example MIIN behaviours. The relative paucity of these behaviours during MI sessions made it difficult to rate them reliably, which may have affected the relationships found. In any case several studies did withdraw unreliable variables from statistical analyses.

A final limitation is the essentially qualitative nature of the review. While the results

of this study can shed light on the relational and technical hypotheses proposed by Miller and

Rose (2009), meta-analytic work that attempts to quantify the model paths will further

enhance the validity of these hypotheses. Magill et al. (2014) have provided meta-analytic

support for Paths 1 (the relationship between MICO and CT) and 5 (an overall composite

measure of CT was related to better client outcome) in various problem areas. Continuing to

examine segments of the model in varying domains may further support the suggested

process of MI.

Future directions

The model suggested by Miller and Rose (2009) outlines a variety of pathways

through which MI may lead to behaviour change. However, in evaluating studies additional

process variables that may form part of the causal model were identified. One set of

behaviours that may be particularly relevant is client engagement behaviours, for example

client involvement in MI sessions and level of disclosure. The third edition of *Motivational*

Interviewing (Miller & Rollnick, 2013) suggests that an important element of MI's

effectiveness is the therapist successfully engaging the client in therapy, and as discussed

research has demonstrated a link between therapist style variables and client engagement. A

client's level of engagement in MI may affect their expression of CT and level of resistance,

potentially moderating the relationship between therapist behaviours and CT. Also,

psychotherapy literature in various treatment domains has shown client engagement

behaviours to relate to outcome (Tetley, Jinks, Huband, & Howells, 2011). Furthermore, there

is some suggestion that MI has a positive effect on the therapist/client working alliance, a

construct akin to Miller and Rollnick's process of engagement in MI. Empirical research has

shown high levels of working alliance in MI, though no difference in working alliance has

been found between MI and other therapy modalities (Crits-Christoph et al. (2009).

In addition, a direct link may exist between therapist style/behaviours and client commitment to change, bypassing client CT. The findings from Magill et al. (2010) support such a link in that therapist behaviours were directly related to an indicator of client commitment; client completion of a change plan. Furthermore, proximal outcome variables such as completion of a change plan may be a valuable addition to the model. These variables are not necessarily behavioural outcomes but indicate a step towards change that may contribute to later behaviour changes. Potentially commitment to change may affect proximal measures of outcome (for example, attending a therapy group), which in turn facilitate behaviour change. Such a path also supports the suggestion of diverse operationalisation of commitment; potentially commitment language is just the start of a client's demonstration of commitment, behavioural indicators of commitment such as completing therapy tasks may be more predictive of actual behavioural changes.

From a methodological standpoint, more experimental research is needed to disaggregate the effect of therapist relational style from directive behaviours to determine how each MI component factors into client outcome. Experimental research could also help to determine which specific therapist behaviours are most relevant to client CT and diminished resistance.

Moreover, commitment language should be analysed independently of the preparatory categories to determine the unique effects of language pertaining to client commitment. Because increasing client commitment is a goal of MI, measuring commitment language throughout the MI session is also recommended in order to capture any changes in commitment and the relationship these changes have to outcome.

Third, comparison conditions are needed to determine if an MI style, MICO behaviours, and client CT is unique to MI. While many of the studies reviewed yielded

comparison groups due to their respective RCT's the majority of these did not compare therapy processes across conditions. This would be an important step to establish the unique process of MI as recent research has demonstrated the effect of alternate therapy styles on elicitation of client CT, for example CBT (Aharonovich, Amrhein, Bisaga, Nunes, & Hasin, 2008; Moyers et al., 2007) and Twelve-Step Facilitation Therapy (Moyers et al., 2007). Furthermore, examining the underlying mechanisms of MI could potentially inform process research in diverse therapeutic modalities. The relationship between potential mediators of treatment effectiveness and client outcome is elusive in all forms of psychotherapy. Systematically observing the relationship between therapist and client behaviours in a variety of therapy styles may indicate the types of behaviours that are fundamental to psychotherapy process in general, potentially allowing for enhanced client outcome.

Conclusions

The current review examined evidence for a causal chain model hypothesised to account for the process of MI. The relational and technical paths suggested by Miller and Rose are in no way competitive hypotheses (Miller & Rose, 2009). It is vital that both therapist MI style and behaviour converge to achieve best client outcomes. However it is important to determine the processes through which MI achieves change in order to improve MI services. The efficiency of MI sessions can be maximised if clinicians focus on those elements of MI known to affect positive client behaviours and outcome. While client CT appears fundamental to the process of MI further investigation and statistical analyses of CT as a mediator are required in order to more confidently assess the findings.

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Table 1. Study characteristics and results for Path 1 and 2

Study	Target Problem	n	Process Measure	Comparison Condition	Path Examined	Results
Gaume et al. (2010)	Alcohol	149	MISC	None	1	MICO, and also simple and complex reflections individually were significantly more likely to be followed by CT and ST. MIIN was significantly more likely to be followed by ST and significantly less likely to be followed by CT.
Gaume et al. (2008)	Alcohol	97	MISC	None	1	MICO was significantly more likely to be followed by CT/ST. MIIN was significantly less likely to be followed by CT.
Gibbons et al. (2010)	Alcohol/Illicit substances	377	ITRS[a]	Counselling as usual	1	Therapist adherence and competence in fundamental and advanced MI skills was associated with more CT and less resistance to change. MIIN was negatively associated with increases in CT.
Glynn & Moyers (2010)	Alcohol	47	MISC	Functional Analysis	1	Clients expressed significantly more CT when therapists employed techniques to evoke CT (e.g., evocative questions, reflections, exploring goals and values) compared to functional analysis (therapists discussed the function of drinking for clients).
Martino et al. (2008)	Alcohol/Illicit substances [b]	461	ITRS[a]/ Idiosyncratic CT scale	Counselling as usual	1	Fundamental and advanced MI adherence and competence was related to more CT and less resistance at end treatment.
Moyers et al. (2009)	Alcohol	63	SCOPE	None	1	MICO was a significant positive predictor of CT/ST. MIIN did not predict CT but positively predicted ST. CT was more likely than expected by chance following QPOS, QNEG, and RCT, and less likely following MIIN, RST, REF and "other" behaviours. ST was likely to follow QPOS, QNEG, and RST but not likely to follow MICO or "other".
Sargeant (2011)	Dual diagnoses[c]	45	MISC/ DARN-C	None	1	MICO was positively related to reasons CT frequency, but was not related to desire, ability or commitment language.
Vader et al. (2010)	Alcohol	143	MISC	MI + FB	1	When controlling for client talkativeness, MICO was positively correlated with CT in the MI+FB condition and CT and ST in the MI only condition.

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Apodaca et al. (2013)	Alcohol	157	MISC	None	1,2	At decile level MICO/MIIN did not predict CT or ST. At session level, MICO positively predicted CT and MIIN negatively predicted CT. At decile level MI spirit and acceptance were unrelated to CT, but did relate to reduced ST.
Daeppen et al. (2007)	Alcohol	97	MISC	None	1, 2	Frequency but not %MICO was related to client intention to decrease alcohol use following MI. MIIN, the ratio of reflections to questions, % open questions and % complex reflections were unrelated to intention to decrease alcohol as were: acceptance, empathy and MI spirit.
Catley et al. (2006)	Smoking	86	MISC	None	1,2	MICO positively related to CT (need, desire, intention, optimism for change) but was unrelated to ST (i.e., arguing, interrupting, negating, not following). MIIN was unrelated to CT/ST. Individually, reflect, reframe, and raise concern without permission positively related to CT (open questions related at trend level). Advise without permission negatively related to CT (warn negatively related at trend level). Advise with permission, emphasise control, support, confront, and direct were unrelated to CT. Emphasize control was negatively related to ST, and reframe was positively related to ST. No other specific behaviour was related to ST. Acceptance, egalitarianism, warmth, genuineness, empathy and MI spirit averaged together positively predicted CT, but not ST.
Fischer (2012)	Alcohol/Illicit substances	150	MISC/ISCEE	None	1,2	MICO and RCT were significantly positively related to CT. Reflect ST positively related to ST. The frequency but not duration of empathic speech was related to CT but both measures of empathic speech showed larger positive correlations with ST.
Pirlott et al. (2012)	Health Promotion	43	MISC	None	1, 2	MICO correlated positively with CT but had no relationship with ST. MIIN was unrelated to CT/ST. MI spirit, empathy and direction were positively related to CT but were unrelated to ST.
Prabhu (2008)	Alcohol	30	MISC	MI + FB	1, 2	MICO positively predicted CT and MIIN positively predicted ST in MI+FB. Facilitate was positively related to CT in MI+FB and ST in both conditions. Simple reflections were positively related to CT in MI+FB and positively related to ST in both conditions. Complex reflections were positively related to CT in MI+FB. Total reflections were positively related to CT in MI+FB and positively related to ST in both conditions. The ratio of reflections to questions was positively related to CT/ST in MI+FB. % MICO was negatively related to ST in the MI+FB condition. Advise

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Tollison (2010)	Alcohol	97	MI-PACT	None	1, 2	Therapist and client speech was divided into deciles. MICO was positively related to preparatory CT frequency in the concurrent but not subsequent decile. Frequency of open questions did not relate to CT in the same decile but predicted less CT in the subsequent decile. RCT positively predicted CT in the same decile but not the subsequent decile. RST positively predicted ST in the concurrent but not subsequent decile, MIIN was unrelated to ST. Over the entire session, simple and complex reflections did not relate to CT. When analysed with MICO, empathy was unrelated to CT frequency. When the use of open questions and RCT was low, empathy positively predicted CT (same decile). Empathy positively predicted CT in the subsequent decile when RCT was high.
Miller et al. (1993)	Alcohol	42	Modified CRC	Directive Confrontational Counselling	1, 2	Positive correlations were found between therapist confront and client argue, off-task, interrupt, and deny problems (r = .74-.88). Positive associations between therapist teach and client follow, therapist restructure and client acknowledging problems, and therapist listening and client following and acknowledging problems (r =. 74-.94) Participants' allocated to the client centred therapy style showed greater CT and less resistance than those who received directive confrontational counselling (these clients were more likely to deny problems, argue with, interrupt and ignore the therapist, and less likely to acknowledge problems).
Morgenstern et al. (2012)	Alcohol	89	MITI/CLCS	SOMI/ Self-Change	2	MI (MI spirit + Directive elements) predicted significantly greater commitment language than SOMI.

Note. MISC = Motivational Interviewing Skill Code; ITRS = Independent Tape Rating Scale; SCOPE =Sequential Code for Observing Process Exchanges; DARN-C = Desire, Ability, Reasons, Need and Commitment; A Training Manual for Coding Client Commitment; ISCEE = In-Session Coding of Empathic Expressions; MI-PACT = Motivational Interviewing Process Assessment and Change Talk coding scheme (A modified version of the MISC, CLCS and MITI); CRC =Client Resistance Code; MITI = Motivational Interviewing Treatment Integrity Code; CLCS, Client Language Coding System (Amrhein et al., 2003); FB = Feedback; SOMI = Spirit-Only MI;: MICO = MI Consistent behaviours; MIIN = MI Inconsistent behaviours; CT = Change Talk; ST =Sustain Talk; QPOS = Question Positive Aspects of the Target behaviour; QNEG = Question Negative Aspects of the Target Behaviour; RCT = Reflect Change Talk; RST = Reflect Sustain Talk; REF = Reflect both CT/ST and neutral language.
[a]Fundamental MI skills; open questions, reflections, affirmations, collaboration, and a MI style; Advanced skills; client-centered problem discussion and feedback, pros and cons, resolving ambivalence, heightening discrepancies and motivation for change, and change planning; MIIN behaviours; emphasis on abstinence, powerlessness and loss of control, unsolicited advice or direction giving, confrontation of denial/defensiveness, therapeutic authority, and use of practices from other therapies. [b]Illicit substances included cocaine, marijuana, opiates, methamphetamines, and "other". [c]Participants' had co-occurring diagnoses of substance use disorder (opiates, cocaine and cannabis) and either schizophrenia, schizoaffective disorder, major depression, bipolar disorder, or other psychotic disorder.

Table 2. Study characteristics and results for Path 3

Study	Target Problem	n	Process measure	Path Examined	Results
Amrhein et al. (2003)	Illicit substances[a]	84	CLCS	3	The strength of each preparatory language category uniquely predicted commitment language strength.
Daeppen et al. (2007)	Alcohol	97	MISC	3	Participant's who intended to decrease alcohol use uttered significantly higher frequencies of desire, reasons, need and commitment CT but not ability or taking steps CT.
Magill et al. (2010)	Alcohol	291	MISC	3	CT was a positive predictor of change plan completion and ST was a negative predictor in a model including 7 demographic and treatment related covariates and therapist behaviours. Positive commitment, ability and desire were positive predictors in the final model and negative reasons CT was a negative predictor of change plan completion.
Martin et al. (2011)	Alcohol	118	SCOPE	3	Ability (+ & -), reasons (+), need (+) and "other" (+) CT were positively related to commitment language (+). Desire (+ & -), taking steps (+ & -), reasons (-) and need (-) were not related to commitment language. Reasons (+ & -), desire (-), ability (-), need (-) and "other" (+) were positively related to negative commitment (taking steps (-) was unrelated). Positive desire, ability, need and taking steps were not related to negative commitment.
Sargeant (2011)	Dual diagnoses[b]	45	MISC/DARN-C	3	Desire, ability and reasons language frequency positively related to commitment language. Reasons and ability accounted for unique variance in commitment language.
Tollison (2010)	Alcohol	97	MI-PACT	3	Strength of preparatory CT was associated with an increased likelihood of commitment language occurring in the concurrent decile and a trend was reached for the subsequent decile. CT was not related to counter-commitment language in either decile.

Note. No Path 3 studies utilized a comparison condition. CLCS =Client Language Coding System (Amrhein et al., 2003); MISC =Motivational Interviewing Skill Code; SCOPE =Sequential Code for Observing Process Exchanges; DARN-C = Desire, Ability, Reasons, Need and Commitment; A Training Manual for Coding Client Commitment; MI-PACT = Motivational Interviewing Process Assessment and Change Talk coding scheme (A modified version of the MISC, CLCS and MITI) ;CT = Change Talk.
[a]Illicit substances included cocaine, crack, heroin, "other"; methamphetamines, speed, crank, marijuana, Percocet, Xanax, and codeine. [b]Participants' had co-occurring diagnoses of substance use disorder (opiates, cocaine and cannabis) and either schizophrenia, schizoaffective disorder, major depression, bipolar disorder, or other psychotic disorder.

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Table 3. Study characteristics and results for Path 4 and 5

Study	Target Problem	n	Process Measure	Comparison Condition	Path Examined	Results
Daeppen et al. (2007)	Alcohol	97	MISC	None	4	Client's who intended to decrease alcohol use at BMI completion had significantly greater reductions in weekly drinking, heavy drinking episodes and AUDIT scores from baseline to FU than clients who did not intend to decrease their drinking.
Morgenstern et al. (2012)	Alcohol	89	MITI/CLCS	SOMI/ Self-Change Condition	4	Week 1: Greater commitment CT predicted reduced drinking at trend level. Commitment CT mediated the relationship between condition differences and outcome. Week 2: Commitment CT was unrelated to outcome. No mediation present.
Perry & Butterworth (2010)	Exercise	20	CLCS	Advice only	4	Commitment strength was unrelated to physical activity. Trend toward more physical activity in those with stronger commitment language.
Tollison (2010)	Alcohol	97	MI-PACT	None	4	Controlling for baseline drinks per week, strength of commitment/counter commitment language per decile and at session level were not predictive of drinking. Commitment at decile 10 was marginally negatively related to drinks per week. Commitment at decile 4 and 10 was predictive of fewer alcohol related problems at FU, however commitment/counter-commitment strength for the whole session was not.
Amrhein et al. (2003)	Illicit substances[a]	84	CLCS	None	4, 5	Strength of commitment language towards the end of MI predicted client abstinence the subsequent year (over and above alcohol use at intake). A positive slope of commitment language throughout MI also predicted whether clients decreased drug use or maintained abstinence. Preparatory CT categories did not predict behaviour change.
Cambell et al. (2010)	Alcohol	28	MISC – Modified	None	4, 5	Remitted drinkers showed significantly higher commitment strength compared to unremitted drinkers in 2 of 4 MI sessions. Commitment strength in Session 2 and change in commitment during MET significantly predicted outcome in the regression model. Remitted drinkers uttered significantly less ST per interval of MET and had higher ability strength than unremitted drinkers in the last MET interval. As predictors of outcome, a forward regression indicated that ability strength was the most significant single predictor. Ability strength and average ST remained significant predictors in a backward regression model.

Gaume et al. (2012)	Alcohol	127	MISC	None	4, 5	Clients showed 15% more drinking with each utterance of positive commitment language (with a strength of +1). Commitment language remained a significant negative predictor in the multivariate model (including negative desire and need, and positive ability). CT/ST were unrelated to changes in drinking at 6-month FU. The frequency of positive ability/desire/need CT grouped together significantly predicted better outcome while negative ability/desire/need predicted poor outcome. The average strength of ability/desire/need was strongly related to better outcome, as was the average strength of taking steps. In final frequency and strength models taking steps was excluded. Individually, frequency of desire (-) and need (-) and ability (+) were significant and robust predictors of change (need (+) and taking steps (+) were excluded).
Gaume, Gmel, & Daeppen (2008)	Alcohol	97	MISC	None	4, 5	Commitment language was not related to weekly alcohol use or number of heavy drinking episodes, nor was desire, reason, or need CT. Averaged strength of ability CT (+5 to -5) predicted decreases in weekly alcohol use (controlling for age, sex and AUDIT score). Ability and taking steps were associated with fewer heavy drinking episodes but neither category predicted outcome when controlling for AUDIT score, age and sex.
Martin et al (2011)[b]	Alcohol	118	SCOPE	None	4, 5	Client language was factor analysed, creating 5 factors: ST, Taking steps, Preparatory language, Commitment, and Ability. All factors were included in regression models to predict DDD and PDA. The commitment factor did not predict any outcome variable. No factor predicted DDD. Taking Steps was a significant predictor of proximal PDA. Preparatory language positively predicted Distal PDA and ability was a negative predictor.
Peterson (2011)	ART adherence	98	MISC	Standard care/ Enhanced counselling + observed therapy	4, 5	Relationships between preparatory CT/ST and commitment/counter-commitment language with ART adherence were assessed at Weeks 1, 2, and 12. Week 1: commitment strength was positively related to % of ART medication taken on time and change in commitment throughout MI was positively related to the % of medication taken. Week 2: No significant relationships. Week 12: preparatory CT was positively related to % taken, and commitment strength was positively related to % of medication taken and % taken on time.
Sargeant (2011)	Dual diagnoses[c]	45	MISC/ DARN-C	Counselling as usual	4,5	Frequencies of desire, ability, need, and commitment language were entered as predictors of short and long-term treatment attendance and substance use. Ability uniquely predicted long-term treatment attendance above and beyond depressive and negative symptoms and substance use severity; and approached significance as a unique predictor of long-term substance use. Strength of ability and reasons language were also examined. Ability strength approached significance in predicting short-term attendance and uniquely predicted short-

						term substance use. Reasons strength approached significance in predicting long-term treatment attendance and long-term substance use
Walker et al. (2011)	Marijuana	61	CLCS	None	4,5	CT categories were measured 3 times during MI (Pre PFR, PFR, Post PFR) and relationship to outcome assessed at 4, 16, and 34-month FU. Commitment and need language were not related to clients' PDA at any FU. Ability (PFR, Post PFR) was positively related to PDA at 16-months. Desire (PFR) was positively related to PDA at all FU points. Reasons (Pre PFR) was positively related to PDA at all FU points. Reasons (PFR) was positively related at 4 and 16months. Controlling for baseline marijuana use, all categories combined explained additional variance in PDA with desire and reason strength contributing unique effects.
Bertholet et al. (2010)	Alcohol	97	MISC	None	5	CT categories were combined to indicate the direction of CT overall. Clients with an inclination towards change at the end of MI drank significantly fewer drinks per week than clients with an away from change last state (controlling for baseline alcohol consumption).
Miller et al. (1993)	Alcohol	42	Modification of CRC	Directive Confrontational Counselling	5	Client interrupting, arguing, off task responses (i.e., inattention, silence or side tracking) and negative responses (i.e., blaming others, disagreeing, pessimism, expressed reluctance or unwillingness to change) negatively predicted 12-month alcohol consumption, but did not predict outcome at 6 week FU.
Moyers et al. (2009)	Alcohol	63	SCOPE	None	5	6 weekly measures of client drinking were collected from baseline to Week 5. CT predicted fewer drinks per week at Week 5 and the slope of drinking from baseline to 5 weeks.
Pirlott et al. (2012)	Health promotion	43	MISC	None	5	Total positive client CT correlated positively with fruit/vegetable intake. No relationship between ST and outcome. CT mediated the effect of clinician behaviours on outcome.
Strange & McCambridge (2004)	Marijuana	44	Idiosyncratic measure	None	5	Only action-oriented CT (CT relating to a need to change) predicted cannabis use at 3-month FU (risk awareness, problem recognition, concern and optimism about change did not).

Note. ART = Antiretroviral therapy; MISC = Motivational Interviewing Skill Code; MITI =Motivational Interviewing Treatment Integrity Code; CLCS =Client Language Coding System Amrhein et al., 2003); MI-PACT = Motivational Interviewing Process Assessment and Change Talk coding scheme (A modified version of the MISC, CLCS and MITI); SCOPE = Sequential Code for Observing Process Exchanges; DARN-C = Desire, Ability, Reasons, Need and Commitment; A Training Manual for Coding Client Commitment; CRC, Client Resistance Code; SOMI = Spirit-Only MI; BMI = Brief Motivational Intervention; AUDIT = Alcohol Use Disorders Identification Test; FU: Follow-up; CT = Change Talk; ST = Sustain Talk; MET = Motivational Enhancement Therapy; DDD = Drinks per drinking day; PDA = Percent Days Abstinent; PFR = Personalised Feedback Report.
[a]Illicit substances included cocaine, crack, heroin, "other"; methamphetamines, speed, crank, marijuana, Percocet, Xanax, and codeine. [b]This study utilised the same sample as Moyers et al. (2009), it was included in the review as it examined CT categories. [c]Participants' had co-occurring diagnoses of substance use disorder (opiates, cocaine and cannabis) and either schizophrenia, schizoaffective disorder, major depression, bipolar disorder, or other psychotic disorder.

Table 4. Study characteristics and results for Path 6 and 7

Study	Target Problem	n	Process Measure	Comparison Condition	Path Examined	Results
Gibbons et al. (2010)	Alcohol/Illicit substances	377	ITRS[a]	Counselling as usual	6	Fundamental and advanced MI adherence and competence were positively associated with % of negative drug screens obtained during 4 weeks of treatment. MIIN was negatively associated to % negative drug screens.
Karno & Longabaugh (2005)	Alcohol	141	Therapy Process Rating Scale Directiveness Subscale	CBT + TSF	6	For participants high in reactance, increased therapist directiveness was associated with less PDA and more DDD post-treatment (largest effect observed in MET). Therapist directiveness did not predict PDA for low reactance participants. 5/6 directiveness items were significant in predicting PDA: frequency of closed-ended questions, interpretations, confrontation, interpreting resistance, and introducing topics. For DDD, therapist interpretation, confrontation and introduction of topics were significant. Providing information did not predict PDA or DDD
Martino et al. (2008)	Alcohol/Illicit substances[b]	461	ITRS[a]/ Idiosyncratic CT Scale	Counselling as usual	6	Fundamental and advanced MI adherence and competence were positively associated with % of negative drug screens obtained during 4 weeks of treatment. MIIN was negatively associated to % negative drug screens.
Moyers et al. (2009)	Alcohol	63	SCOPE	None	6	A higher frequency of MICO predicted fewer drinks per week at Week 5 of the study and predicted the slope of drinking from baseline through Week 5.
Sargeant (2011)	Dual diagnoses[c]	45	MISC/ DARN-C	None	6	MICO behaviours did not predict outcome.
Strang & McCambridge (2004)	Marijuana	44	Idiosyncratic instrument	None	6	Therapist self-rated directiveness predicted reductions in marijuana use at 3 months.

Tollison et al. (2008)	Alcohol	67	MITI	None	6	Greater use of simple reflections was significantly related to more drinks per week at follow-up (open and closed questions, and complex reflections were unrelated to outcome).
Magill et al. (2012)	Alcohol	577	Idiosyncratic MET Clinical Emphasis measure	None	6	Therapist focus on client ambivalence (focus on ambivalence, rolling with resistance, and developing discrepancy) predicted more DDD in the outpatient sample, but was unrelated to outcome in the aftercare sample. Therapist focus on commitment (eliciting CT, encouraging steps towards change, discussing commitment to abstinence) was associated with greater PDA and reduced DDD in both samples. Therapist expression of empathy and support of self-efficacy were excluded due to non-significance.
Baird et al. (2007)	Alcohol	210	Idiosyncratic Intervention Implementation Measure	None	6,7	Less focus on drinking (therapist increases ambivalence about drinking, provides feedback, elicits CT, encourages client commitment to change), and greater focus on emotional support (therapist expressed empathy, supported self-efficacy, emphasised personal responsibility for change) predicted participant attendance at the second MI session.
Gaume, Gmel & Daeppen (2008)	Alcohol	97	MISC	None	6,7	Advise with permission and affirm related to fewer heavy drinking episodes. Confront was negatively related to heavy drinking episodes, which approached significance. Advise without permission, emphasise control, giving information, open and closed questions, simple and complex reflections, support, structure and warn were not related to either outcome variable. In multiple regression models no therapist behaviour was a significant predictor, affirming behaviours approached significance to predict heavy drinking episodes. Empathy was associated with greater weekly alcohol decrease and fewer heavy drinking episodes (MI spirit and acceptance were unrelated).
Miller et al. (1993)	Alcohol	42	Modification of CRC	Directive Confrontational Counselling	6, 7	Confrontation (challenging, disagreeing, head on disputes, incredulity, emphasising negative client characteristics, sarcasm) predicted worse outcomes 1 year later. Other behaviours (direct, listen, query, restructure, support, teach, understand) were not related to outcome. No differences in outcome were found between client-centered and directive approaches.
Morgenstern et al. (2012)	Alcohol	89	MITI/CLCS	SOMI/Self-Change Condition	6, 7	MI (MI spirit + Directive elements) achieved no better drinking outcomes than the SOMI or Self Change conditions. SOMI had larger reductions in drinking, though the difference was non-significant.
Pirlott et al. (2012)	Health promotion	43	MISC	None	6, 7	MICO was unrelated to fruit/vegetable intake. MIIN showed a marginal positive correlation. Direction, MI spirit and empathy were not related to outcome.

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Thrasher et al. (2006)	ART adherence	47	MISC	None	6, 7	Higher ART adherence was positively related to affirm, a higher ratio of reflections to questions, and negatively related to closed questions. Acceptance, egalitarianism, empathy, genuineness, warmth and MI spirit averaged together, and acceptance and empathy individually were positively associated to ART adherence but only for participants' who discussed medication-related topics.
Tollison et al. (2013)	Alcohol	327	MITI	None	6, 7	Open questions and simple reflections were correlated with an increased number of drinks per week at 5 and 10month follow-up. Closed questions, complex reflections, empathy and MI spirit were unrelated to outcome. More open questions during MI predicted a greater increase in drinking over time for the heaviest drinkers. More simple reflections also predicted significantly more drinking over time, but baseline drinking did not moderate this effect.
Woodin et al. (2012)	Partner aggression	25	MITI	None	6, 7	A higher reflection to question ratio was related to greater aggression reductions for men and women. A higher % of open questions was related to reductions in women but not men. % Complex reflections and % MICO were unrelated to outcome. Empathy was related to marginally greater aggression reductions for women but not men. MI spirit was unrelated to outcome.
Feldstein & Forcehimes (2007)	Alcohol	51	MITI	No treatment control	7	Therapist empathy was not related to binge drinking and alcohol related problems at follow-up for the 35 MI clients.
Thyrian et al. (2007)	Smoking	161	MITI	None	7	Based on empathy and MI spirit ratings, MI sessions were divided into "good" and "low/moderate" adherence categories. "Good" adherence to the principles of MI significantly raised the chances of being a non-smoker after 6 months.

Note. ITRS = Independent Tape Rating Scale; SCOPE = Sequential Code for Observing Process Exchanges; MISC = Motivational Interviewing Skill Code; DARN-C =Desire, Ability, Reasons, Need and Commitment; A Training Manual for Coding Client Commitment; MITI =Motivational Interviewing Treatment Integrity Code; CRC = Client Resistance Code; CLCS = Client Language Coding System (Amrhein et al., 2003); CT = Change Talk; MICO = MI Consistent behaviours; MIIN = MI Inconsistent behaviours; MET = Motivational Enhancement Therapy; CBT = Cognitive Behaviour Therapy; TSF = Twelve-Step Facilitation Therapy; SOMI =Spirit-Only MI; PDA = Percent Days Abstinent; DDD = Number of drinks per drinking day; ART = Antiretroviral Therapy.
[a] Fundamental MI skills; open questions, reflections, affirmations, collaboration, and a MI style; Advanced skills; client-centered problem discussion and feedback, pros and cons, resolving ambivalence, heightening discrepancies and motivation for change, and change planning; MIIN behaviours; emphasis on abstinence, powerlessness and loss of control, unsolicited advice or direction giving, confrontation of denial/defensiveness, therapeutic authority, and use of practices from other therapies. [b]Illicit substances included; cocaine, marijuana, opiates, methamphetamines, and "other". [c]Participants' had co-occurring diagnoses of substance use disorder (opiates, cocaine and cannabis) and either schizophrenia, schizoaffective disorder, major depression, bipolar disorder, or other psychotic disorder.

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Figure List

Figure 1. Causal model adapted from Miller and Rose (2009)

Figure 2. Flowchart of search outcomes and progression of studies through the review

Adapted from The PRISMA Group (2009)

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Appendix

Table 1. MI characteristics

Study	Type of MI	Number of Sessions	Session length	Portion Coded
Amrhein et al. (2003)	MI	1	45-90 minutes	Whole session
Apodaca et al. (2013)	MI	1	Variable length	Whole session
Baird et al. (2007)	BMI	1 or 2[a]	Not specified	Therapists rated at end of each session
Bertholet et al. (2010)	BMI	1	15-20 minutes	Whole session
Cambell et al. (2010)	MET	4	50 minutes	All sessions
Catley et al. (2006)	MI	7	30 minutes	1st session – First 20 minutes
Daeppen et al. (2007)	BMI	1	15 minutes	Whole session
Feldstein & Forcehimes (2007)	MI	1	45 minutes	Random 20 minutes
Fischer (2012)	MI	4[b]	Variable length	2nd session - quasi-random selection of 20 minute segment (excluded first 5 minutes of session)
Gaume et al. (2010)	BMI	1	20-30 minutes	Whole session
Gaume et al. (2012)	BMI	1	20-30 minutes	Whole session
Gaume, Gmel, & Daeppen (2008)	BMI	1	Approximately 15 minutes	Whole session
Gaume et al. (2008)	BMI	1	Approximately 15 minutes	Whole session
Gibbons et al. (2010)	MI assessment	1	Not specified	First and last 20 minutes
Glynn & Moyers (2010)	CT/FA conditions	1	60 minutes	Whole session (2 x 12 minute segments of CT/ 2 x 12 minute segments of FA)
Karno & Longabaugh (2005)	MET	4	Variable length	All sessions
Magill et al. (2010)	MI	1	Not specified	Whole session
Magill et al. (2012)	MET	4	Variable length	All sessions
Martin et al. (2011)	MET	4	Variable length	1st session
Martino et al. (2008)	MET	3	50 minutes	All sessions
Miller et al. (1993)	Drinkers check-up	1	Not specified	Whole feedback session

|				
Morgenstern et al. (2012)	MI/SOMI	4	45-60 minutes	First 2 sessions
Moyers et al. (2009)	MET	4	Variable length	1st session
Perry & Butterworth (2010)	MI	1^{c}	30 minutes	Whole session
Peterson (2011)	MI	5^{d}	7-72 minutes	2nd session
Pirlott et al. (2012)	MI	4	30-60 minutes	2nd session
Prabhu (2008)	MI MI+FB	1	45-60 minutes 60-90 minutes	Whole session
Sargeant (2011)	MI	3^{e}	20-35 minutes	1st session
Strang & McCambridge (2004)	MI	1	60 minutes	Therapist rated
Thrasher et al. (2006)	MI	4	Variable length (M = 30 minutes)	2nd session
Thyrian et al. (2007)	MI	1^{f}	Not specified	Random 20 minutes
Tollison (2010)	BASICS	1	60 minutes	Whole session
Tollison et al. (2008)	BASICS	1	60 minutes	Random 20 minutes
Tollison et al. (2013)	BASICS	1	45-60 minutes	Random 20 minutes
Vader et al. (2010)	MI MI+FB	1	M = 36 minutes M = 45 minutes	Whole session
Walker et al. (2011)	MI	1	Variable length	Whole session
Woodin et al. (2012)	MI	1^{g}	45 minutes	Whole session

Note. MI = Motivational Interview; BMI = Brief Motivational Interview; MET = Motivational Enhancement Therapy; CT = Change Talk; FA = Functional Analysis; SOMI = MI Spirit only MI; FB = Feedback; BASICS = Brief Alcohol Screening and Intervention for College Students; M = Mean
[a]Participants received 1 or 2 sessions of MI depending on randomization. [b]Sample was derived from clinicians, of which each clinician had 4 sessions of MI (post training, 3, 6, 12 month). [c]Following MI participants received six 10 minute booster phone calls (these were not recorded). [d]Following MI participants received four 15 minute MI phone calls. [e]Participants received other behavioural treatment over 52 weeks with an MI session before starting treatment and at 3 and 6months. [f]Following MI participants received two calls 4 and 12 weeks later. [g]Each partner received an individual MI and feedback together. The feedback session was not recorded.

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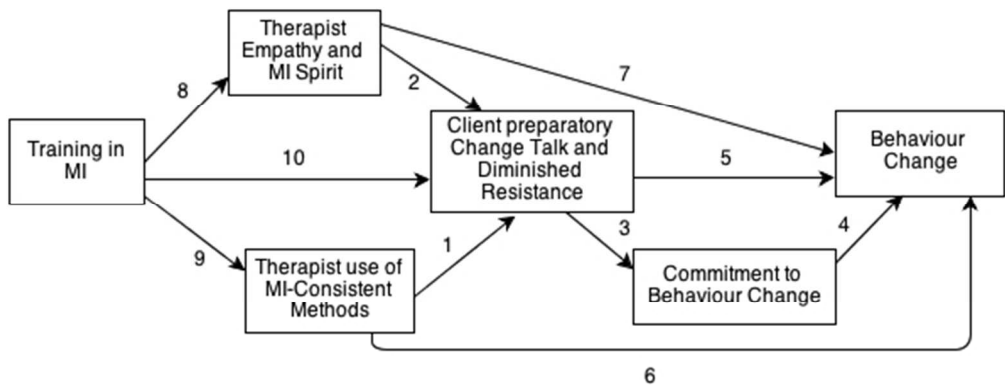
Causal model adapted from Miller and Rose (2009)
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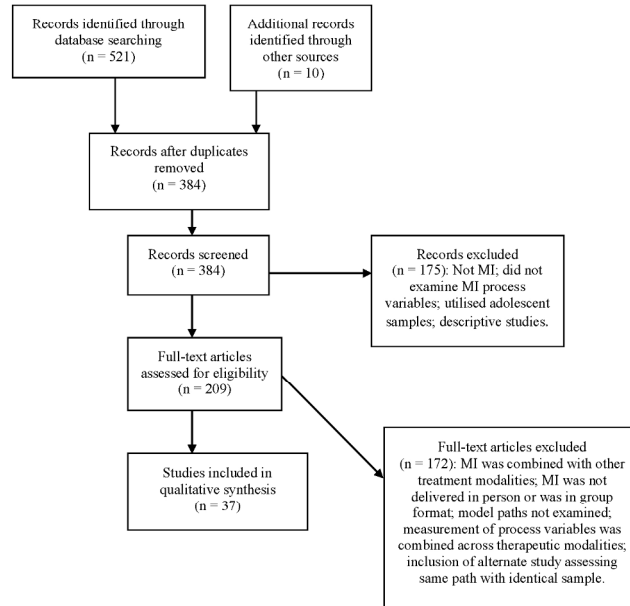
Flowchart of search outcomes and progression of studies through the review
Adapted from The PRISMA Group (2009

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