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Motivational Interviewing in Primary Care and General Health Care Settings: a Meta-Analysis

Michele Kathryn Olson
University of Wisconsin-Milwaukee

MOTIVATIONAL INTERVIEWING IN PRIMARY CARE AND GENERAL HEALTH CARE SETTINGS: A META-ANALYSIS

by

Michele K. Olson

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ABSTRACT
MOTIVATIONAL INTERVIEWING IN PRIMARY CARE AND GENERAL HEALTH CARE SETTINGS: A META-ANALYSIS

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Michele K. Olson

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The rate of mortality and morbidity due to alcohol consumption warrants a comprehensive and evidence-based investigation exploring the efficacy of behavioral interventions within a general health care setting as a means of alcohol reduction. A particular type of intervention, known as Motivational Interviewing (MI; Miller, 1983) and Motivational Enhancement Therapy (MET; Miller, Sovereign, & Krege, 1988), both of which have seen surge in popularity, merits further inspection. Through electronic database searching, hand searching previous meta-analyses and systematic reviews, and searching the Motivational Network of Trainers bibliographic resource, 33 randomized controlled trials were located isolating the effect of motivational interviewing in general health care settings. The average effect ($\bar{d}$ = .153 k = 33, N = 32,588) constitutes a small effect in favor of MI and/or MET, with no substantial benefit in offering MET ($\bar{d}$ = .125, (95% CI [0.044, 0.206], N = 21,226) as opposed to MI ($\bar{d}$ = .114, (95% CI [0.06, 0.016], N = 8689). MI and/or MET produces a small benefit within primary care and is relatively comparable to other brief interventions within the same setting. Primary care providers wishing to implement MI/MET within their practice may be reasonably assured that MI/MET will be more effective in improving patient outcomes than delivering no intervention.

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In 2012, alcohol consumption was responsible for 3.3 million deaths worldwide, equating to 5.9% of all global mortalities (World Health Organization [WHO], 2014). In the United States, excessive alcohol consumption (see Table 1) constitutes the third leading lifestyle-related cause of death, with approximately 88,000 deaths from 2006-2010 (Centers for Disease Control [CDC], 2013). In addition to the fatalities associated with alcohol consumption, a causal relationship exists between an individual's average level of alcohol consumption and more than 60 diseases (Rehm et al., 2004). The morbidity consequences are both acute (e.g., intentional and unintentional injury) and chronic (e.g., cardiovascular disease, certain types of cancer, gastrointestinal diseases) (WHO, 2014).

Furthermore, alcohol consumption does not solely affect the individual user in terms of adverse health outcomes or mortality. Close others (e.g., spouse or partner, child, or friend) may be harmed as well, primarily through violence and aggressive behaviors (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 1997; WHO, 2014). Even individuals not in proximity with a problematic drinker face economic consequences at the hand of a distant alcohol consumer, considering excessive alcohol consumption costs American citizens approximately $185 billion annually in related health care costs, criminal justice expenses and loss of productivity (CDC, 2011).

Due to the burden placed on both the individual and society at large, there is a robust effort to reduce Americans' alcohol consumption. A variety of public policies, such as increasing alcohol taxes or placing harsher consequences on intoxicated driving, seek to reduce national alcohol consumption (Alcohol and Public Policy Group, 2010).

Within the American health care system, the prevention and treatment of alcohol use disorders (see Table 1) receive increased attention, both in terms of research production and resource allocation.

The following sections provide a brief overview of alcohol treatment within the United States, with a focus on the importance of delivering alcohol treatment within primary care and general health care settings. Next, a summary of the process of Screening and Brief Intervention (SBI), a common practice in primary health care will be examined. A specific and popular type of brief intervention, Motivational Interviewing, will be outlined, with an emphasis on the communication centered causal mechanisms of the theory. Finally, a review of previous meta-analyses synthesizing Motivational Interviewing application will highlight the past the methodological issue of combining treatment seeking and non-treatment seeking populations.

Alcohol Treatment Within the United States

For individuals diagnosed with an alcohol use disorder (AUD), various treatment options exist. These include inpatient rehabilitation services, outpatient treatment and the use of pharmaceutical medications, such as disulfiram, naltrexone, and acamprosate (Fuller & Hiller-Sturmhofel, 1999). Commonly, inpatient treatment, colloquially referred to as "rehab," is a residential treatment program that provides services such as therapy (both individual and group) and alcohol education (Fuller & Hiller-Sturmhofel, 1999). For those with a less severe AUD, an outpatient treatment service (e.g., day hospital programs) may be more appropriate. Typically, patients submit to a facility for several hours per day, which allows them to maintain familial responsibilities (Fuller & Hiller-Sturmhofel, 1999). Either type of treatment may be supplemented with pharmacotherapy

using aversive (e.g., disulfiram) or anti-craving medications (e.g., naltrexone and acamprosate) to aid the patient in maintaining abstinence (Fuller & Hiller-Sturmhofel, 1999).

Unfortunately, the majority of those at risk or diagnosed with AUD fail to enter inpatient or outpatient treatment, with only a small fraction "enter[ing] a qualified treatment program" (Heinz**,** Wilwer & Mann**,** 2003, p. 706). To illustrate, in Germany only 2% of those with AUDs enter specialized rehabilitation facilities (Heinz et al., 2003). Due to the poor rate of patient voluntary commitment to formal alcohol treatment, efforts have shifted to preventing AUDs before they manifest, and providing alcohol treatment at locations where a majority of patients receive health care. And the setting in which most at-risk drinkers present for health services are primary care clinics and other general health care settings (Fleming & Manwell, 1999).

Alcohol Prevention Within A General Health Setting

Within the developed world, 85% of the population visits a primary care physician (PCP) annually for services ranging from a routine check-ups, management of specific health conditions and acute illness treatment (Barbor & Higgens-Biddle, 2001; Fleming & Manwell, 1999; Henry-Edwards, Humenik, Moneiro & Poznya, 2003). Through the volume of patients in contact with a PCP or other general health care provider (e.g., nurse, nurse practitioner, internist in a hospital), there exists an opportunity to detect and aid those with a range of alcohol issues (e.g., opportunistic screening and intervention). Heavy drinkers (see Table 1), in particular consult a PCP more frequently than the general public, most likely due to an increased likelihood of chronic disease (Anderson, 1996). Research by Manwell, Fleming, Johnson and Barry (1998) examined

the prevalence of alcohol use within a primary care setting by screening approximately 21,300 adults ages 18-65. Results indicate that approximately 23% of persons encountering a physician met the standards for an at-risk classification as a problem or dependent alcohol user.

Although epidemiological analyses support how essential primary care is in the treatment of alcohol problems, PCPs often display reluctance to deliver interventions in order to help patients decrease or eliminate alcohol consumption (Fleming & Manwell, 1999). PCP reluctance may reflect the widespread belief that treatment for alcohol problems requires an intensive treatment and delivery by alcohol specialists (Bien, Miller & Tonigan, 1993). Through interviews with 36 PCPs, Aira, Kauhanen, Larivaara and Rautio (2003) categorized the predominant reasons why PCPs feel uncertain about delivering alcohol interventions in their clinics. Reasons include (a) the idea that alcohol consumption constitutes a more sensitive issue than other health conditions, (b) the belief that interventions are ineffective, and (c) feeling ill equipped and unsuited to address unhealthy alcohol consumption. While alcohol consumption constitutes an uncomfortable conversation, the other prevailing fears are generally unfounded, considering the demonstrated effectiveness of interventions (Bien, Miller & Tonigan, 1993), and the conclusion that the delivery of such interventions by a PCP can be just as effective as those delivered by an alcohol specialist (see Drummond, Thom, Brown, Edwards & Mullan, 1990).

In order to dispel the pervading myths and increase the likelihood that interventions will be utilized within a primary care or general health setting, numerous health organizations and international governments provide recommendations and

guidelines for undertaking interventions in primary and routine health care. Many of the recommendations and guidelines occur in developed areas (e.g., Europe and the United States), as alcohol consumption is highest in more economically developed regions (Alcohol and Public Policy Group, 2010). For example, the Primary Health European Project on Alcohol (PHEPA), funded by the European Commission, is involved with incorporating interventions into PCPs' daily clinical work (Primary Health European Project on Alcohol, 2012). In Sweden, the government-funded "Swedish Risk Drinking Project" aims to give alcohol issues an increased place in routine health care encounters (Nilsen, Wahlin & Heather, 2011). In the United Kingdom, the National Health Service gives general practitioners the responsibility to screen and provide interventions for patients considered "at risk" (Barbor & Higgins-Biddle, 2000).

Importantly in the United States, The United States Preventative Task Force (USPTF) currently "recommends that clinicians *screen* adults aged 18 years or older for alcohol misuse and provide persons engaged in risky or hazardous drinking with brief behavioral counseling interventions to reduce alcohol misuse" (USPTF, 2013, p. 210). This process is commonly recognized as Screening and Brief Intervention (SBI). Increased opportunity exists for expanding SBI in a variety of health contexts, as the Affordable Care Act (ACA) now requires all employer and Medicare insurance plans to cover prevention services that the USPSTF has stated are effective (Brolin et al., 2012). The SBI process recommended by the USPTF underscores the two primary goals within a primary care-based approach: the detection of those with an alcohol issue through screening efforts**,** and subsequent behavioral treatment (i.e., brief intervention).

Screening. Screening refers to "a systematic process of identifying patients whose alcohol consumption places them at increased risk of physical, psychological, or social complications and who might benefit from brief intervention" (Kaner, Newbury-Birch & Heather, 2009, p. 198). Opportunities for screening are plentiful in primary care and general hospital settings, including new patient registration or intake assessments, annual check-ups, or in treatment for certain conditions linked to alcohol use (e.g., diabetes or injury) (Kaner, Newbury-Birch & Heather, 2009). Importantly, screening does not have to occupy a lengthy amount of time, as most screening measures involve paper or electronic questionnaires patients complete while waiting for an appointment. Even for patients without any alcohol consumption issues, screening still provides an opportunity to educate patients about the beneficial effects of lowering alcohol consumption (Barbor & Higgins-Biddle, 2001).

Common screening measures include the CAGE Questionnaire (Ewing, 1984), Michigan Alcohol Screening Test (MAST; Selzer, 1971), the Alcohol Dependence Scale (ADS; Skinner & Allen, 1982), and the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST; Henry-Edwards, Humeniuk, Ali, Poznyak & Monteiro, 2003). Perhaps the most commonly used measure is the Alcohol Use Disorders Identification Test (AUDIT), developed by the World Health Organization (Barbor, Higgins-Biddle, Saunders & Monterio, 2001). The 10-question AUDIT provides an especially sensitive tool to identify harmful or hazardous drinkers (see Table 1) and is designed for delivery by primary health care workers (Babor et al., 2001).

Brief interventions. Broadly speaking, brief interventions may be understood as "a spectrum of clinical activity focused on the use of a talk-based therapeutic approach to

reducing excessive drinking and its associated problems" (Kaner, Newbury-Birch & Heather, 2009, p. 201). While the "clinical activity" may vary, the commonality that connects brief interventions is their brevity, with most brief interventions composed of 5-60 minutes of counseling in 3-5 sessions. Another connecting factor is the "FRAMES" structure. FRAMES is an acronym for Feedback, Responsibility, Advice, Menu (i.e., providing options for change), Empathy and Self-efficacy (Miller & Sanchez, 1993). While FRAMES guides many interventions, the structure is not a requirement in order to be labeled a "brief intervention."

Notably, the goals and outcomes of a brief intervention may vary based on the patient's prior level of consumption. For patients at risk of developing alcohol-related problems, but not yet classified as having an AUD, the goal may involve reducing drinking to below the recommended levels as opposed to abstinence. For those with an AUD, a more intensive treatment beyond the brief intervention will most likely be needed. Therefore, the PCP may refer the patient to a form of specialized treatment (Fleming & Manwell, 1999). Unfortunately, a majority of patients referred to specialized treatment will not independently enroll (Bien, Miller & Tonigan, 1993; Fleming & Manwell, 1999). Consequently, the only treatment that an AUD patient may be exposed to is the brief intervention delivered by the PCP, further highlighting the importance of delivering brief interventions within primary care.

Generally, brief interventions are effective. When compared to control conditions, brief interventions produced a reduction in hazardous and harmful drinking, as demonstrated through multiple systematic reviews and meta-analyses (Agosti, 1995; Ballesteros, Duffy, Querejeta, Arino & Gonzalez-Pinto, 2004; Bertholet, Daeppen,

Wietlisback, Fleming & Burnand, 2005; Bien, Miller & Tonigan, 1993; Kaner et al. 2007; Moyer, Finney, Swearingen & Vergun, 2002; Poikolainen, 1999; Whitlock, Polen, Green, Orleans & Klein, 2004; Wilk, Jensen & Havinghurst, 1997). Of concern from an empirical perspective, especially in reference to previous meta-analyses, is the variability of the content delivered within the intervention (Barbor & Higgins-Biddle, 200l; Kaner et al., 2009). While some investigations may employ a FRAMES structure, many studies do not. For example, simple advice lasting less than ten minutes can constitute a brief intervention. However, more intensive motivational counseling sessions may also be considered a brief intervention. It therefore becomes necessary to discern between each type of brief intervention to determine their efficacy, as combing contradictory brief interventions (e.g., advice and motivational interviewing) provides an inaccurate representation of brief intervention effectiveness.

One specific type of brief intervention that warrants an independent investigation is the motivational interview (MI), a type of counseling originally developed to address alcohol use problems in an in-patient setting (Miller, 1983). Not only has the application of motivational interviewing in a clinical practice been steadily increasing, but motivational interviewing based empirical investigations have increased as well. For instance, a PsycINFO search from 1990 to 1999 using the simple phrase "motivational interviewing," would yield 35 results, and increase to 352 references for studies conducted from 2000 to 2008 (Lundahl, Kunz, Brownell, Tollefson & Burke, 2010). From 2008 to 2014, there are now over 1,500 studies utilizing motivational interviewing. As the practical and experimental application of MI continues to rise, there is an ever-growing need for a systematic evaluation of MI. Specifically an evaluation is needed in

the pivotal primary care setting, which is an attractive venue for MI use**.** The attractiveness is due in part to MI, and its extension motivational enhancement therapy (MET), often requiring fewer sessions than some alternative types of therapy (e.g., cognitive behavioral therapy). Fewer sessions give MI and MET an advantage in primary care settings, where contact may be relatively limited to a few meetings (Miller, Meyers & Tonigan, 1999). The following provides an overview of motivational interviewing and the postulated causal mechanisms.

Motivational Interviewing: Overcoming Ambivalence via an Interpersonal Process

Motivational interviewing represents "a client-centered, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence" (Miller & Rollnick, 2002, p. 25). Importantly, MI is said to alter behavior through the resolution of ambivalence (Miller & Rollnick, 2002). Ambivalence is present when patients hold two opposing attitudes or feelings (Hall, Gibbie & Lubman, 2012). For example, a patient recognizing and demonstrating concern for the harmful effects of alcohol consumption yet continues to drink, despite pleas from a physician to stop, becomes classified as ambivalent (Hall, Gibbie & Lubman, 2012). The provider then highlights the discrepancy between the patient's actual behavior and ideal behavior (Miller, 2003). No change can begin to occur, regardless of the target behavior (e.g., drink less frequently, routinely take medication, eat more fruits and vegetables), until ambivalence is addressed (Miller & Rollnick, 2002).

Miller and Rollnick (2002) outline three characteristics that capture the "spirit" of MI and illustrate certain characteristics the provider shall embody; the provider is to be collaborative, autonomy supporting and evocative. The spirit of motivational

interviewing highlights the sharp contrast to the classic addictive counseling approach, whereby the counselor acts as the expert actively convincing the patient of the necessity for change. Instead, patients are assumed to be the expert on personal experiences, and possess a fundamental responsibility to choose the outcome. The provider must recognize it is ultimately the choice of the patient to change, and illustrates the provider's support of patient autonomy. In expanding upon the initial definition of MI, Miller and Rollnick (2002) offer five principles that direct the application and clinical practice of MI while maintaining an embodiment of the "spirit." The principles of MI are, (a) express empathy, (b) develop discrepancy, (c) avoid argumentation, (d) roll with resistance, and (e) support self-efficacy (Miller & Rollnick, 2002).

A specific employment of motivational interviewing, initially called "The Drinkers Check Up" and further applied in Project MATCH as Motivational Enhancement Therapy (MET), offers an extension of the typical MI interaction (Miller, Sovergein & Krege, 1988). MET incorporates a form of personalized feedback into the motivational interview (Miller, 2003). In MET, once an alcohol pre-treatment assessment is completed, the results are presented to the patient in a "low key, objective fashion" (Miller, 2003, p. 138). The low-key presentation is meant to reduce the potential resistance a patient may display, whereby the provider will present the findings and ask, "what do you make of this?" (Miller, 2003, p. 138). Typically, after delivering assessment feedback, an MI intervention is employed.

Regardless if MI or MET is selected, the provider must "elicit from the client and reinforce reasons for concern and for change" (Miller, 1996, p. 840). The elicitation is often referred to as "change talk," or having patients verbalize reasons for changing their

behavior (Miller & Rollnick, 2002). Change talk predicts patient benefit from MI and is advanced as the causal mechanism in MI (Miller & Rollnick, 2002; Moyers, Martin, Houck, Christopher & Tonigan, 2009).

MI/MET as a communication construct: Potential mechanisms of MI efficacy through language. The primary mechanism elucidating why MIs is efficacious focuses on the speech of the patient that is in support of behavior change, previously referred to as "change talk" (Miller & Rollnick, 2002; Moyers et al., 2009). In the seminal work relating change talk (CT) to patient behavioral change, Amrhein, Miller, Yahne, Palmer and Fulcher (2003) coded 84 video transcripts of patients enrolled in an MI clinical trial**,** and analyzed and closely attended to patients CT and subsequent health outcomes. Important to this particular investigation is the division of CT into two primary subtypes: preparatory language and commitment language (Miller, Moyers, Ernst & Amrhein, 2006). Preparatory language is that which expresses a patient's desire, ability, reasons and needs (DARN; Amrhein et al., 2003; Miller et al., 2006). However, Amrhein et al. (2003) were primarily concerned with a patient's commitment language, both in terms of frequency and strength. While the frequency of commitment language purely counts its incidence, measuring the strength of commitment language can potentially be more illustrative of a patient's readiness to change. For example, "I will try to stop using" versus "There's no question about quitting this time," provide vastly different examples of dedication to commitment, and contribute differently to the probability that change will indeed occur (Amrhein et al., 2003, p. 864).

Results indicate that the strength of the commitment language, not the frequency of commitment language, predicts behavior change. However, the strength of a patient's

preparatory language was not associated with any positive patient outcomes. Miller, Benefield and Tonigan's (1993) findings, which also failed to determine a significant relationship between the frequency of a patient's change talk and the patient's behavioral outcomes, support the results of this investigation.

Therapist language and change talk. Due to the relationship CT shares with patient behavioral outcomes, recent scholarship has begun to examine the potential ways in which the communication of the practitioner can influence and direct the patient's speech in favor of CT (Daeppen, Bertholet, Gmel, Gaume, 2007; Gaume, Gmel, Faouzi & Daeppen, 2008; Gaume, Bertholet, Faouzi, Gmel & Daeppen, 2010; Magill, Gaume, Apodaca, Walthers, Mostroleo & Borsari, 2014). Findings indicate that employing MI consistent behavior (MICO) (e.g., the expression of empathy, reflective listening) associates with an increase in CT (Gaume et al., 2008; Gaume et al., 2010).

Moyers et al. (2009) became the first to adjoin these previously separate pathways (practitioner's impact on CT as path 1 and CT impact on health outcomes as path 2) into one causal chain, therefore directly linking practitioner's communication to patient behavioral outcomes, accomplished through obtaining therapy recordings and corresponding patient outcomes from participants in Project MATCH.

Therapist ➔ Change Talk ➔ Behavioral Outcomes

The frequency of MICO behaviors was found to predict patient's future drinking behaviors, whereby patients paired with practitioners who used more MICO behaviors were associated with consuming fewer drinks per week. Reflective listening was found to be the strongest MICO behavior in eliciting CT from the patient. This outcome is

consistent with Gaume et al. (2010), indicating that reflections may be an influential tool in the evocation of CT.

However, a central question remains: does the link between change talk and health outcomes demonstrate causality? In other words, is change talk a reflection of an intrapersonal change, or does change talk induce change? As supported by Vader, Walters, Prabhu, Houck and Field, (2010**)** "it is unknown whether such language is merely a marker of some other internal change, or if the language is actually functioning as a mechanism of change" (p. 191). Regardless if this question remains unanswered, this line of inquiry serves to underscore the pivotal role of communication, language and influence to MI.

MI/MET & Primary care

MI and/or MET techniques provide practical interventions in primary care due to the focus on resolving ambivalence. Ambivalence about changing alcohol consumption is a common problem in health care consultations, with approximately one-third to one-half of hazardous or harmful drinkers who are *not* seeking treatment for alcohol feeling ambivalent about changing or engaging in an intervention (Anderson, 1996). MI/MET has the potential to be an effective technique to initiate behavior change in primary care populations through resolution of this ambivalence.

However, studies examining MI and/or MET in primary care settings have found both significant and non-significant results. For example, D'Amico, Miles, Stern and Meredith (2008) assessed an MI intervention for high-risk youth delivered in a community-based, primary care setting. Teens randomly assigned to the MI intervention

group and a control group receiving "treatment as usual," demonstrated no statistically significant difference in number of days alcohol was consumed.

For MET, Emmen, Schippers, Wollersheim and Blejenberg (2005) examined the Dutch Motivational Drinker's Check Up (DVA), a type of intervention modeled after the Drinkers Check Up (aka MET). No significant reduction in self-reported alcohol consumption was found between the intervention and control group. Self-reported consumption was supported by biological measures (carbohydrate-deficient transferrin), where no significance was found between the intervention and control group. However, other studies examining MI or MET in primary care settings (Sentf, Polen, Freeborn & Hollis, 1997; Maisto et al., 2001; Noknoy, Rangsin, Saengcharnchai, Tantibhaedhyangkul & McCambridge, 2010) report significant differences between those receiving treatment (MI or MET) and control groups.

Due to the variation in significance across various studies, an alternative to significance testing ought to be utilized. Measuring the effect size over a relatively large number of studies may be more appropriate (Moyer, Finney, Swearingen & Vergun, 2002). Subsequently, a meta-analytic approach can potentially provide a more powerful estimate of how MI/MET performs in a primary care setting.

MI/MET Meta-Analytic Reviews

Previous meta-analyses provide support for MI/MET efficacy as applied to various health issues and across a number of contexts. However, the effect size of MI/MET appears contingent on the comparison treatment or control. For example, in the first meta-analysis examining adaptations of MI, Burke, Arkowitz and Menchola (2003) found for studies examining alcohol and drug abuse ($k = 8$), adaptations of MI had a

combined effect size near zero (d = .02) when compared to other active treatments and an effect size, d = .25 to .53, when compared to no treatment or a placebo control group.

Hettema, Steel and Miller (2005) followed to include 72 studies in a meta-analysis examining MI over a range of health behaviors (e.g., alcohol, smoking, HIV, treatment compliance, gambling, water purification, eating disorders, diet and exercise). Of these studies, 32 examined alcohol use, with d values ranging from -0.08 to 3.07. The largest effect sizes were seen in studies contrasting MI to no-treatment, a waitlist control, education or adding MI to a standard form of treatment. A mean d value of 0.41 for post-treatment and .26 across all study follow-up points (up to 24 months) demonstrates a relatively small effect. However, studies focusing on alcohol abuse had effect sizes ranging from d = 0 to more than 3.0. Lundahl and Burke (2009) note that results from this particular meta-analysis may be limited, since studies were included that did not isolate the effect of MI (e.g., a combination of MI and cognitive behavioral therapy (CBT) was compared to a control group who received no treatment.).

Vasilaki, Hosier and Cox's (2006) meta-analysis specifically examined MI and alcohol consumption. MI interventions were examined in a variety of contexts across 15 studies (n=2767) and found that compared to no treatment, MI had a benefit, with d = 0.18 (95% CI [0.07, 0.29]). Compared to other treatments, d = 0.43 (95% CI [0.17, 0.70]).

Lundahl, Kunz, Brownell, Tollefson and Burke (2010) was the first meta-analysis to include studies focusing on MET along with those using MI, producing an average effect size of g = .22 (95% CI [0.17, 0.27]) across 132 comparisons. Hedge's g was selected for this particular investigation due to its ability to correct for potential bias as a

result of a small sample size, and may be interpreted using Cohen's (1988) convention as small (0.2), medium (0.5), and large (0.8) effect sizes (Cooper & Hedges, 1994; Hofmann, Sawyer, Witt & Oh, 2010; Lipsey & Wilson, 2001). While Lundahl et al., (2010) did not report the precise formula used to calculate *g*, Hedges & Olkin propose the following: $g = d\,(1 - (3/4(n_1+n_2) - 9))$ (p. 81). For alcohol related studies, where MI/MET was compared to a weak condition, $g = .20$. However, when compared to a strong comparison group, $g = .03$. Across all conditions, Lundahl et al., (2010) found that MET ($g = .32$, 95% CI [0.23, 0.40]) is relatively more effective than MI ($g = 0.19$, 95% CI [0.11, 0.27]). However, Lundahl et al., (2013) uncovered no substantial advantage in offering MET ($d = .321$) relative to MI ($d = .105$)

In the most recent meta-analysis and systematic review, VanBuskirk and Wetherell (2014) examined the effectiveness of motivational interviewing in primary care populations. While this review has the potential to answer the question of efficacy for MI in primary care, there are two primary issues. First, duel-focused interventions (e.g., cognitive behavioral therapy paired with MI) were included. Therefore, the effect of MI cannot be isolated. Second, participant recruitment was required to occur in a primary care setting, although the intervention could be delivered outside of a primary care setting. Subsequently, studies were included if they used telephone-based or other mediated forms of delivery. Arguably, the combination of these two factors does not provide an accurate picture of MI in a primary care setting.

Active vs. Passive Treatment Seeking and Implications For Meta-Analyses

The results of past meta-analyses support the viability of MI/MET as a treatment option. However, a problem plagues previous MI/MET meta-analyses and confounds

actual effect sizes is the practice of combining studies examining two distinct populations (Heather, 1995, 1996). The first population includes those identified opportunistically through primary care and who are subsequently *not* seeking treatment for alcohol (Heather, 1995; Moyer et al., 2002). The second are those who are actively seeking alcohol treatment, and are thus more motivated to change. As shown in Table 2, the majority of MI based meta-analyses have combined treatment seeking and non-treatment seeking populations. Combining non-treatment seeking patients with those who are seeking treatment may inflate the reported effect of MI/MET, due to important differences between the level of motivation and readiness to change (Heather, 1995). Treating all populations as homogeneous will not present an accurate picture of the efficacy of MI/MET. Given the opportunity primary care can provide, it is important to determine the utility of MI/MET in non-treatment seeking, primary care populations.

A second problem arises when the effects of MI and MET are combined to create the overall effect size. This does not allow for the separation and isolation of MI/MET and the different components of each type of intervention. According to Burke, Arkowitz and Dunn (2002) "an immediate task for research is to dismantle feedback based AMIs (adaption of motivational interviewing) [i.e., MET] into their main components-problem feedback and motivational interviewing- to determine their relative contributions to outcome" (p. 244).

Thus far, Lundahl et al. (2010) and Lundhal et al. (2013) are the only meta-analyses to discern between the delivery of MI and MET. However, one meta-analysis found a relative difference (Lundahl et al., 2010) while the other did not (Lundahl et al.,

2013). Furthermore, it remains unknown if the feedback provided in MET provides any additional benefit within a primary care population.

Accordingly, this meta-analysis seeks to answer the following inquires:

RQ 1: What is the effect size of MI and MET as an alcohol intervention in primary care and general health care settings?

RQ 2: Is there a difference in effect size between MI and MET in primary care populations?

Method

Literature Search

A comprehensive search strategy was performed in order to collect all pertinent studies. This consisted of searching (a) electronic databases, (b) previous meta-analyses and systematic reviews, and (c) the bibliographic resource provided by the Motivational Interviewing Network of Trainers (MINT).

First, 17 electronic databases (*ABI/INFORM, Alcohol and Alcohol Problems Science Database (ETOH), CINAHL Plus, Cochrane Trials, Cochrane Drug and Alcohol and Effective Practice and Organization of Care specialized register, CommAbstracts, Communication and Mass Media Complete, ERIC, ProQuest Dissertation and Theses Global, PsychINFO/PsychLit, PsychArticles, PubMed/Medline, Science Citation Index and Social Science Citation Index (via Web Of Science), ScienceDirect/ISI, Sociological Abstracts*) were searched, with the last search performed in February of 2015.

Database searching was performed using a Boolean search strategy with the following terms: (motivational interviewing OR motivational enhancement therapy OR drinkers check up OR motivational intervention) AND (primary care OR general practice

OR community health care) AND (alcohol OR alcohol consumption OR drinking OR alcohol use OR hazardous drinking).

Secondary searching was executed by hand searching the reference lists from previous meta-analyses or systematic reviews addressing either motivational interviewing or brief interventions (Bertholet, Daeppen, Wietlisbach, Fleming, Burnand, 2005; Beich, Thorsen & Rollnick, 2003; Bien, Miller & Tonigan, 1993; Burke et al., 2003; Burke, Dunn, Atkins & Phelps, 2004; Carey, Scott-Sheldon, Elliott, Garey & Carey, 2012; Dunn, Deroo & Rivara, 2001; Emmen, Schippers, Bleigenberg & Wollersheim, 2004; Hettema et al., 2004; Jensen, Cushing, Aylward, Craig, Sorell & Steele, 2011; Kahan, Wilson & Becker, 1995; Kaner et al., 2007; Lundahl et al., 2010; Lundahl et al., 2013; Moyer, Finney, Swearingen & Vergun, 2002; Noonan & Moyers, 1997; Poikolainen, 1999; Rubak et al., 2005; Smedslund Berg, Hammerstrom, Steiro, Leiknes, Dahl, Karlsen, 2011; Vasilaki et al., 2006; VanBuskirk & Wetherell, 2014; Wilk, Jensen & Havighurst, 1997).

Finally, the Motivational Interviewing Network of Trainers 1,290 bibliographic entries (http://www.motivationalinterviewing.org/bibliography?s=author&o=asc) were searched, with a focus on locating relevant key words within the title of the entry.

Study Eligibility

Studies were included if the author(s);

(a) Used MI or MET as a primary technique of intervention;

(b) Used a randomized control trial design. Acceptable control groups include treatment as usual, information only control, waitlist control, or assessment only control;

(c) Isolated the impact of MI or MET, especially if it was used as an additive component to treatment;

(d) Delivered the intervention in a general medical setting. This is operationalized as a health care facility in which patients may seek care for a variety of health problems and access is not the result of a referral (Kaner et al., 2007). Common settings may include a general hospital, stand alone primary care clinics, and clinics within a hospital**.**

Studies were excluded if patients were actively seeking a consultation for alcohol problems or addiction (as opposed to seeking help for a different or general medical condition), were recruited in non-clinical or health care related settings (e.g., university classes) or through advertisements, were diagnosed with concurrent psychosis (e.g., schizophrenia) or were admitted to a psychiatric inpatient program. In addition, studies were excluded if patients were mandated to treatment (e.g., court ordered rehabilitation, counseling required as a result of university alcohol policy violation), were incarcerated, or currently in a separate substance abuse treatment.

Certain methodological considerations also made a study ineligible for inclusion, including studies in which MI/MET was delivered exclusively through computer-based programs, telephone interviews or mailings (i.e., MI/MET not delivered by humans), if there was no measure of alcohol consumption or alcohol related problems, or the article was published before 1983, as MI was not introduced until this date.

Coding of Studies

Dependent outcomes. The following outcomes were synthesized from relevant studies (a) Patient scores on drinking measures (e.g., AUDIT, ASSIST), (b) Biological measures (e.g., GGT, CDT), (c) Heavy drinking or binge drinking episodes (commonly

operationalized as 5 or more drinks per occasion for men and 4 or more drinks per occasion for women), (d) Total consumption (commonly measured as alcohol by volume or standardized ethanol content), (e) Drinking days or occasions, (f) Any alcohol use (particularly relevant in studies with a sample of pregnant women), (g) Abstinence, (h) Hazardous or risky use (as indicated by study author, and typically operationalized following WHO guidelines; see Table 1), (i) Drinks per drinking occasion, (j) Alcohol consequences (typically measured using alcohol related harm validated measures, including the Rutgers Alcohol Problem Index (RAPI; White and Labouvie, 1989) and the Drinker Inventory of Consequences-2L (DrInC-2L; Miller, Tonnigan & Longabaugh, 1995), (k) Quality of life, and (l) Alcohol dependence or abuse.

Moderator Variables. The following articles were coded in order to identify potential factors that influence the efficacy of MI/MET and MI/MET delivery:

(a) Type of control group.

(b) Type of MI (as described by study author).

(c) For those who delivered the intervention (i.e., interventionists):

(1) Amount of MI training (in hours).

(2) Fidelity to MI intervention (when provided by authors, how accurately providers delivered MI/MET and how this was measured. For example, if fidelity was measured via audio or video recording, was it assessed with or without a standardized system (e.g., the MI Skill Code (MISC), Miller, 2002).

(3) Educational background.

(d) Screening measurement employed and subsequent study eligibility based on screening

(e) If provided, type or intensity of patient alcohol use disorder prior to intervention, based on screening criteria.

(f) Patient exposure to MI delivery (total number of time spent (in minutes) in sessions in which MI/MET was delivered, not including assessments).

(g) Number of sessions whereby MI was delivered.

(h) If patients with alcohol dependence were excluded from the study.

(i) Role of MI in treatment (Additive: was combined with another treatment, but effect of MI/MET isolated, Prelude: MI/MET used before more intensive treatment, yet effect of MI/MET isolated, or Stand Alone: MI/MET was the sole treatment provided).

(j) Durability of MI treatment (the longest time period in which post-intervention measures were collected).

Statistical Analysis

Conversion. *d* was used as the primary effect size in this review. According to Durlak (1995), when a meta-analysis is evaluating some form of treatment "the most important variables is the standardized difference between group means" (p. 327). This difference, called Cohen's *d,* is the most "widely used statistic in the meta-analysis of experimental or intervention studies" (Hunter & Schmidt, 2004, p. 246) and is commonly applied "when the research in question is related to group differences" (Whinston & Li, 2011, p. 274). *d* is calculated by subtracting the control group mean from the intervention group mean and dividing by the pooled standard deviation (Hedges & Olkin, 1985).

$$\text{Cohen's } d = \frac{\overline{X}_{\text{I}} - \overline{X}_{\text{C}}}{\sqrt{\frac{(n_{\text{I}} - 1)s_{\text{I}}^2 + (n_{\text{C}} - 1)s_{\text{C}}^2}{n_{\text{I}} + n_{\text{C}} - 2}}}$$

When calculating between group differences for all relevant variables, the mean and standard deviation of each variable was compared to the mean and standard deviation of the control condition at all follow up points.

Ninety-five percent confidence intervals were calculated from their variance using the following estimation (Hedges and Olkin, 1985, p. 86).

$$\sigma^2 (d) = [(n_E + n_c)/n_E n_c] + [d^2/2 (n_E + n_c)]$$

Where n_E is the sample size of the experimental group and n_c is the sample size of the control group.

If mean, standard deviation or sample size information were missing, effect sizes were calculated by converting significance testing (e.g., F, t, chi-square) to *r* and then converting *r* to *d* using the following equation (Hunter & Schmidt, 2004, p. 279).

$$d = \frac{2r}{\sqrt{1-r^2}}$$

The mean effect size was calculated by dividing the sum of the *n*-weighted effects by the sum of the sample.

Corrections for Artifact. All effects were corrected for error in measurement (i.e., correction for attenuation) using reported reliability coefficients (Hunter & Schmidt, 2004). When primary investigations failed to report reliability coefficients for measures (e.g., ASSIST, AUDIT), effects were corrected using previously reported reliability coefficients (see Allen, Litten, Fertig, & Babor, 1997). When self-reported drinking behaviors, such as total consumption or drinking days/occasions, were measured using a timeline follow back drinking (TLFB) procedure, corrections were based on reliability as reported by Sobell, Sobell, Leo and Cancilla (1988).

Outlier Identification. The selection criteria yielded 34 studies. For article screening and exclusion process, please refer to the PRISMA Flow Chart (Fig. 1). The 34 studies resulted in 185 effect size calculations. However, 25 outliers were removed, thus resulting in 160 effects used in analysis. Outliers were operationalized as those effects falling 5 *SDs* below the mean or 5 *SDs* above the mean, and were identified through z-standardization of all effect sizes. Primary justifications for removal of outliers was based on certain sample populations potentially having an increased motivation to decrease or cease drinking (e.g., pregnant women; Osterman & Dyehouse, 2012), and thus contributed to an inflated effect size. Patients with medical conditions where alcohol is strongly contraindicated had a more dramatic decrease in alcohol consumption, and resulted in larger mean differences compared to a typical patient population. Weinrieb, Van Horn, Lynch and Lucey's (2011) study had *all* calculated effect sizes outside 5 *SD*s of outcome means and was thus removed from analysis. Within this investigation, the population sampled was composed of patients undergoing a liver transplant as a result of alcohol related liver disease. In order for their liver transplant to be successful, those with prior liver cirrhosis must completely abstain from alcohol (NIAAA, 2005). Due to the elimination of Weinrieb et al. (2011), the final number of studies utilized in this investigation is 33 (see Table 3 for study characteristics).

Results

Overall Effect Sizes

The average effect of MI and/or MET indicates a small improvement in relevant drinking outcomes ($\bar{d}$ = .153, 95% CI [0.109, 0.196], k = 33, N = 32,588). This is, however, based on a heterogeneous set of findings, χ^2 = 585.8 (159, N = 32,588), p < .05.

Scores on Drinking Measures. The average effect of MI and/or MET on the reduction of patient scores on drinking measures (e.g., ASSIST, AUDIT) was very small ($\bar{d}$ = .038, 95% CI [-0.055, 0.131], *N*= 2903) based on a heterogeneous set of results, χ^2 = 57.7 (5, *N* = 2903), *p* < .05.

Biological Measures. The average effect of MI and/or MET on the reduction of alcohol biological measures (e.g., GGT, CDT) was small ($\bar{d}$ = .218, 95% CI [0.012, 0.423], *N* = 767) based on a heterogeneous set of results, χ^2 = 17.71 (6, *N* = 767), *p* < .05.

Heavy Drinking or Binge Drinking Episodes. The average effect of MI and/or MET on the reduction of alcohol heavy or binge drinking episodes was small ($\bar{d}$ = .181, 95% CI [0.01, 0.262], *N* = 7067) based on a heterogeneous set of results, χ^2 = 150.46 (35, *N* = 7067), *p* < .05.

Total Consumption. The average effect of MI and/or MET on the reduction of total alcohol consumption was small ($\bar{d}$ = .175, 95% CI [0.116, 0.234] *N* = 6796) based on a heterogeneous set of results, χ^2 = 104.16 (32, *N* = 6796), *p* < .05.

Drinking Days or Occasions. The average effect of MI and/or MET on the reduction of total drinking days or occasions was positive ($\bar{d}$ = .299, 95% CI [0.135, 0.462], *N* = 1072), based on a homogeneous set of results, χ^2 = 5.43 (6, *N* = 1072), *p* > .05.

Any Alcohol Use. The average effect of MI and/or MET on patient use of any alcohol products was positive ($\bar{d}$ = .304, 95% CI [0.076, 0.532], *N* = 804) based on a heterogeneous set of results χ^2 = 8.07 (3, *N* = 804), *p* < .05.

Abstinence. The average effect of MI and/or MET on patient abstinence was small ($\bar{d}$ = .136, 95% CI [-0.005, 0.277], *N* = 1204), based on a homogeneous set of results, χ^2 = 4.69 (6, *N* =1204), *p* > .05.

Hazardous or At-Risk Use. The average effect of MI and/or MET on patient reduction of hazardous or at risk alcohol use was small ($\bar{d}$ = .198, 95% CI [0.092, 0.3], *N* =1503) based on a heterogeneous set of results, χ^2 = 14.72 (5, *N* =1503), *p* < .05.

Drinks per Drinking Occasion. The average effect of MI and/or MET on reduction of drinks per drinking occasion was small ($\bar{d}$ = .179, 95% CI [0.055, 0.303], *N* = 2725) based on a heterogeneous set of results, χ^2 = 41.31 (14, *N* = 2725), *p* < .05.

Alcohol Consequences. The average effect of MI and/or MET on patient alcohol consequences was small ($\bar{d}$ = .125, 95% CI [-0.004, 0.254], *N* = 4663) based on a homogeneous set of results, χ^2 = 34.99 (28, *N* = 4663), *p* > .05.

Quality of Life. The average effect of MI and/or MET on improvement of quality of life was very small ($\bar{d}$ = .071, 95% CI [-0.096, 0.238], *N* = 1964) based on a homogeneous set of results, χ^2 = 5.82 (4, *N* = 1964), *p* > .05.

Alcohol Dependence or Abuse. The average effect of MI and/or MET on patient reduction of alcohol dependence or abuse was extremely small ($\bar{d}$ = -.001, 95% CI [-0.169, 0.167], *N* = 1120), and negative, and thus indicates a very small increase in frequency of alcohol or abuse. This is based on a homogeneous set of results, χ^2 = 2.84 (2, *N* = 1120), *p* > .05.

Durability of MI and MET

For follow up points ranging from 4 to 12 months, the average effect of MI/MET was small ($\bar{d}$ = .165, *N* = 11,101). However, the effect increased slightly at follow up

assessments occurring from 16 to 24 weeks ($\bar{d}$ = .19, *N* = 9,745). For those follow up points exceeding 24 weeks (25, 36 and 52 weeks), the average affect was relatively small ($\overline{(d}$ = .11, *N* = 11,708).

MI vs. MET

The relative benefit of offering MET as opposed to MI was minute, with an average effect of MI = .114, (95% CI [0.06, 0.016], *N* = 8689) compared to $\bar{d}$ = .125, (95% CI [0.044, 0.206], *N* = 21,226) for MET, thus demonstrating no significant benefit in offering feedback to patients in primary care settings.

Discussion

This meta-analysis documents how MI and/or MET performs in primary and general health care settings for the purpose of alcohol reduction. Results suggest that MI and/or MET exerts a small, positive overall effect ($\bar{d}$ = .153). However, the overall effect of MI is smaller than those from comparable MI/MET focused meta-analyses. For instance, VanBuskirk and Wetherell (2014) uncovered $\bar{d}$ = .22 (95% CI [-.21, .65]) for general substance abuse treatment within opportunistic health care. Within this investigation, MI/MET demonstrates a small, positive effect for most alcohol related variables, including biological measures ($\bar{d}$ = .218), binge drinking episodes ($\bar{d}$ = .181), total consumption ($\bar{d}$ = .175), drinking days/occasions ($\bar{d}$ = .299), alcohol use of any kind ($\bar{d}$ = .304), hazardous/at-risk use ($\overline{(d}$ = .198), drinks per drinking occasion ($\overline{(d}$ = .179), and alcohol related consequences ($\overline{(d}$ = .125). Like the overall effect of MI/MET, certain outcome variables had substantially smaller effects compared to other investigations. For example, in the review by Burke et al., (2003), the average effect of MI on peak blood

alcohol concentration (BAC) was $\bar{d}$ = .53, as opposed to this investigation where $\bar{d}$ = .181 for similar intoxication measures.

Interestingly, no significant benefit in offering MET (i.e., MI + Feedback) as opposed to MI existed. The lack of MET to MI benefit appears surprising considering the results of Project MATCH (1997, 1998) reporting MET to be just as effective as more intensive and time consuming forms of treatment, such as cognitive behavioral therapy. Lundahl et al., (2010) corroborates the finding with an investigation concluding significantly better health outcomes in offering MET as opposed to MI. Future investigations should explore *why* feedback exerts no profound increase on the positive outcomes of MI in primary and general health care settings.

A common finding in investigations examining discrete interventions (i.e., one on one therapeutic sessions) involves the gradual decay of effectiveness. However, MI-based investigations often show no such relapse (see Burke et al., 2003; Dunn et al., 2001). MI/MET exerted a relatively stable impact over time, with the effect of MI/MET at 25 to 32 weeks ($\bar{d}$ = .110) relatively similar to the effect at 4 to 12 weeks ($\bar{d}$ = .165). This result is consistent with previous meta-analyses and represents a relatively short-term effect. Long-term stability past one year could not be assessed because no study included in this meta-analysis followed patients beyond 52 weeks.

Limitations

Nearly all studies included in this investigation fail to conceal allocation or use blind assignment. However, concealment and blind assignment may be difficult in RCTs examining interventions in human populations; particularly when informed consent procedures stipulate noticeable differences between experimental and control conditions.

Importantly, given the heterogeneity of most study outcomes, follow up moderator analyses are appropriate and necessary. Even though all studies focused on excessive alcohol consumption, high variability across studies still exists. This variability is speculated to be a result of two potential factors. The first is inconsistency in the amount of time MI/MET was delivered. For instance, the minimum time of intervention delivery was 10 minutes across one session (Mertens, Ward, Bresick, Broder, & Weisner, 2014). The maximum was 150 minutes across 5 sessions (Rubio et al., 2014).

The second source of variability may be attributed to discrepancies in clinical delivery of MI/MET. While a majority of the studies indicate the length of interventionist training (typically described in terms of days of training), others simply stated that practitioners had "extensive training." In addition, few studies detail the precise training received by the interventionists. Second, 22 of the 33 investigations indicate that fidelity to MI/MET was assessed in some manner, most often through a review of audio and videotapes. However, only seven of these studies used a standardized fidelity assessment (e.g., Motivational Interviewing Skill Code, Motivational Interviewing Treatment Integrity). For the purpose of determining relevant constructs that contribute to variability across studies, follow-up analyses are required. Therefore, a strong limitation of this meta-analysis stems from the reliance on primary studies that may lack consistency in treatment application. Subsequently, findings must be interpreted with a degree of caution.

Comparative Efficacy of MI/MET and Clinical Relevance

In order to determine the efficacy of MI/MET relative to other viable therapies requires a brief review. Lipsey and Wilson (1993) collected meta-analytic comparative

data for psychological, educational, and behavioral treatments and interventions. Through calculating a distribution of mean effect sizes (*d*), it was discovered that interventions produced a mean and median effect sizes around .5 (*SD* = .29). The average effect size of this investigation ($\bar{d}$ = .153) is outside one standard deviation of the mean effect of determined by Lipsey and Wilson (1993). Arguably, the effect of MI within primary and general health care may be inconsistent with other interventions in more specialized settings.

However, MI/MET compared to other brief interventions delivered in primary care is more aligned with the results of this investigation. Moyer, Finney, Swearingen and Vergun (2002) examined brief intervention efficacy for alcohol problems in both treatment seeking and non-treatment seeking populations, and is thus considered a comparable reference. For non-treatment seeking populations, the effect of brief interventions at 3 to 6 months *g* = .144, 6 to 12 months *g* = .241 and 12+ months *g* = .129, respectively. This is similar to the longitudinal effects uncovered in this meta-analysis, and may indicate that MI/MET is more comparable in effectiveness to brief interventions than previously thought.

As MI/MET may potentially be less effective in primary care as opposed to other health care settings, the decision to implement MI/MET within a specific clinic must be carefully considered. The choice to adopt a particular intervention is highly dependent on certain relevant issues, and must be weighed against factors such as cost effectiveness, ease of learning, time of delivery and typical patient populations. Importantly, the decision should ultimately rest on the confidence a practitioner feels in delivering MI and/or MET. Confidence may reflect MI training, but may also depend on the character

and predispositions of the practitioner. MI/MET is contingent upon the expression of empathy, reflective listening and non-confrontational communication. A PCP feeling uneasy about embracing a patient-centered perspective should considering adopting a different intervention framework, as there are other effective interventions to choose from.

Conclusion

Due to the significant role primary health care serves in reducing excessive alcohol consumption, it becomes increasingly crucial to assess potentially efficacious interventions that can be delivered within this setting. However, primary care patients are especially ambivalent about changing their alcohol related behaviors, particularly when they are not actively seeking treatment for problematic alcohol consumption. MI and MET are two analogous therapeutic styles which focus on reducing patient ambivalence through shifting patient language in favor of behavior change. This investigation examined MI and MET in primary care settings through a meta-analytic approach in order to determine the efficacy of MI and/or MET within this important context.

MI and MET were found to exert a small, positive and relatively stable effect on patient alcohol related outcomes within primary and general health care. The largest benefit was seen in patients who sought to eliminate all alcohol use, as opposed to moderate consumption. Interestingly, adding feedback did not considerably improve patient outcomes. Currently, no studies have reported MI or MET as producing any adverse effects. Therefore, it may be reasonably assumed that MI/MET produces a small benefit in primary care with few risks. Ultimately, if a PCP feels comfortable delivering

MI or MET, they can be reasonably assured that MI/MET will be more effective than delivering no intervention.

Table 1

Alcohol Consumption Definitions

Term	Definition
Alcohol Use Disorder [a]	A problematic pattern of alcohol use leading to clinically significant impairment or distress, as manifested by at least two of the following, occurring within a 12 month period 1. Alcohol is often taken in larger amounts and over a longer period of time than was intended 2. There is a persistent desire or unsuccessful efforts to cut down or control alcohol use 3. A great deal of time is spent in activities necessary to obtain, use, or recover from alcohol 4. Craving, or a strong desire or urge to use alcohol 5. Recurrent alcohol use resulting in a failure to fulfill major role obligations at work, school or home 6. Continued alcohol use despite having persistent or recurrent social or interpersonal problems cause or exacerbated by the effects of alcohol 7. Important social, occupational or recreational activities are given up or reduced because of alcohol 8. Recurrent alcohol use in situations in which it is physically hazardous 9. Alcohol use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is

	likely to have been caused or exacerbated by alcohol 10. Tolerance to alcohol (e.g., a need for markedly increased amount to achieve intoxication) 11. Withdrawal from alcohol as defined by DSM-V **Mild Alcohol Use Disorder:** Presence of 2-3 symptoms **Moderate Alcohol Use Disorder:** Presence of 4-5 symptoms **Severe Alcohol Use Disorder:** Presence of 6 or more symptoms
Binge Drinking [d]	A pattern of drinking that brings blood alcohol concentration (BAC) levels to 0.08 g/dL. This typically occurs after 4 drinks for women and 5 drinks for men—in about 2 hours.
Excessive Drinking/ Consumption [b, c]	Includes binge drinking, heavy drinking, any alcohol use by people under the age of 21 (United States legal drinking age), and any alcohol use by pregnant women
Harmful Use [a, e]	A pattern of psychoactive substance use that is causing damage to health. The damage may be physical (as in cases of hepatitis from the self-administration of injected drugs) or mental (e.g. episodes of depressive disorder secondary to heavy consumption of alcohol). Harmful use commonly, but not invariably, has adverse social consequences
Hazardous Use [e]	A pattern of substance abuse that increases the risks of harmful consequences for the user, and a pattern of drinking that is of public health significance despite absence of any current

	disorder in the individual user
Heavy Drinking [c,e]	A pattern of drinking that exceeds some standard of moderate drinking or defined threshold, i.e., for women, 8 or more drinks per week. For men, 15 or more drinks per week.

[a] American Psychological Association (APA; 2013). [b] Centers for Disease Control and Prevention, (2014a). [c] Centers for Disease Control and Prevention, (2014b). [d] National Institute on Alcohol Abuse and Alcoholism, (n.d.).[e] World Health Organization, (1994).

Table 2

Previous Motivational Interviewing Meta-Analyses Characteristics

Study (by first author)	Health behaviors addressed	Setting(s)	MI or MET isolated from other active treatments?	Combination of treatment and non-treatment seeking patients?
Burke (2003)	Variety	All	Yes	Yes
Hettema (2005)	Variety	All	No	Yes
Vasilaki (2006)	Alcohol	All	Yes	Yes
Lundahl (2010)	Variety	All	Yes	Yes
Lundahl (2013)	Variety	All	Yes	No
VanBuskirk (2014)	Variety	Primary Care	No	Yes

Table 3

Selected Study Characteristics

Study (by first author)	Sample	Sessions	Dose (In Minutes)	Final Follow Up Point (In Weeks)
Allen (2013)	*N* = 370 F; 0%	4 to 6	Not indicated	52
Beckham (2003, 2007)	*N* = 26 F; 53%	1	45-60	6
Butler (2013)	*N* = 1401 F; Not indicated	Not indicated	Not indicated	52
Daeppen (2011)	*N* = 371 F; 0%	1	15	24
D'Amico (2008)	*N* = 42 F; 52.4%	2	20-30	12
Dieperink (2014)	*N* = 120 F; 5%	4	120-180	25
Dimeff (1997)	*N* = 33 F; 60%	5	100	4
Drummond (2009)	*N* = 90 F; 0%	1 to 5	40-200	24
Emmen (2005)	*N* = 112 F; 24%	1	60	24

Freyer-Adam (2008)	*N* = 515 F; 6%	1	25	52
Gaume (2014)	*N* = 50 F; 0%	1	20-30	12
Gillham (2010)	*N* =50 F; 71%	Not indicated	Not indicated	12
Handmaker (1999)	*N* = 34 F; 100%	1	60	8
Hansen (2011)	*N* = 616 F; 48.8%	1	10	52
Hasin (2013)	*N* = 165 F; 21.8%	3	40-55	8
Heather (1996)	*N* = 80 F; 0%	1	30-40	24
Humeniuk (2012)	*N* = 631 F; 28%	1	13.8	25
Kuchipudi (1990)	*N* = 114 F; not indicated	5	45-75	10-16
Maisto (2001)	*N* = 158 F; 30%	3	60-85	52
McDevitt-Murphy (2014)	*N* = 63 F; 8.8%	1	60	24

Mertens (2014)	*N* = 363 F; 52%	1	10	12
Naar-King (2006)	*N* = 51 F; 48%	4	240	12
Noknoy (2010)	*N* = 107 F; 9%	1	10	24
Osterman (2012)	*N* = 56 F; 100%	1	30	24
Reiff-Hekking (2005)	*N* = 445 F; 37%	1	5-10	52
Rendall-Mkosi (2013)	*N* = 125 F; 100%	5	Not indicated	52
Rubio (2014)	*N* = 251 F; 100%	5	50-150	6 weeks postpartum
Saitz (2007)	*N* = 287 F; 29%	1	30	52
Saitz (2014)	*N* = 346 F; 30%	2	50-75	24
Satre (2013)	*N* = 97 F; 64.4%	3	75	24
Schaus (2009)	*N* = 236 F; 52%	2	40	52
Senft (1997)	*N* = 411	1	15	52

	F; 30%			
Watson (2013)	*N* = 463	1 to 4	20-120	52
	F; 20%			

Table 4

Average Effect Sizes For Outcome Variables

Outcome	$\bar{d}$	95% CI	χ^2	df
Scores on Drinking Measures	0.038	0.055, 0.131	57.7*	5
Biological Measures	0.218	0.012, 0.423	17.71*	6
Heavy Drinking/Binge Drinking	0.181	0.01, 0.262	150.46*	35
Total Consumption	0.175	0.116, 0.234	104.16*	32
Drinking Days/Occasions	0.299	0.135, 0.462	5.43	6
Any Alcohol Use	0.304	0.076, 0.532	8.07*	3
Abstinence	0.136	-0.005, 0.277	4.69	6
Hazardous/At Risk Use	0.198	0.092, 0.3	14.72*	5
Drinks per Drinking Occasion	0.179	0.055, 0.303	41.31*	14
Alcohol Consequences	0.125	-0.004, 0.254	34.99	28
Quality of Life	0.071	-0.096, 0.238	5.82	4
Alcohol Dependence/Abuse	-0.001	-0.169, 0.167	2.84	2

Note. CI = confidence interval

* $p < .05$

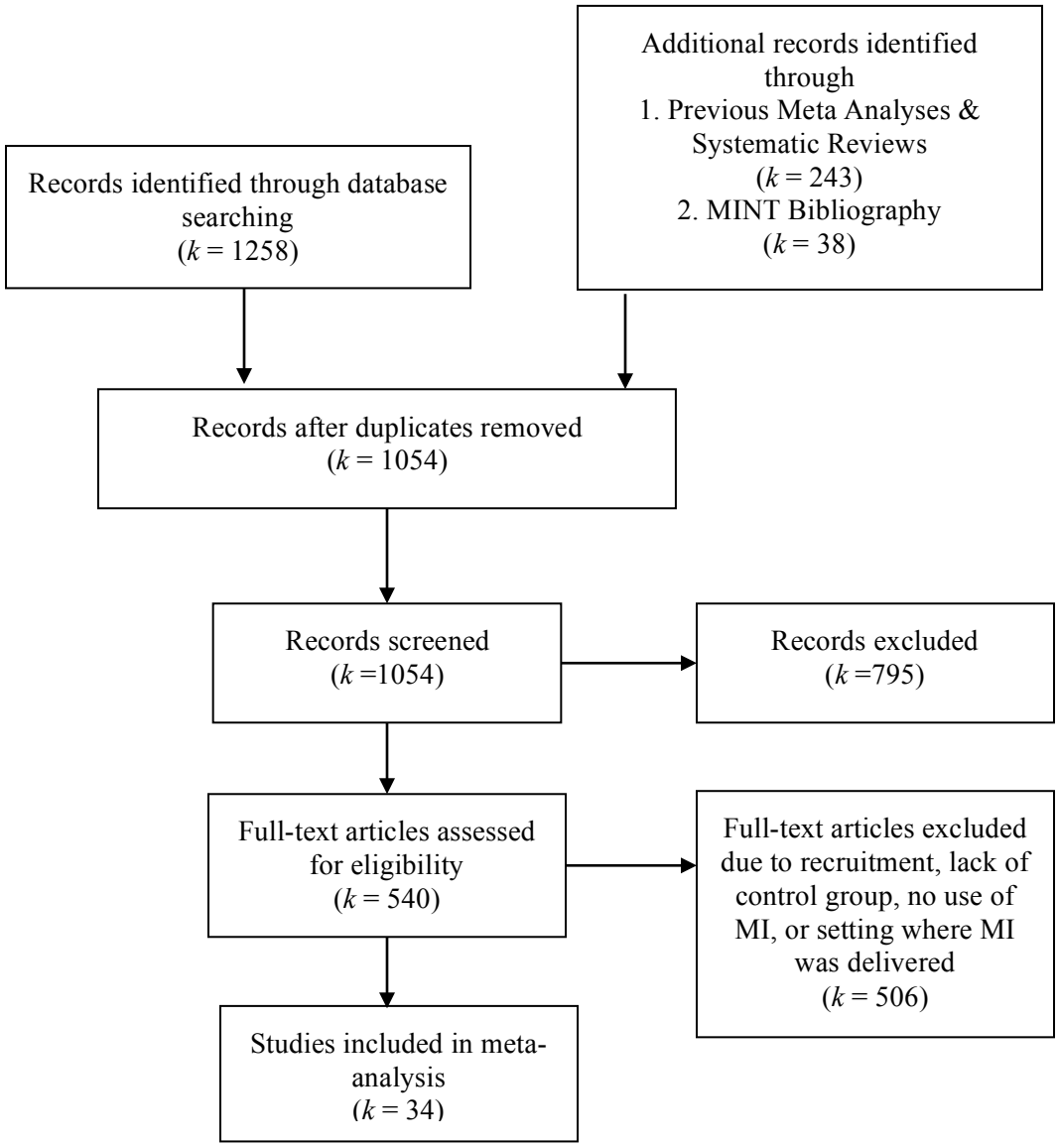

Figure 1. PRISMA Flow Chart of Study Selection Strategy (Moher, Liberati, Tetzlaff, Altman & Group, 2009).

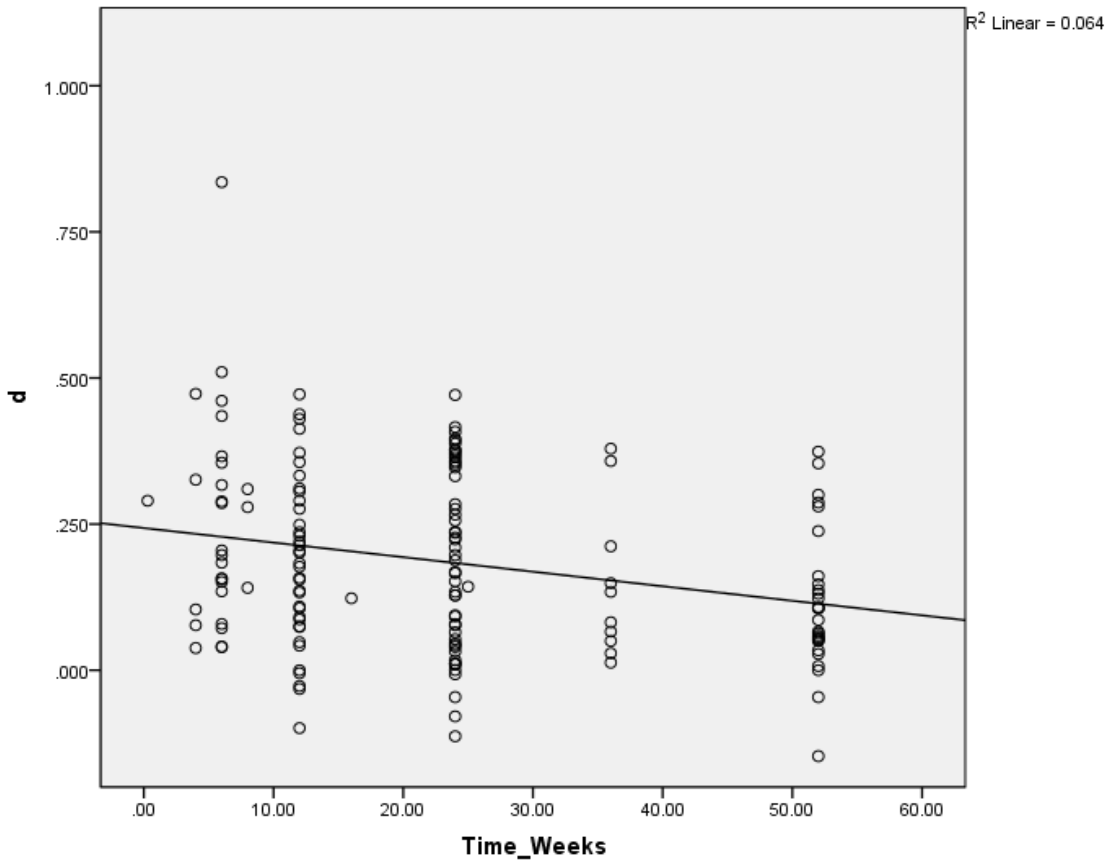

Figure 2. Scatterplot of Effect Sizes at Follow Up Points (in weeks).

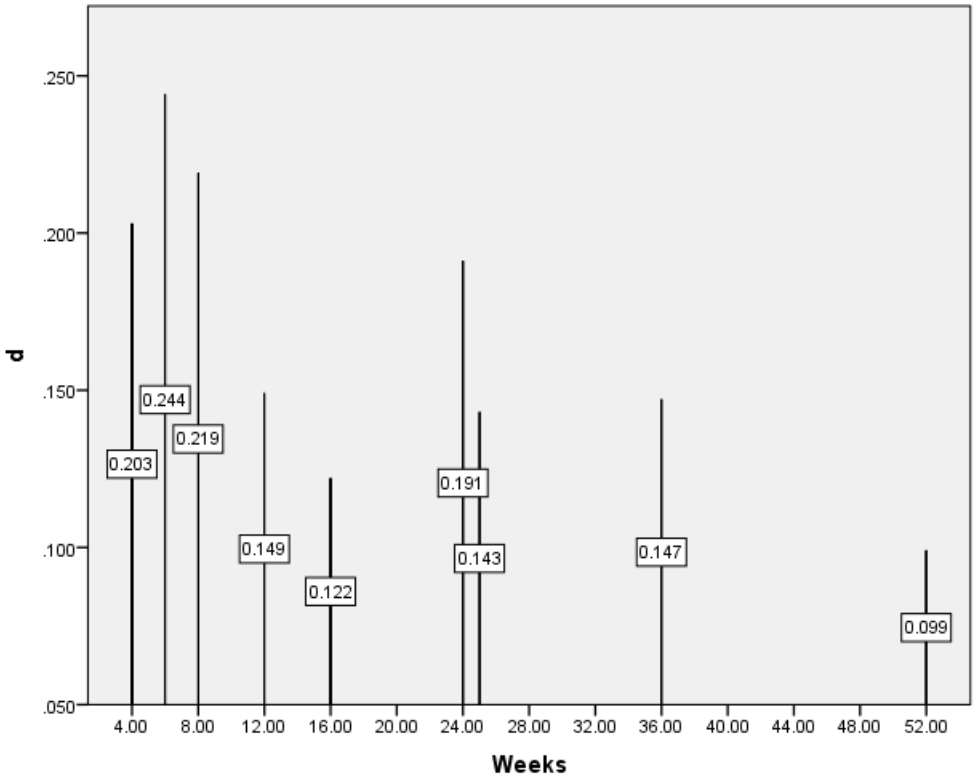

Figure 3. Average effect sizes at follow up points (in weeks).

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* Indicates inclusion in meta-analysis

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