


Motivational Interviewing–Based Compliance/Adherence Therapy Interventions to Improve Psychiatric Symptoms of People With Severe Mental Illness: Meta-Analysis

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Abstract

BACKGROUND: Nonadherence is the leading cause of relapse in mental illness. No quantitative synthesis of multiple studies has been conducted to determine the effect of motivational interviewing (MI)–based compliance/adherence therapy (CAT) interventions on people with severe mental illness. **OBJECTIVE:** To synthesize the studies that examined the effectiveness of MI-based CAT interventions to improve psychiatric symptoms. **DESIGN:** Quantitative meta-analysis. **RESULTS:** Sixteen primary studies were retrieved ($N = 1267$ participants). MI-based CAT interventions significantly improved psychiatric symptoms with a moderate effect size (ES) of .45. Longer sessions and higher intervention doses showed significantly greater ESs than shorter sessions and lower doses. ESs were significantly lower when participants were older and when there was a longer period between the intervention and outcome measurement. **CONCLUSIONS:** These findings support the effectiveness of MI-based CAT interventions. Session length and dose effect should be considered when tailoring MI to clients.

Keywords

motivational interviewing (MI), meta-analysis, mental illness, adherence, psychiatric symptoms

Introduction

People who suffer from severe mental illness (i.e., schizophrenia, schizoaffective disorder, bipolar disorder, and major depressive disorder) often manifest a combination of disturbing or dysfunctional thoughts, emotions, behaviors, and relationships with others. They may display a wide range of symptom features and manifestations, such as psychosis, depression, anxiety, and substance abuse, including side effects of antipsychotic agents (e.g., weight gain, hypertension, cardiovascular disease, metabolic syndrome, and diabetes mellitus) that are unwanted consequences of psychopharmacotherapy (Correll, Detraux, De Lepeleire, & De Hert, 2015). The adverse effects of antipsychotic agents make the morbidity and mortality rates of people with severe mental illness high (Correll et al., 2015; Rao, Raney, & Xiong, 2015).

People with severe mental illness are more likely than others to have poor dietary intake with high fat and low fiber consumption, use tobacco and other addictive substances, and lack adequate exercise and physical activity, all of which predispose them to poor physical health and

comorbidity (Yasamy, Cross, McDaniel, & Saxena, 2014). Not only are physical health problems exacerbated by an unhealthy lifestyle but also psychiatric symptoms are unavoidably affected. Those with uncontrolled, more severe psychiatric symptoms tend to have more medical health problems than the general population (Bradshaw & Mairs, 2014; Correll et al., 2015; Rao Raney, & Xiong, 2015; Yasamy et al., 2014).

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Nonadherence to prescribed antipsychotic medications is the leading cause of relapse in mental illness (Barkhof, Meijer, de Sonnevile, Linszen, & de Haan, 2012). Social influences, such as stigmatization, may lead to the avoidance of mental health services that in turn reduces treatment adherence and achievement of health outcomes (Shrivastava, Johnston, & Bureau, 2012; Wong-Anuchit et al., 2016). Any exacerbation of severe mental illness influences not only health outcomes but also affects patients and families in terms of personal suffering, hospitalization, and poor quality of life (Barkhof et al., 2012), increasing the burden to those taking care of people with severe mental illness. In addition, for society, exacerbations drive up health care costs.

The health status of people with severe mental illness, like the general population, is affected by modifiable risk factors and lifestyle choice behaviors (Correll et al., 2015; Latoo, Mistry, & Dunne, 2013; Yasamy et al., 2014). Motivational interviewing (MI) is one approach to promote healthy lifestyle choices. As an intervention, MI is a person-centered counseling style with collaborative and goal-oriented communication techniques to address personal ambivalence about changing behaviors (Miller & Rollnick, 2013). MI is designed to evoke personal motivation and reinforce a commitment to a specific behavior. It combines a supportive approach (reflective listening statements, affirmation, open-ended questions, summarizing statements) and a directive approach (informed feedback, incongruous or conflicting statements/objectives) to motivate behavioral change (Polcin et al., 2015).

Miller and Rollnick (2013) posit a middle ground along a continuum of Directing–Guiding–Following communication styles in which a skilled interventionist explores a person’s current thoughts, attitudes, and behaviors while guiding and coaching them to resolve ambivalences about illness and behavioral change. Interventionists approach the therapeutic relationship with more than a set of communication styles in that they possess personal/professional characteristics that reflect an internalized belief system or way of being. These characteristics, such as collaboration or partnership, acceptance, compassion, and evocation, are acknowledged to be in the “Spirit of Motivational Interviewing” (Miller & Rollnick, 2013).

MI has been extensively used in individual and group therapy. It has been used on people with schizophrenia and schizoaffective disorder (Chien, Mui, Cheung, & Gray, 2015), bipolar disorder (McKenzie & Chang, 2015), and depression (Interian, Lewis-Fernández, Gara, & Escobar, 2013). However, the MI counseling style is not typically the sole intervention in the therapeutic encounter with severe mental illness. It is almost always combined with other forms of therapeutic interventions to

promote healthy behaviors, such as cognitive behavior therapy, to increase treatment adherence.

The combination of MI with cognitive behavior therapy and psychoeducation has been referred to as compliance/adherence therapy (Chien et al., 2015) and has been widely used in people with severe mental illness (Barkhof et al., 2012).

MI-based compliance/adherence therapy (CAT) intervention is a client-centered, goal-oriented counseling style within a collaborative relationship intended to evoke personal motivation and reinforce a commitment and adherence to a treatment regimen by emphasizing empathy and acceptance, and envisioning a better future (Chien et al., 2015; Miller & Rollnick, 2013). The underlying mechanisms of the intervention involve a nonjudgmental exploration of a person’s current thoughts, attitudes, and behaviors while guiding and coaching them to resolve ambivalences about illness and behavioral change. The intervention involves engaging in the relationship to focus on change and evoking an intrinsic motivation to plan for better health behaviors, thus guiding the client to modify medication adherence, self-care, and help-seeking behaviors (Barkhof, Meijer, Sonnevile, Linszen, & Haan, 2013; Chien et al., 2015).

Results of research on MI-based CAT interventions have been inconsistent. Some researchers have shown the intervention’s positive effects on treatment adherence, including psychiatric symptoms, attitude toward treatment and medication, insight, and functioning (Hayward, Chan, Kemp, Youle, & David, 1995; Kemp, Hayward, Applewhaite, Everitt, & David, 1996; Kemp, Kirov, Everitt, Hayward, & David, 1998; Maneesakorn, Robson, Gournay, & Gray, 2007; Tsang & Wong, 2005). Other researchers (Gray, Wykes, Edmonds, Leese, & Gournay, 2006; O’Donnell et al., 2003) have shown no differences in effect. In a recent narrative review, Barkhof et al. (2012) concluded that the benefits of MI-based CAT interventions have not been confirmed.

Although narrative reviews of interventions can be informative for practice and future research recommendations, a meta-analysis provides specific and detailed quantitative synthesis of intervention effectiveness (Borenstein, Hedges, Higgins, & Rothstein, 2009). As a quantitative research synthesis of multiple independent studies, meta-analysis contributes more detailed information about the research results than merely vote counting that is common in narrative reviews. It quantifies and summarizes the relationships between variables, thus revealing insights for clinical practice related to client outcomes and moderators that may affect those outcomes, gives clinicians evidence for effective treatment choices, and provides effect sizes (ESs) for understanding current research (Borenstein et al., 2009). Meta-analysis has been

considered to be at the pinnacle of the clinical evidence hierarchy that can inform practice (Haidich, 2010). Moreover, by informing clinicians of evidence-based practice, meta-analytic studies point to areas for future inquiry (Goodman et al., 2015).

Researchers of one meta-analytic study examined a single randomized control trial of patients with schizophrenia and compliance therapy based on MI (McIntosh, Conlon, Lawrie, & Stanfield, 2006). No researchers, however, have synthesized multiple primary studies using a meta-analytic approach to determine the effect of MI-based CAT interventions on treatment adherence of people with severe mental illness.

No universally accepted standard exists that measures compliance/adherence. One of the simplest ways to examine compliance/adherence as a health outcome has been to measure psychiatric symptoms as a proxy for the concept (Maneesakorn et al., 2007). This does not negate the importance of other measures, such as attitudes toward treatment and taking medication, insight, functioning, hospitalization, and quality of life. Although these outcomes are important, the focus for this meta-analysis was on psychiatric symptoms as a proxy for compliance/adherence. Resources did not exist to include measures of all health outcomes either in this single meta-analysis or across multiple meta-analyses.

In addition to the intervention, how science is conducted and what gets published can affect the interpretation of outcomes reported in the literature. Study characteristics, including possible publication bias and the rigor of the research design, need to be considered during a meta-analysis. Therefore, the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 were collected to facilitate the preparation and reporting of this meta-analytic study (Moher et al., 2015; Shamseer et al., 2015).

Objectives

This meta-analytic study aimed to quantitatively synthesize the primary studies that have examined the effectiveness of MI-based CAT interventions to improve psychiatric symptoms as a proxy for treatment adherence. To this end, the purpose of the study addressed the following research questions of people with severe mental illness:

Research Question 1: Do MI-based CAT interventions improve psychiatric symptoms (as a proxy for compliance/adherence)?

Research Question 2: Are the effects of MI-based CAT interventions on psychiatric symptoms moderated by the characteristics of the study reports, participants, intervention, and design?

Method

Information Sources

All primary studies related to MI-based CAT interventional studies were identified without date restrictions through December 31, 2015. We searched Ovid MEDLINE(R), PsycINFO, CINAHL Plus with Full Text (EBSCOhost), SCOPUS, Web of Science, Cochrane Library, Sociological Abstracts (ProQuest), Social Work Abstracts (EBSCOhost), and ProQuest Dissertations and Theses-Full Text, as well as ancestry and citation index searches. We also searched reference lists of the qualified studies, previous systematic reviews, and prior research synthesis and meta-analyses to identify relevant articles. Finally, we e-mailed key researchers and corresponding authors of eligible studies to request missing information and inquire if they had unpublished research reports, including those of their students.

Search Strategy

E-databases were searched using the following search terms: (“severe mental disorder*” OR “severe psychiatric disorder*” OR “severe mental illness*” OR “severe psychiatric illness*” OR “serious mental disorder*” OR “serious psychiatric disorder*” OR “serious mental illness*” OR “serious psychiatric illness*” OR “severe and persistent mental disorder*” OR “severe and persistent psychiatric disorder*” OR “severe and persistent mental illness*” OR “severe and persistent psychiatric illness*” OR “serious and persistent mental disorder*” OR “serious and persistent psychiatric disorder*” OR “serious and persistent mental illness*” OR “serious and persistent psychiatric illness*” OR schizophren* OR “major depress*” OR schizoaffective OR bipolar) AND (“motivation* interview*” OR “motivation* enhanc*” OR “compliance therapy” OR “compliance therapies” OR “adherence therapy” OR “adherence therapies”). The terms “compliance” and “adherence” were accepted as interchangeable, putting aside definitional nuances.

Eligibility Criteria

Primary studies were eligible if they were published in English and compared MI-based CAT to a control/usual care group of adults (18 years or older) with severe mental illness (diagnostically defined as schizophrenia, schizoaffective disorder, bipolar disorder, and major depressive disorder) in groups of at least five adults per group, for which researchers measured psychiatric symptoms as a proxy of treatment adherence. Primary studies were excluded if participants had a primary diagnosis of substance abuse, unless co-occurring with another diagnosable serious mental illness. We also excluded studies

reporting only median outcome values because we required means for ES computations.

Study Records

Data Management and Selection Process. After duplicates were removed, two reviewers independently screened primary study titles, abstracts, and keywords to determine possible eligibility. Then they reviewed full-text versions of all possibly eligible studies.

Data Collection Process. Four aspects of each study were coded for moderator analysis. Study characteristics included funding and location. Participant characteristic was age. Intervention characteristics were interventionists' discipline and training, use of the spirit of MI, number of sessions and length of each session, intervention dose, and duration from postintervention to outcome measurement. Design characteristics reflected study quality indicators including type of group assignment, concealed allocation; use of intention-to-treat analysis, power analysis to calculate sample size, blinded/masked data collectors, and fidelity checks; and examination of equality of participant characteristics across groups.

Finally, we collected pre- and postintervention means and standard deviations (or standard errors) of an indirect composite measure of psychiatric symptoms (as a proxy for treatment adherence) when one of the following was reported: Brief Psychiatric Rating Scale (BPRS), Positive and Negative Syndrome Scale (PANSS), and Beck Depression Inventory (BDI-II). The IBM® SPSS® for Windows® version 25 and Comprehensive Meta-Analysis® version 2.0 software were used to analyze the data. Standard errors (*SEs*) or confidence intervals (*CI*s) were converted to standard deviations (*SD*s). Baseline *SD* was substituted for the postintervention *SD* when baseline was missing. When there were companion articles based on the same participants, we retrieved missing data as appropriate.

Data Synthesis

To compute ESs between MI-based CAT interventions and control groups for each study and across all studies, we used an unbiased standardized means difference (Hedges's *g*) rather than a standardized mean difference (Cohen's *d*) to avoid overestimating ES with small samples (Borenstein et al., 2009). We computed standardized differences because psychiatric symptom measures differed across studies (BPRS, PANSS, or BDI-II). We used a random-effects model assuming that the true ES varied from study to study. We examined heterogeneity and dispersion across studies by inspecting forest plots and calculating the *Q* and *I*² statistics. We examined publication bias using the funnel

plot, Egger's regression intercept, Orwin's fail-safe *N*, and Begg Mazumdar rank correlation test (Borenstein et al., 2009; Rothstein, 2008).

Results

After de-duplication of the 1386 e-database records retrieved from years 1978 through 2015, 801 research reports remained for screening. Another 639 records were eliminated because they did not meet the inclusion criteria for MI-based CAT interventional studies. The full texts of the remaining 162 reports were retrieved and reviewed in detail. Of these, 111 study reports were removed because they failed to meet all inclusion criteria. However, three additional studies were identified through the ancestry search process, resulting in 54 articles for further examination. Because the primary focus of this meta-analysis was on psychiatric symptoms as a proxy outcome of adherence to psychiatric treatment, the articles reporting other proxy outcomes of adherence were excluded. As a result of the winnowing process (Figure 1), 16 studies were deemed eligible as primary studies for this meta-analytic study. They are identified by asterisks in the reference list (Anderson et al., 2010; Barkhof et al., 2013; Cavezza, Aurora, & Ogloff, 2013; Chien et al., 2015; Gray et al., 2006; Gray, Wykes, Edmonds, Leese, & Gournay, 2004; Hayward et al., 1995; Interian et al., 2013; Kemp et al., 1998; Maneesakorn et al., 2007; O'Donnell et al., 2003; Omranifard, Karahmadi, Jannesari, & Maracy, 2012; Schulz et al., 2013; Staring et al., 2010; Tsang & Wong, 2005; von Bormann, Robson, & Gray, 2015).

Demographics of Primary Studies

The sample sizes of the 16 primary studies totaled 1,267 participants (Table 1), with a mean age of 36.4 years for the total sample, 35.7 years for the intervention groups, and 37.9 years for the control groups. The average duration from the end of the intervention to the measurement of psychiatric symptoms was 197.5 days. All primary studies were published in journals. Eight of 11 studies were funded by not-for-profit/government entities; no mention of funding in five studies was treated as not funded. Studies were conducted in Europe (*s* = 8), North America (*s* = 2), Australia (*s* = 1), Asia (*s* = 4), and the Middle East (*s* = 1). Locations were collapsed into Western (*s* = 11) and Eastern (*s* = 5) countries for moderator analysis.

Nurses (*s* = 6) and psychologists (*s* = 5) were the professionals who primarily delivered MI-based CAT interventions. In two studies, both nurses and psychologists provided the MI sessions; and in one study, a mix of social workers and family/mental health therapists used

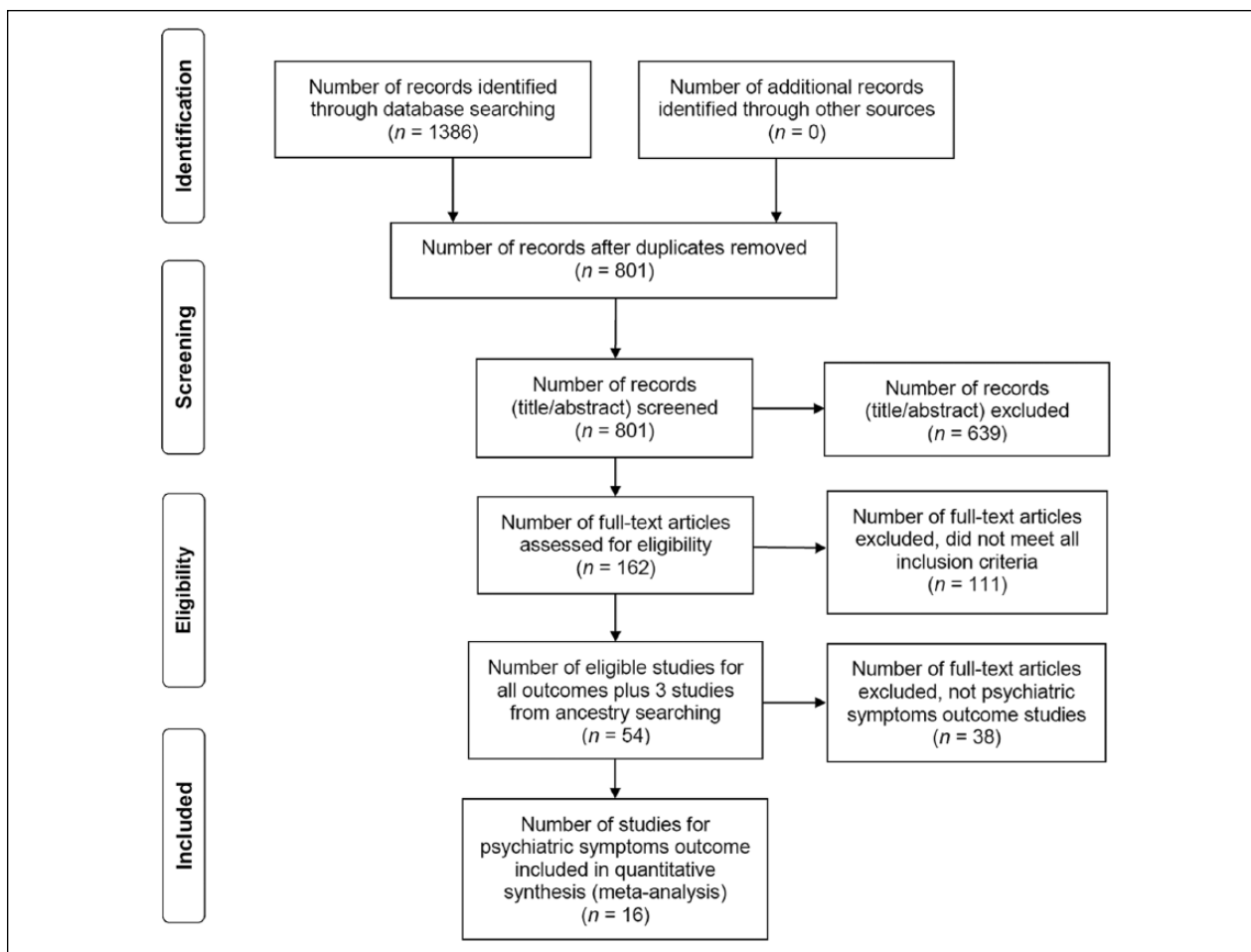


Figure 1. Flow diagram of the search strategy to identify studies meeting all inclusion criteria.

Note. Adapted from Moher, Liberati, Tetzlaff, and Altman (2010).

Table 1. Characteristics of Primary Studies ($s = 16$).

Characteristics	s	Minimum	Q_1	Median	Q_3	Maximum
Mean age (years)	16	28.7	32.8	36.1	40.6	43.5
Sample size analyzed	16	21	47.3	57.5	97.8	372
Number of intervention sessions	15	3	5	8	8	10
Average minutes per session	12	30	38	40	45	120
Intervention doses	12	90	206.25	304	332	960
Days after outcome was measured	12	2	108.5	183	206.3	549
Interventionist training hours	8	16	32	48	56	80

Note. s = number of studies providing data, Q_1 = first quartile, Q_3 = third quartile.

MI. The type of interventionist was not reported in two studies. The total number of intervention sessions ranged from 3 to 10 sessions ($M = 6.9$, $SD = 2.1$); the average time length of each session was 47.6 minutes.

In 12 studies, researchers indicated that the interventionists received training before delivering the MI sessions. In 8 of the 12 studies, the length of training time was given for nurses, social workers or family/mental

health therapists, and a mix of nurses and psychologists ($M = 46$ hours, range 16 to 80 hours, $SD = 19.9$). No researchers reported the hours of training for psychologists. In three studies researchers reported that interventionists received follow-up training during the intervention period; however, only two studies (one mix of nurses and psychologists and another one for nurses only) included

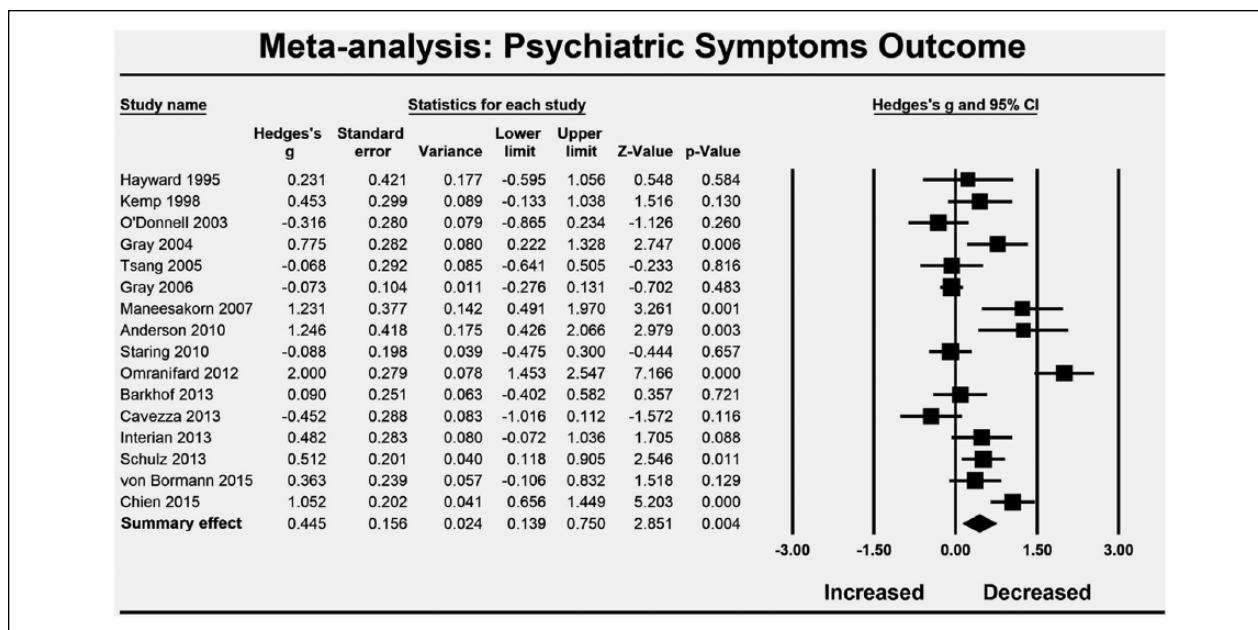


Figure 2. Forest plot of individual and overall effect sizes.

Note. The forest plot illustrates the effect sizes (g), SE, variance, CI, Z and p values, sample sizes of treatment and control groups, and magnitude of the effect. The size of squares displayed in the forest plot represents the weight assigned for each primary study.

the hours of training. Additional characteristics are presented in Table 1.

Quality indicators of research design and the number of studies that used each were as follows: concealment of allocation ($s = 9$), blinding/masking data collectors ($s = 13$), intention-to-treat analysis ($s = 9$), intervention fidelity checks ($s = 8$), and calculating a priori power analysis ($s = 12$). Control groups across the 16 studies were essentially considered treatment as usual or standard care based on the following activities: psychiatric and mental health support, group or individual counseling, psychotherapy, home visits, and psychoeducation. Interventionists used at least one of the characteristics related to the spirit of MI (as listed earlier) in 10 of the 16 studies.

Effect Size of the MI-Based Compliance/Adherence Therapy Intervention

To respond to the first objective, an ES was calculated for the indirect measure of psychiatric symptoms (BPRS, PANSS, or BDI-II) in each study, then a summary standardized ES was calculated for psychiatric symptoms across all studies. Results showed that MI-based CAT interventions significantly improved psychiatric symptoms of people with severe mental illness. The summary ES (Hedges's g) across all primary study MI-based CAT intervention and control comparisons was .45 (95% CI [0.139, 0.750]; $Z = 2.851$, $p = .004$) in the .20 to .50 range to be considered moderate

(Borenstein et al., 2009). Although the summary ES of this meta-analytic study is considered moderate, only six primary studies (Figure 2) had significant ESs (Anderson et al., 2010; Chien et al., 2015; Gray et al., 2004; Maneesakorn et al., 2007; Omranifard et al., 2012; Schulz et al., 2013). Most studies tended toward positive effects though they were not statistically significant. The Q value, a test statistic reflecting the total dispersion of ESs, was 97.54 ($df = 15$, $p < .001$). The $I^2 = 84.6\%$ was the ratio of observed dispersion to within-study dispersion (i.e., heterogeneity).

Exploratory Moderator Effects

To address the second objective, the ESs of moderator subgroups were calculated (Table 2). Because I^2 was high (84.6%), subgroup analysis and meta-regression were indicated (Borenstein et al., 2009). Eleven of the 13 comparisons across categorical moderator subgroups showed no significant differences in their ESs despite a significant ES in one subgroup of each moderator. Table 2 presents subgroup ESs and their related significance tests. Table 3 reports the moderators measured as continuous variables.

Moderator analysis of categorical variables using subgroup comparisons showed that the ES of studies conducted in Eastern countries was significantly larger than in Western countries. Studies that were not blinded had significantly greater ESs than studies that were blinded. In addition, ESs in studies where nurses were the sole

Table 2. Categorical Moderator Results for Psychiatric Symptoms Outcome.

Moderator	s	ES	SE	Var	95% CI	Z	p(Z)	Q_{bet}	$p(Q_{bet})$
<i>Study report characteristics</i>									
Funding								.580	.446
Not funded	5	.253	.299	.090	-.333, .840	.846	.398		
Funded	11	.523	.189	.036	.151, .894	2.760	.006		
Location								5.632	.018
West	11	.226	.159	.025	-.086, .539	1.418	.156		
East	5	.904	.237	.056	.440, .369	3.814	<.001		
<i>Intervention characteristics</i>									
Interventionists' discipline								2.740	.098
Psychologists	5	.122	.221	.049	-.312, .556	.552	.581		
Nurses	6	.601	.186	.035	.236, .966	3.228	.001		
Interventionists' discipline								3.585	.058
Psychologists	5	.122	.224	.050	-.316, .561	.547	.584		
Nurses and social workers	7	.665	.179	.032	.314, 1.016	3.713	<.001		
Interventionists trained								.090	.764
No	4	.528	.318	.101	-.095, 1.151	1.660	.097		
Yes	12	.418	.183	.033	.060, .776	2.288	.022		
MI spirit used								.045	.832
Not reported	6	.401	.264	.070	-.117, .919	1.518	.129		
Reported	10	.472	.203	.041	.074, .870	2.325	.020		
<i>Design characteristics</i>									
Random assignment								.308	.579
Individual	12	.499	.186	.035	.134, .863	2.680	.007		
Cluster	4	.298	.311	.097	-.311, .906	.958	.338		
Concealed allocation								1.527	.217
No	7	.236	.225	.051	-.205, .676	1.048	.295		
Yes	9	.607	.200	.040	.215, 1.000	3.035	.002		
Intention-to-treat analysis								.001	.971
No	7	.439	.246	.061	-.044, .922	1.782	.075		
Yes	9	.451	.211	.045	.037, .865	2.133	.033		
A priori power computed								2.134	.144
No	4	.829	.302	.091	.236, 1.421	2.742	.006		
Yes	12	.325	.167	.028	-.002, .651	1.949	.051		
Blinded/masked								16.850	<.001
No	3	1.548	.296	.087	.968, 2.128	5.234	<.001		
Yes	13	.230	.125	.016	-.014, .475	1.848	.065		
Fidelity checked								.018	.893
No	8	.423	.234	.055	-.034, .881	1.812	.070		
Yes	8	.467	.224	.050	.028, .906	2.083	.037		
Equality of participant characteristics								.061	.805
No	6	.396	.263	.069	-.120, .911	1.503	.133		
Yes	10	.479	.210	.044	.067, .891	2.279	.023		

Note. s = number of studies; ES = effect size; SE = standard error; Var = variance; CI = confidence interval; Z = meta-analysis Z score; Q_{bet} = heterogeneity between two groups; $p(Q_{bet})$ = p value or statistical probability of finding heterogeneity between two groups.

interventionists ($s = 6$) or when combining studies with nurses and those with a mix of social workers and family/mental health therapists as interventionists ($s = 7$) tended toward significance (Table 2).

Moderator analysis of continuous variables using meta-regression indicated that the MI-based CAT effects

on psychiatric symptoms was significantly lower in studies with older participants than studies with younger participants. Studies with higher intervention doses (number of sessions multiplied by the average time of each session) showed a greater effect on reducing psychiatric symptoms than studies with lower doses. This may have

Table 3. Continuous Moderator Results for Psychiatric Symptoms Outcome Comparing MI-based Compliance/Adherence Intervention Versus Control Groups.

Moderator	s	Slope	SE	Tau ²	Q _{model}	p(slope)
Age mean of participants	16	-.066	.013	.246	26.89	<.001
Number of intervention sessions	15	-.002	.035	.347	.003	.957
Dose of MI-based compliance/adherence therapy	12	.001	.000	.338	20.228	<.001
Days after outcome was measured	12	-.001	.001	.318	5.013	.025
Average minutes per session	12	.011	.002	.339	20.724	<.001

Note. MI = motivating interview.

Table 4. Intervention Characteristics Studies Where Interventionists Were Nurses Versus Psychologists.

Comparisons between nurses and psychologists	Nurses			Psychologists			t test	
	s	M	SD	s	M	SD	t	p value
Number of intervention sessions	5	8.4	0.89	5	4.8	2.05	-3.60	.007
Average minutes per session	4	59.5	40.38	3	43.3	15.28	-.65	.546
Intervention doses	4	476.0	323.02	3	156.7	58.60	-1.65	.159
Days after outcome was measured	4	158.0	49.34	3	263.7	254.77	.71	.549
Interventionist training hours	5	39.7	43.80	0	—	—	—	—

Note. s = number of studies providing data.

been partially affected by the fact that studies with longer MI sessions had greater ESs than studies with shorter sessions. Finally, when there was longer time between the intervention and the outcome measure, lower ESs were reported (Table 3).

Supplemental Analysis

On average, nurses spent a longer time in each MI session and delivered more MI sessions than did psychologists (Table 4); but the duration post MI interventions to measuring psychiatric symptoms was longer for psychologists than for nurses. Statistical tests, however, did not show significant differences in average times or duration between nurses and psychologists. Because the interventionists' discipline approached significance, further analysis was conducted to better understand this trend. Supplemental analysis indicates that the interventionist discipline itself might not be what makes the difference between studies (Table 4). Studies where nurses were the interventionists were the studies that had a greater number of sessions (8.4 sessions) compared with psychologists (4.8 sessions).

Publication Bias Determination

Statistical results would indicate there was no suggestion of publication bias. The funnel plot was visually symmetrical; the Duval and Tweedie's trim and fill method showed that nothing was needed to produce

a symmetrical plot. The Orwin's fail-safe *N* with trivial criterion to reduce the Hedges's *g* from .30 to .10 indicates that there could be 32 missing studies, which is greater than the located studies. Furthermore, the Egger's regression intercept was 2.75 (95% CI [-.65, 6.15]; $t_{(16)} = 1.74$, $p = .104$) and Kendall's tau with continuity correction of the Begg Mazumdar rank correlation (a test of whether sample sizes might have biased the results; Borenstein et al., 2009; Rothstein, 2008) was .125 ($p = .50$), both nonsignificant and further suggesting no evidence of publication bias.

Discussion

This meta-analytic study quantified the effects of MI-based CAT interventions on psychiatric symptoms of people with severe mental illness. The indirect measures of psychiatric symptoms were used as a proxy measure for compliance/adherence. Most researchers tended to show positive effects evidenced by lower scores of the BPRS, PANSS, or BDI-II on intervention groups compared to those of the control groups. Therefore, we conclude that MI-based CAT interventions moderately and significantly improve compliance/adherence to therapies of people with severe mental illness. Because there have been inconsistent findings in the narrative review of studies on MI-based CAT interventions (Barkhof et al., 2012), the evidence gathered here supports the therapeutic advantage of this intervention.

Evidence from this meta-analytic study can be used to confirm the effectiveness of MI-based CAT interventions. Clinicians should tailor their interventions to specific circumstances throughout the four key processes of MI. The spirit and principles of MI, core communication skills, and potential differences due to a psychiatric diagnosis are also essential for clinicians in their practice (Miller & Rollnick, 2013). For example, during a remission period, people diagnosed with schizophrenia or schizoaffective disorder may still experience some negative symptoms, such as a lack of personal interest, social disengagement, or feelings of social isolation and stigmatization (Wong-Anuchit et al., 2016). Clinicians must establish and reinforce motivation by first engaging clients in a therapeutic relationship using empathic understanding then moving into the process of focusing, evoking, and planning. People with a depressive disorder may have a lack of self-confidence and low self-esteem, often accompanied by self-destructive behavior. Clinicians should initially focus on building clients' self-confidence and self-esteem by reinforcing successful behaviors and interpersonal experiences, and empathizing with normal stresses of life. Simultaneously, clinicians should begin to strengthen clients' intrinsic motivation and their desire to live and find life worth living. MI would explore clients' ambivalences about living and personal changes required to address self-destructive behaviors (Britton, Patrick, Wenzel, & Williams, 2011).

In the process of evoking, clinicians stimulate client responses and listen for what is termed change talk. These are expressions of an intention, desire, or need to change behaviors, often followed by the rationale for change and exploring the ability to change. Prior to clients' decisions to commit, clinicians will typically hear statements of resistance or a renewed reluctance to change behaviors, especially in people with severe mental illness if they continue to struggle with negative symptoms.

When clients demonstrate resistance, appropriate MI strategies would be to express empathy, support self-efficacy, and roll with the resistance (nonconfrontational and nonargumentative communication). Through nondirective communication, clients can develop an understanding of the gap between their goals and present behaviors (develop discrepancy). Inappropriate MI responses would be any attempt to persuade or use directive change strategies (righting reflex).

When clients reach the point of committing to change, the equal partnership forged between clinician and client gives rise to planning and preparing for how goals will realistically be achieved. The duration and severity of mental illness affect the length of time that can be expected to attain future goals. Findings from this study show that there is a potentiating dose effect in that longer and more frequent MI sessions increase compliance/

adherence to therapies. This has been observed elsewhere (Chien et al., 2015). Providing more time and opportunity for clients to gain insight into their unhealthy behaviors seems to be more effective than shorter sessions. More time with clients allows interventionists to assess their receptivity to change and emphasize aspects of the intervention.

Older participants showed less improvement in psychiatric symptoms from the MI-based CAT interventions than younger participants. The lengths of illness were unknown among the study participants. If older participants have longer histories of mental illness and more engrained negative behaviors, the ability to absorb the intervention messages may be reduced. It is also possible that physiological alterations associated with aging can create accumulative deleterious conditions hindering behavioral change. These could include cellular senescence, imbalance of free radical production and antioxidant defense, and inflammatory processes (Phillip, Aifuwa, Walston, & Wirtz, 2015). Future researchers might examine the dose effects of MI sessions on older clients who may require the additional time to show significant improvement.

When there was greater time between the intervention and the outcome, ESs were less. This is likely due to an extinction effect for MI-based therapies. When the duration between intervention and symptom measurement gets longer, the ES is reduced. Periodic booster sessions as therapeutic reinforcement may enhance the long-term success of the intervention.

When researchers attend to better design quality, the trend is that ESs increase. These research methods include ensuring random assignment of individuals to groups, enrollment concealment, intention-to-treat analysis, conducting a priori power analysis, using fidelity checks, or examining for group equality. Because when studies were compared to those that did not use these methods and were not statistically significant, we cannot conclude that the study designs will always produce the expected results. Moreover, it is of concern to find that data collectors who did not blind/mask showed improved psychiatric symptoms. This is suggestive of possible bias in these studies. It is possible that individual differences and subjectivity across the studies may have affected reporting the reduction of psychiatric symptoms.

Developed in the West with its individualistic culture, MI has its roots in self-determination theory. However, its application and success have been demonstrated in Eastern cultures that are more collectivistic (Deci & Ryan, 2012). Some Eastern cultures are thought to be nonconfrontational and collaborative in social interactions. People in Eastern/Asian cultures may have a propensity toward maintaining social desirability in human discourse, thus striving to be "good" clients. For example, they may defer

to better-educated health care professionals as higher in social class and authority (Maneesakorn et al., 2007). Although some might suggest that this cultural tendency promotes superficial change based on approval or shame, the dynamic interactions and totality of a culture's impact on a client can produce real behavioral change through MI (Oh & Lee, 2016). Because MI uses a nonconfrontational, nonjudgmental, collaborative approach with clients, these characteristics may more easily resonate with those in Eastern cultures. The results of the meta-analysis, however, cannot be fully explained on this distinction alone. One study included clients from Iran, a Middle-Eastern culture, not known for those attributes.

A goal was to examine the individual subgroups' effects on reducing psychiatric symptoms based on MI-based CAT interventions. The nonsignificant summary ESs for the categorical moderators may have resulted because several studies had wide confidence intervals (Figure 1). This suggests low precision based on small sample sizes. In moderator analysis, significant effects are difficult to obtain between subgroups when the small sample sizes are further divided. The trend across the significant subgroup moderators, however, is suggestive of their individual importance.

Although all eligible primary studies were identified, a limitation is still the small number of studies available for analysis. Also, studies used in this meta-analysis had been published in journals. Unpublished literature was not available for meta-analysis.

Implications for Practice and Conclusions

MI-based CAT interventions substantially increase treatment adherence in people with severe mental illness. Clinicians should consider incorporating these interventions into their clinical practice. Empathy and acceptance, with a supportive, nonjudgmental counseling style, should be implemented simultaneously for motivating behavioral change within the context of tailored interventions to meet specific client needs. Clinicians might balance session lengths considering the need for periodic reinforcement to sustain behavioral change. Session length and the dose effect should be considered when tailoring MI to clients. Future meta-analyses are needed to examine the effects of MI-based CAT interventions on other outcomes, such as attitude toward treatment and taking medication, insight, functioning, hospitalization, and quality of life. Despite the findings that quality indicators of study design were not conclusively beneficial, future researchers should not ignore their importance. Future research might also include variables that measure characteristics of the interventionist, the length and severity of client illness, and length of the provider-client relationship to determine

their individual and summary effects on improving psychiatric outcomes.

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Author Roles

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