A Meta-Analysis of the Intervention Effects on Mental Health Literacy in Chinese Populations

Authors: Zhihong Ren, Zhao Chunxiao, Tian Fan, Yan Yupeng, Li Danyang, Zhao Ziyi, Tan Mengling, Jiang Guangrong, Jiang Guangrong

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Abstract

This study followed the PRISMA-Protocol and employed meta-analytic techniques to examine intervention effects and influencing factors, with knowledge, stigma attitudes, and help-seeking regarding mental health literacy as outcome variables, aiming to provide guidance for more effectively enhancing mental health literacy. The meta-analysis included a total of 38 studies. Results revealed that the intervention achieved significant medium-to-large immediate effect sizes on knowledge, stigma attitudes, and help-seeking (knowledge: g = 0.70, stigma attitudes: g = -0.52, help-seeking: g = 1.18). Subgroup analysis results indicated that intervention effects on mental health literacy were influenced by multiple variables, including geographical region, participant type, interaction and contact within the intervention, and trial type. Future research should further explore moderating variables of mental health literacy and develop personalized intervention programs tailored to different intervention targets by integrating Chinese culture, thereby enhancing intervention effectiveness.

Full Text

Meta-Analysis of Intervention Effects on Mental Health Literacy Among Chinese People

Authors: Ren Zhihong, Zhao Chunxiao, Tian Fan, Yan Yupeng, Li Danyang, Zhao Ziyi, Tan Mengling, Jiang Guangrong
(Key Laboratory of Adolescent Cyberpsychology and Behavior (CCNU), Ministry of Education; School of Psychology, Central China Normal University; Key Laboratory of Human Development and Mental Health of Hubei Province, Wuhan 430079, China)

Abstract

This study employed meta-analytic techniques following the PRISMA-Protocol to examine intervention effects on mental health literacy among Chinese populations, using knowledge, stigma attitudes, and help-seeking as outcome variables. The analysis aimed to identify factors influencing intervention effectiveness to inform more efficient strategies for improving mental health literacy.

The meta-analysis included 38 studies. Results revealed significant medium-to-large immediate intervention effects on knowledge (g = 0.70), stigma attitudes (g = -0.52), and help-seeking (g = 1.18). Subgroup analyses indicated that intervention effects were moderated by multiple variables including geographic region, participant type, interaction and contact during interventions, and study design. Future research should further explore moderating variables of mental health literacy and develop culturally adapted, personalized intervention protocols for different target populations to enhance intervention efficacy.

Keywords: mental health literacy; intervention effect; interaction; contact

Introduction

Currently, mental health status among the Chinese public is characterized by high prevalence rates but low service utilization (Y. Huang et al., 2019; Phillips et al., 2009). Over the past three decades, various psychological disorders have become increasingly prevalent, with data showing a weighted lifetime prevalence rate as high as 16.6% for all mental disorders (excluding dementia) (Y. Huang et al., 2019). However, only 8% of individuals with mental disorders have sought professional psychological treatment (Phillips et al., 2009). One important reason for this phenomenon is the low mental health literacy (MHL) among the Chinese population, manifested as insufficient ability to recognize mental illness (Huang, Yang, & Pescosolido, 2019), severe stigmatizing attitudes (Wong, Lau, Kwok, Wong, & Tori, 2017), and reluctance to seek help (Yu et al., 2015).

Improving national mental health literacy has become a key strategic priority for China' s development. In October 2016, the "Healthy China 2030" Planning Outline issued by the Central Committee of the Communist Party of China and the State Council proposed to "increase nationwide mental health science popularization efforts and enhance mental health literacy···By 2030, the prevention of common mental disorders and the identification and intervention of psychological and behavioral problems will be significantly improved." Subsequently, the State Council' s Opinions on Implementing the Healthy China Action proposed to "increase residents' mental health literacy levels to 20% and 30% by 2022 and 2030, respectively."

Although numerous mental health literacy intervention studies exist internationally, their effects show substantial variability (Maunder & White, 2019), and cultural differences make it difficult to determine the effectiveness of these interventions among Chinese populations. Therefore, to efficiently enhance mental

health literacy among Chinese people, this meta-analysis systematically reviews intervention methods and effects on mental health literacy both domestically and internationally, analyzes influencing factors, examines relationships among outcome variables, and particularly explores interventions within the Chinese cultural context to provide references for improving mental health literacy.

1.1 Conceptual Evolution of Mental Health Literacy

Initially, Jorm and colleagues (1997) proposed the concept of mental health literacy, referring to knowledge and beliefs about mental disorders that enable people to recognize, manage, or prevent mental illness. This includes knowledge about preventing mental illness, ability to identify mental disorders, knowledge about seeking psychological help, understanding self-help methods for mild psychological problems, and skills to support those experiencing mental illness. The concept has since evolved considerably. Recently, Kutcher, Wei, and Coniglio (2016) significantly expanded the definition, suggesting that mental health literacy should include obtaining and maintaining positive mental health, understanding mental illness and treatment, reducing stigma associated with mental illness, and enhancing help-seeking efficacy. Domestic scholars have offered similar perspectives, arguing that mental health literacy encompasses not only knowledge but also beliefs/attitudes and behaviors/skills (Ming & Chen, 2020; Chen et al., 2019; Jiang et al., in press). Moreover, Jiang et al. (in press) propose incorporating mental health-related content and adding a "self-other" dimension, defining mental health literacy as the knowledge, attitudes, and behavioral habits individuals develop in promoting their own and others' mental health and addressing mental illness.

Despite this conceptual expansion, most intervention research still focuses on specific aspects of mental health literacy, with knowledge (Morgan, Ross, & Reavley, 2018b), stigma attitudes (Maunder & White, 2019), and help-seeking (Xu et al., 2018) receiving the most attention. Specifically, knowledge refers to basic psychological common sense, understanding of common mental illness manifestations, etiology and treatment methods, professional help-seeking channels, and common methods for maintaining mental health (Jiang et al., in press). Stigma attitudes refer to negative or prejudiced views toward mental illness and people with mental disorders (Corrigan, Larson, & Ruesch, 2009; Corrigan & Watson, 2002). Help-seeking refers to any action or activity individuals undertake to meet their needs in a positive way, which can provide psychological and emotional social support, care, or services (Barker, 2007).

1.2 Interventions for Mental Health Literacy

Currently, the most commonly used approaches for intervening on mental health literacy are education and contact (Arboleda-Flórez & Sartorius, 2008). Education aims to dispel myths about mental illness by providing relevant information, typically delivered through thematic lectures, courses, reading materials, group counseling, or discussions. Contact involves exposing individuals to people with

mental illness, who share their personal stories, thereby reducing anxiety and increasing empathy to decrease stigmatizing attitudes toward people with mental disorders (Corrigan, Michaels, & Morris, 2015).

Regarding interventions to improve public knowledge about mental health, researchers typically focus on enhancing knowledge about mental illness symptoms to promote recognition. Education is the primary intervention method. Previous systematic reviews and meta-analyses on knowledge interventions report immediate effect sizes ranging from d = 0.22 to 2.3 (Hadlaczky et al., 2014; Morgan et al., 2018b; Yamaguchi et al., 2019). Yamaguchi et al. (2019) conducted a systematic review of 16 studies examining educational interventions for teachers' mental health literacy. The other two meta-analyses (Hadlaczky et al., 2014; Morgan et al., 2018b) examined the effects of the established intervention program Mental Health First Aid (MHFA) training. Originating in Australia in 2000, MHFA is a course-based program for community members that teaches how to recognize symptoms of different mental disorders and mental health crises, provide initial help, and guide individuals to appropriate treatment and supportive services (Kitchener & Jorm, 2002). Morgan et al. (2018b) included 18 studies with 5,936 participants, finding significant medium-to-large improvements in mental health knowledge with immediate effect size d = 0.72, 6-month follow-up d = 0.54, and 12-month follow-up d = 0.31. However, these meta-analyses did not adequately explore factors influencing intervention effects, making it difficult to explain variability in effect sizes.

Research on stigma attitude interventions is more extensive and in-depth than that on knowledge and help-seeking. Most meta-analyses indicate that education and contact effectively reduce stigma (Corrigan et al., 2012; Griffiths et al., 2014; Maunder & White, 2019; Mehta et al., 2015; Morgan et al., 2018a), with effect sizes ranging from d = 0.10 to 0.84, showing substantial variation. Previous meta-analyses examining effect size variability have focused primarily on comparing education versus contact interventions and different types of contact (Corrigan et al., 2012; Mehta et al., 2015; Morgan et al., 2018a), while neglecting other potential moderating variables. Maunder and White (2019) conducted the first meta-analysis to simultaneously examine potential moderators including contact type, participant characteristics, and characteristics of contact targets, finding significant contact intervention effects with small-to-medium effect sizes at immediate, 3-month, and 12-month time points (d = -0.384, -0.334, and -0.526, respectively). No significant differences were found between contact with or without educational components, different contact media, or different types of mental illness among contact patients. Unfortunately, this meta-analysis did not include Chinese literature.

Although Western intervention effects on mental illness stigma have been confirmed in recent systematic reviews, the situation in China remains unclear. Two meta-analyses have examined mental illness stigma interventions among Chinese populations (Xu, Huang, Kosters, & Rusch, 2017a; Xu, Rüsch, Huang, & Koesters, 2017b), evaluating stigma intervention effects in mainland China,

Hong Kong, Taiwan, and Macau. One focused on self-stigma among people with mental illness (Xu et al., 2017a), including 17 studies and finding that psychoeducation was the most common intervention method with significant effects on self-stigma (SMD = 0.84). The other meta-analysis on public stigma interventions found smaller effects (SMD = 0.33) (Xu et al., 2017b). However, neither meta-analysis thoroughly examined factors influencing effect sizes nor included follow-up effects.

Research on help-seeking interventions is relatively limited. A systematic review (Gulliver, Griffiths, Christensen, & Brewer, 2012) included six randomized controlled trials (RCTs) with eight intervention types, finding small-to-medium effects on help-seeking attitudes (d = 0.12-0.53) but no significant effects on help-seeking behavior (d = -0.01 to 0.02). In contrast, a meta-analysis including 98 studies (Xu et al., 2018) examined intervention effects on help-seeking for mental health problems, finding significant improvements in professional help-seeking behavior (OR = 1.67, 95% CI: 1.30, 2.16) sustained over six months (OR = 1.48, 95% CI: 1.24, 1.77). However, this meta-analysis did not differentiate intervention approaches in detail, and most included studies originated from Western developed countries.

In summary, while education and contact as primary intervention methods for mental health literacy have been confirmed by multiple meta-analyses internationally and domestically, these meta-analyses have not thoroughly examined moderating factors influencing intervention effects, particularly regarding applicability in developing countries like China.

1.3.1 Exploring Intervention Effects in Chinese Cultural Context

Culture significantly influences all aspects of mental health literacy (Chen & Mak, 2008; Giandinoto, Stephenson, & Edward, 2018). Traditional Chinese culture holds unique beliefs about the causes of psychological distress. On one hand, psychological distress is often considered malingering or resulting from personal weakness and lack of willpower (Ng, 1997). On the other hand, beliefs that mental illness represents demonic possession, punishment for ancestral sins, or retribution for family misconduct persist in some economically underdeveloped regions (Wong et al., 2017). Regarding attitudes toward mental illness, stigma is more severe in Chinese culture (Fung, Tsang, Corrigan, Lam, & Cheng, 2007; Phillips, Li, Stroup, & Xin, 2000). Chinese people typically distinguish between two states of severe mental illness: *dian* (madness) and *kuang* (mania) (Liu, 1981). These states represent unpredictability, dangerousness, and incurability, leading to substantial personal and social stigma (Fung et al., 2007). Due to China' s collectivist culture, stigma associated with mental illness extends beyond the individual to affect the entire family (Yang et al., 2014). Consequently, to avoid exposing "family shame," some families even isolate relatives with mental illness (Lam et al., 2010). Influenced by stigma, more people choose self-help or seek help from relatives rather than professional services (Kung & Lu, 2008; Thikeo, Florin, & Ng, 2015). Additional barriers to help-seeking in-

clude self-efficacy regarding psychological problems, as individuals' confidence in being "good" help-seekers affects their professional help-seeking behavior (Jiang & Xia, 2006).

Considering culture' s impact on mental health literacy, an increasing number of domestic researchers have made cultural adaptations when borrowing foreign intervention protocols (Xu et al., 2017a), such as modifying educational or contact materials to be more acceptable to Chinese populations, though their effectiveness remains to be tested.

1.3.2 Examining Moderating Variables to Guide Interventions

Intervention effects on knowledge, stigma attitudes, and help-seeking are influenced by numerous moderating factors. Existing international meta-analyses on mental health literacy have inadequately explored these moderating variables. First, no meta-analysis has simultaneously examined knowledge, stigma attitudes, and help-seeking. Among existing meta-analyses, only two addressed knowledge (Hadlaczky et al., 2014; Morgan et al., 2018b), one addressed help-seeking (Xu et al., 2018), and the remainder focused on stigma intervention effects and influencing factors (Corrigan et al., 2012; Griffiths et al., 2014; Hadlaczky et al., 2014; Maunder & White, 2019; Morgan et al., 2018a; Morgan et al., 2018b; Xu et al., 2017b). Second, analyses of moderating variables have been incomplete. Research indicates that interaction (Brijnath et al., 2016), contact (Maunder & White, 2019), region (Wong & Xuesong, 2011), intervention staff type (Reavley, Mackinnon, Morgan, & Jorm, 2014), and study design may all influence intervention effects, yet no meta-analysis has comprehensively examined these variables.

1.3.3 Clarifying Relationships Among Outcome Variables to Improve Intervention Efficacy

Although mental health literacy has been proposed as an integrated concept (Kutcher et al., 2016), few studies have simultaneously explored intervention effects on knowledge, stigma attitudes, and help-seeking, let alone clarified their interrelationships. In fact, the relationships among knowledge, stigma attitudes, and help-seeking remain controversial (Jennings et al., 2015; Kitchener & Jorm, 2006). To efficiently improve mental health literacy, we must consider questions such as "Can improved knowledge reduce stigma and increase help-seeking?" and "Can reduced stigma improve knowledge and help-seeking?" This meta-analysis attempts to explore the relationships among these three variables during interventions.

In summary, this study aims to explore intervention effects on mental health literacy in Chinese cultural context, analyze moderating variables influencing intervention effectiveness, and examine relationships among outcome variables to provide guidance for efficiently improving mental health literacy.

Methods

This study followed PRISMA guidelines (Liberati et al., 2009) and a PROSPERO-registered protocol (CRD42019126819).

2.1 Inclusion and Exclusion Criteria

Inclusion criteria were: (1) Chinese samples, defined as Chinese people living in mainland China, Hong Kong, Taiwan, and Macau; (2) Controlled trials, including both randomized and non-randomized controlled trials, examining changes in mental health literacy before and after intervention; (3) Outcome variables: at least one indicator of mental health literacy including knowledge, stigma attitudes, or help-seeking; (4) Intervention measures: education and contact interventions designed to improve mental health literacy; (5) Included studies were peer-reviewed journal articles, master' s theses, or doctoral dissertations.

Exclusion criteria were: (1) Studies with participants who were patients with mental disorders, as their intervention circumstances are more complex and require separate investigation (Xu et al., 2017a); (2) Non-Chinese and non-English literature. The literature search and screening process is shown in Figure 1 [Figure 1: see original paper].

2.2 Literature Search

Relevant literature was searched in six foreign databases (PubMed, PsycARTICLES, PsycINFO, Elsevier, Web of Science, and Cochrane Controlled Trials Register) and three Chinese databases (CNKI, Wanfang, and VIP). Search terms included subject headings such as mental illness, mental health, and mental disorder; outcome indicators such as attitude, knowledge, and help-seeking; intervention methods such as health education, health promotion, and curriculum; and region terms such as China, mainland, Hong Kong, Taiwan, and Macau, which were paired and combined (see Appendix 1 for details). The initial search was conducted in July 2018, with a second update in December 2018. Literature was screened by the first author and checked by the second author, with disagreements resolved through consultation with the corresponding author.

2.3 Meta-Analysis Procedure

Comprehensive Meta-Analysis Version 3.3 (CMA 3.3) (Borenstein, Hedges, Higgins, & Rothstein, 2005) was used for the meta-analysis.

2.3.1 Data Extraction and Quality Assessment Characteristics and outcome data from each study were extracted and coded. Data extraction was conducted independently by two authors (Borenstein et al., 2011), with disagreements resolved through consultation with the corresponding author. Study characteristics coded included: author (year), region, study design, sample size, measurement time points, participant type, age (years), intervention method,

outcome variables, measurement instruments, measurement quality assessment, and study quality assessment.

Based on Jiang et al.' s (in press) new conceptual framework for mental health literacy, three types of knowledge data were extracted: (1) knowledge about mental disorders; (2) recognition of common psychological problems; (3) knowledge about coping with psychological problems. Data extraction rules were: (1) For studies measuring multiple disorders, results for the most prevalent disorder (Y. Huang et al., 2019) were extracted; (2) When scales included both total and subscale scores, total scores were prioritized; when only subscale scores were available, scores from subscales significantly related to the outcome variable were extracted (Livingston & Boyd, 2010); (3) Avoidance dimensions of stigma and social distance scales were combined; (4) When both attitude and stigma measures appeared in the same study, both were extracted.

To avoid bias from multiple effect sizes from a single study occupying excessive weight (Borenstein et al., 2011), studies with two or more control groups or using different outcome measures were analyzed by first determining whether the reported conditions were of interest to this study. If so, they were decomposed into multiple independent studies for separate effect size calculations.

Both measurement instruments and studies were quality-assessed. Measurement instrument quality was evaluated using three risk levels established by Clement et al. (2013): low risk, high risk, and unclear risk. Low risk: (1) developed by Chinese researchers with Cronbach' s 0.7; (2) cited scales with established reliability and validity in Chinese samples. High risk: (1) scales developed by Chinese researchers without reported psychometric properties; (2) Cronbach' s < 0.7; (3) measures without citations. Unclear risk: cited scales without indication of applicability to Chinese samples.

Study quality was assessed using the Jadad scale (Brouwers et al., 2005; Jadad et al., 1996), evaluating: (1) randomization sequence generation; (2) double-blinding implementation; (3) dropout and attrition. Total scores ranged from 0 to 5.

Both measurement instrument and study quality assessments were conducted independently by two authors, with inter-rater reliability calculated and final results determined through consultation with the corresponding author. Kappa coefficients measured inter-rater reliability: 0.85 for measurement instrument assessment and 0.89 for study quality assessment. According to the criterion that 0.75 indicates excellent agreement (Orwin, 1994), these results demonstrate high consistency in this study' s assessments.

2.3.2 Effect Size Calculation Hedge' s g, a corrected version of Cohen' s d (Vøllestad, Nielsen, & Nielsen, 2012), was used as the effect size for psychological interventions. Hedge' s g was calculated directly by CMA 3.3 using sample sizes, post-test (or follow-up) means, and standard deviations for intervention

and control groups. When means or standard deviations were unavailable, ^{2}, t, or F statistics were used instead.

Effect size interpretation criteria were: 0.2 = small, 0.5 = medium, 0.8 = large (Kallapiran et al., 2015). Random-effects models were used for effect size calculations, and mixed models for moderator analyses. Theoretical justifications for random-effects models include: (1) they assume each independent effect size represents a distribution of true effect sizes, thus acknowledging variation among effect sizes and across studies; (2) results are generalizable to other contexts (Carrero, Vila, & Redondo, 2019); (3) random-effects models produce wider confidence intervals, reducing Type I error risk and giving greater weight to small-sample studies (Berkeljon & Baldwin, 2009). Heterogeneity was assessed using Q and I^2 statistics, where I^2 represents the proportion of variance between studies (I^2 = 25%, 50%, 75% indicating low, medium, high heterogeneity). When Q was significant and I^2 75%, substantial heterogeneity justified using random-effects models (Huedo-Medina et al., 2006).

2.3.3 Publication Bias Assessment Funnel plots and fail-safe numbers (Nfs) were used for preliminary publication bias assessment (Khoury et al., 2013), supplemented by Egger' s linear regression test. Funnel plots provide subjective evaluation of publication bias; generally, symmetrical distribution concentrated in the middle and upper portions suggests low publication bias risk, though this method typically requires 10 studies (Morgan et al., 2018a). Egger' s linear regression with intercept near zero and non-significant suggests low publication bias risk (Egger, Smith, Schneider, & Minder, 1997). Nfs represents the minimum number of studies needed to nullify current findings; larger Nfs indicates lower bias risk. Caution is warranted when Nfs $<$ 5k + 10 (where k is the number of original studies) (Rothstein, Sutton, & Borenstein, 2005).

2.3.4 Sensitivity Analysis Sensitivity analysis was conducted to test result robustness. Selection of inclusion criteria, data extraction methods, and missing data handling can all affect meta-analysis results, necessitating sensitivity analysis (Borenstein et al., 2011). In this study, effect sizes were recalculated after removing outlier studies. Outliers were defined as studies whose 95% confidence intervals did not overlap with the pooled effect size' s 95% confidence interval, i.e., studies with confidence intervals including 0 were considered ineffective (Morgan et al., 2018b).

2.3.5 Moderator Analysis To explore potential sources of heterogeneity, subgroup analysis and meta-regression were conducted. First, subgroup analysis was performed for each grouping variable to examine its impact on intervention effects. Since subgroup analysis ignores potential correlations and interactions among variables (Carrero et al., 2019), meta-regression was subsequently used to explore factors influencing intervention effects. Following Fu et al.' s (2011) recommendations, each subgroup required 4 studies, and regression analysis required 6 studies.

Based on evidence-based medicine principles and the PICO framework (Population, Intervention, Comparison, Outcome) (Akobeng, 2005), combined with existing research, potential factors influencing mental health literacy intervention effects were proposed: (1) Participant characteristics: region, age, and participant type; (2) Intervention characteristics: intervention duration, length, format, and method; (3) Study characteristics: study design; (4) Outcome variables: knowledge, stigma attitudes, and help-seeking.

Results

3.1 Literature Inclusion and Coding

The literature screening process is shown in Figure 1, yielding 34 eligible articles (17 English, 17 Chinese) comprising 38 studies with a total sample size of 12,963. Mainland China contributed 22 studies (n = 8,204), while Hong Kong, Macau, and Taiwan contributed 16 studies (n = 4,759). Eleven studies included follow-up assessments, with seven tracking within 6 months and five beyond 6 months (one study (Li et al., 2015) included both within- and beyond-6-month follow-ups). Participants were diverse, including family members of patients (11 studies), general public (6), adolescents (6), university students (6), medical students (7), and professionals (2). Measurement instrument quality assessment yielded 34 low-risk, 15 high-risk, and 8 unclear-risk items. Study quality assessment results are detailed below.

3.2 Intervention Effects on Mental Health Literacy

Intervention effects were categorized as immediate or follow-up effects, obtained by comparing intervention and control groups. Follow-up effects were divided at the 6-month mark into within-6-month and beyond-6-month periods. Effect sizes are presented in Table 2 .

Table 2 Intervention Effects on Mental Health Literacy: Effect Sizes, Heterogeneity Tests, and Publication Bias Tests

[Note: The table shows immediate and follow-up effects for knowledge, stigma attitudes, and help-seeking, with Hedge's g values, 95% confidence intervals, heterogeneity statistics (Q, I^2), and publication bias indicators (Egger' s intercept, fail-safe N).]

As shown in Table 2, immediate intervention effects were significant medium-to-large for knowledge (g = 0.70), stigma attitudes (g = -0.52), and help-seeking (g = 1.18). For within-6-month follow-up, only knowledge effects remained significant (g = 0.67). For beyond-6-month follow-up, knowledge effects persisted (g = 0.74) and were larger than immediate effects, while stigma attitude effects also became significant (g = -0.34).

Sensitivity analysis results: For immediate knowledge effects (22 studies), removing 2 outliers (Chan, 2004a; Fung et al., 2016) yielded g = 0.74 (CI: 0.54, 0.95). No outliers were identified for within-6-month follow-up. For beyond-6-month follow-up, removing 1 outlier (Chan, Yip, Tso, Cheng, & Tam, 2009) yielded g = 1.00 (CI: 0.346, 1.656), confirming robust knowledge intervention effects.

For immediate stigma attitude effects (26 studies), removing 7 outliers (Chan, Mak, & Law, 2009; Chung, 2005; Han & Chen, 2014; Li et al., 2015; Wang, 2018; Wang et al., 2017) yielded g = -0.64 (CI: -1.09, -0.19). For within-6-month follow-up, removing 3 outliers (J. Chan et al., 2009; Wang, 2018) yielded g = -0.12 (CI: -0.59, 0.25). For beyond-6-month follow-up, removing 1 outlier (Li et al., 2015) yielded g = -0.32 (CI: -0.62, -0.02), confirming robust stigma attitude intervention effects.

For immediate help-seeking effects, removing 5 outliers (Han, Chen, Hwang, & Wei, 2006; Lai et al., 2016ab; Wong et al., 2017) yielded g = 3.65 (CI: -0.52, 7.82), which was non-significant. Only 2 studies were available for within-6-month follow-up, both outliers; no beyond-6-month studies were included, indicating insufficient robustness of help-seeking intervention effects.

Due to limited study numbers, funnel plots were only analyzed for immediate knowledge and stigma attitude interventions (see Appendix 3). The funnel plots showed no publication bias risk for immediate knowledge and stigma attitude interventions. For knowledge beyond-6-month follow-up, Egger' s linear regression showed a large but non-significant intercept, with Nfs = 29 < 30, suggesting potential publication bias risk. For stigma attitudes within-6-month follow-up, similar bias risk was indicated.

3.3 Subgroup Analysis of Mental Health Literacy Interventions

Due to limited study numbers, subgroup analysis was only conducted for immediate intervention effects on knowledge, stigma attitudes, and help-seeking. Based on previous discussions of moderating variables and study characteristics, the following subgroups were proposed: (1) Region: mainland China vs. Hong Kong/Macau/Taiwan; (2) Participant type: professionals vs. non-professionals; (3) Interaction between interventionist and participants: high vs. low interaction; (4) Interaction among participants: with vs. without interaction; (5) Contact with patients during intervention: yes vs. no; (6) Contact with patients in daily life: yes vs. no; (7) Study design: RCT vs. non-RCT.

3.3.1 Knowledge Subgroup Analysis Knowledge subgroup analysis revealed that six moderating variables significantly influenced immediate knowledge effect sizes (participant type was not analyzed due to insufficient study numbers). Specifically: Hong Kong/Macau/Taiwan interventions were significantly more effective than mainland China interventions (g: 0.86 > 0.46, p < 0.001); high interaction between interventionist and participants was signifi-

cantly more effective than low interaction (g: 0.85 > 0.46, p < 0.001); interaction among participants was significantly more effective than no interaction (g: 0.88 > 0.41, p < 0.001); interventions without patient contact were significantly more effective than those with contact (g: 0.66 > 0.37, p < 0.001); participants with daily contact with patients showed significantly better effects than those without (g: 0.78 > 0.62, p = 0.048); non-RCT studies were significantly more effective than RCTs (g: 0.88 > 0.46, p < 0.001) (see Appendix 4 for details).

3.3.2 Stigma Attitude Subgroup Analysis Stigma attitude subgroup analysis revealed that all seven moderating variables significantly influenced immediate stigma attitude effect sizes. Specifically: mainland China interventions were significantly more effective than Hong Kong/Macau/Taiwan interventions (g: 0.87 > 0.05, p < 0.001); professional interventions were significantly more effective than non-professional interventions (g: 0.9 > 0.11, p < 0.001); low interaction between interventionist and participants was significantly more effective than high interaction (g: 0.88 > 0.04, p < 0.001); no interaction among participants was significantly more effective than interaction (g: 0.89 > 0.02, p < 0.001); interventions without patient contact were significantly more effective than those with contact (g: 0.89 > 0.02, p < 0.001); participants with daily contact with patients showed significantly better effects than those without (g: 0.76 > 0.25, p < 0.001); RCT studies were significantly more effective than non-RCT studies (g: 0.38 > 0.27, p < 0.001) (see Appendix 4 for details).

3.3.3 Help-Seeking Subgroup Analysis For help-seeking subgroup analysis, only region and study design had sufficient studies. Region significantly influenced immediate help-seeking effect sizes, with mainland China interventions significantly more effective than Hong Kong/Macau/Taiwan interventions (g: 2.1 > -0.05, p < 0.001). Study design did not significantly affect immediate help-seeking effects (p = 0.16) (see Appendix 4 for details).

3.4 Meta-Regression Analysis

Significant Q statistics and $I^2 > 75\%$ indicated unexplained effect size variation (Higgins, Thompson, Deeks, & Altman, 2003). Therefore, meta-regression was conducted to explore explanatory rates of moderating variables.

Model 1 included participant characteristics (age, participant type, region); Model 2 added intervention characteristics (duration, length, contact, and interaction); Model 3 added study design. Meta-regression was performed separately for knowledge, stigma attitudes, and help-seeking. Help-seeking meta-regression could not be conducted due to insufficient study numbers.

Nine moderating variables (participant type excluded due to insufficient study numbers) were entered into the knowledge intervention regression. Model 1 (age, region) explained 0.01 of total variance. Model 2 added six intervention characteristic variables (duration, length, daily patient contact, intervention patient

contact, interventionist-participant interaction, participant-participant interaction), with $R^2 = 0.74$. Model 3 added study design, with $R^2 = 0.70$. The ΔR^2 between Model 1 and Model 2 was 0.73, indicating that intervention characteristic variables explained 73% of effect size variance. After controlling for all other moderating variables, region and interventionist-participant interaction effects remained significant (see Table 3).

Nine moderating variables (daily patient contact excluded due to insufficient study numbers) were entered into the stigma attitude intervention regression. Model 1 (age, participant type, region) explained 0.23 of total variance. Model 2 added five intervention characteristic variables (duration, length, intervention patient contact, interventionist-participant interaction, participant-participant interaction), with $R^2 = 0.30$. Model 3 added study design, with $R^2 = 0.45$. After controlling for all other moderating variables, only study design effect remained significant (see Table 4).

3.5 Relationships Among Knowledge, Stigma Attitudes, and Help-Seeking in Interventions

To explore relationships among knowledge, stigma attitudes, and help-seeking during interventions, studies measuring two or more outcome variables were selected for analysis. Twelve studies were identified, and after excluding ineffective studies with confidence intervals crossing zero (Fung et al., 2016ab; Han & Chen, 2014; Lai et al., 2016ab; Li et al., 2015), six studies remained.

Four studies simultaneously intervened on knowledge and stigma attitudes (J. Chan et al., 2009; Rong et al., 2011; Wong et al., 2017; Zhang, 2013), with a combined correlation coefficient of -0.12 (CI: -0.52, 0.33; $p = 0.62$). Two other studies intervened on stigma and help-seeking: one (Bao et al., 2014) showed a correlation of 0.36 (CI: 0.29, 0.44; $p < 0.001$), while another (Hao & Liang, 2011) showed a correlation of 0.78 (CI: -0.41, 0.99; $p = 0.17$) between knowledge and help-seeking.

3.6 Study Quality Assessment Results

Among measurement instruments used in included studies, 34 were low-risk, 15 high-risk, and 8 unclear-risk. Of the 15 high-risk measures, 13 assessed knowledge and 2 assessed help-seeking. Of the 8 unclear-risk measures, 1 assessed knowledge and 7 assessed attitudes.

Study quality assessment revealed generally low quality: 27 studies scored 0 points, 8 scored 1 point, 2 scored 2 points, and 1 scored 3 points on the Jadad scale. Among the 3 studies scoring >1, Huang et al. (2009) showed immediate knowledge intervention effect $g = 0.43$ (CI: 0.24, 0.62), smaller than the overall immediate knowledge effect ($g = 0.70$, CI: 0.51, 0.90); Tu et al. (2018) showed immediate knowledge effect $g = 0.74$ (CI: 0.17, 1.30); Wang et al. (2017) showed stigma attitude intervention effect $g = -0.08$ (CI: -0.09, 0.22), smaller than the overall immediate stigma attitude effect ($g = -0.52$, CI: -0.9, -0.16).

Discussion

This meta-analysis, based on controlled trials, explored intervention effects on mental health literacy in Chinese cultural context and yielded several conclusions to guide future efforts to improve mental health literacy.

4.1 Significant Immediate and Long-Term Intervention Effects

Knowledge intervention showed significant medium-to-large immediate and long-term effects. Intervention effects did not diminish over 6+ months, similar to international findings (Morgan et al., 2018b). However, unlike Western studies showing decreasing effect sizes over time, this study found effects remained medium-to-large throughout the follow-up period. Stigma attitude interventions also showed significant medium-to-large immediate and long-term effects (beyond 6 months), with larger effect sizes than previous meta-analyses showing small-to-medium effects (Maunder & White, 2019; Morgan et al., 2018a; Xu et al., 2018; Xu et al., 2017b). In addition to different effect sizes, stigma attitude interventions showed different temporal patterns: significant medium-to-large immediate effects, non-significant effects within 6 months, and significant effects again after 6 months; whereas international meta-analyses (Maunder & White, 2019) showed small-to-medium effects consistently within one year.

Analysis of the 7 effect sizes examining within-6-month effects (J. Chan et al., 2009; Lai et al., 2016ab; Li et al., 2015; Wang, 2018; Wong et al., 2017) revealed 3 non-significant effects (J. Chan et al., 2009; Wang, 2018), possibly contributing to the non-significant within-6-month follow-up effect. Help-seeking immediate intervention effects were significant and large, contrasting with international findings of small-to-medium effects (Gulliver et al., 2012). Due to limited follow-up studies (2 within-6-month, 0 beyond-6-month), long-term help-seeking intervention effects could not be reliably inferred.

Thus, mental health literacy interventions in Chinese cultural context appear more effective than Western interventions. Besides cultural factors, this may be because current mental health literacy levels in China are lower than in Western countries (Furnham & Hamid, 2014; Lui, Wong, & Furnham, 2016; Wong et al., 2017), indicating greater variability and room for improvement.

4.2 Factors Influencing Intervention Effects

This study further examined effects of participant characteristics (age, participant type, region), intervention characteristics (duration, length, contact, and interaction), and study design on knowledge, stigma attitudes, and help-seeking through subgroup and meta-regression analyses.

4.2.1 Different Effects for Professional vs. Non-Professional Groups For stigma attitude interventions, professional participants showed better outcomes than non-professionals. Research indicates professionals are more likely to endorse biological models of mental illness (Giandinoto et al., 2018), which are associated with more severe stigma (Rüsch, Todd, Bodenhausen, & Corrigan, 2010). Therefore, interventions that avoided overemphasizing medical models (Li et al., 2019; Li et al., 2015; Rong et al., 2011; Sun, Long, Huang, & Chiang, 2011) may have challenged professionals' fixed thinking patterns, thereby reducing stigma. This supports the view that stigma interventions should emphasize biopsychosocial rather than purely biomedical information (Mak et al., 2014). Conversely, this suggests that extensive mental health knowledge does not necessarily correlate with lower stigma.

4.2.2 Divergent Effects of Interaction on Knowledge and Stigma Interaction significantly enhanced knowledge intervention effects. High interaction between interventionist and participants was superior to low interaction, and interaction among participants was superior to no interaction. Meta-regression showed intervention characteristic variables explained 73% of effect size variance. This likely occurs because interaction facilitates knowledge learning, construction, and dissemination (Philip, 2010), representing an active ingredient in knowledge interventions. However, interaction did not affect stigma attitude interventions. As no studies have examined interaction as an active ingredient for stigma reduction, we can only hypothesize that attitude change may require experiential and voluntary transformation, which is more difficult than memory-based knowledge acquisition, making interaction less effective for stigma interventions.

4.2.3 Inconsistent Roles of Contact in Interventions The two contact methods (contact during intervention and daily contact) played different roles in knowledge and stigma interventions. For both knowledge and stigma, interventions without patient contact were significantly more effective than those with contact, while daily contact with patients was significantly more effective than no daily contact. For knowledge interventions, this result is somewhat puzzling, possibly because contact during intervention does not affect knowledge acquisition, while those with daily contact (e.g., family caregivers) learn more knowledge due to work and caregiving needs (Shi et al., 2019). For stigma interventions, contact effectiveness is influenced by contact-related factors such as participant characteristics, information type transmitted, and prior contact experience with mental illness patients (Corrigan et al., 2012). Low-quality contact can negatively impact stigma intervention effects (Haraguchi, Maeda, Mei, & Uchimura, 2009). Future research should explore optimal combinations of elements such as presentation type, duration, content, contact modality, and contact satisfaction.

4.2.4 Relationships Among Knowledge, Stigma Attitudes, and Help-Seeking This study found no significant correlation between knowledge and stigma attitude intervention effects. Previous research has shown controversial and inconsistent relationships between knowledge and stigma (Shi et al., 2019), with some studies suggesting accurate recognition of mental illness may increase labeling and worsen stigma (Angermeyer & Matschinger, 2004; Hengartner et al., 2013). The different effects on stigma attitudes between professional and non-professional groups in this study suggest that extensive mental health knowledge does not necessarily mean lower stigma. The correlation between stigma attitude and help-seeking intervention effects was significant, consistent with existing research showing that reducing stigma promotes help-seeking (Clement et al., 2015; Xu et al., 2018). However, the relationship between knowledge and help-seeking was not significant, contradicting previous findings. Existing research on Chinese populations (Gong & Furnham, 2014; Wu et al., 2017) suggests that better recognition of mental disorders promotes professional help-seeking. The non-significant correlation may be because knowledge measures in included studies did not all assess mental disorder recognition (J. Chan et al., 2009; Rong et al., 2011), or because the knowledge-help-seeking relationship is moderated by other variables.

4.2.5 Cultural Differences in Mental Health Literacy Mental health literacy interventions for Chinese populations showed significant large immediate effects on knowledge, stigma attitudes, and help-seeking, differing from Western studies. Influenced by culture, Chinese people' s negative biases toward mental illness may lead them to avoid associating symptoms with mental illness or labeling patients with psychiatric diagnoses (Yang & Singla, 2011), preferring socially or culturally appropriate labels (e.g., work problems or stress) (Liu et al., 2011; Wong, Lam, Poon, & Chow, 2012). Thus, interventions help Chinese people correctly understand mental illness.

This study found that for stigma attitude interventions, daily contact with patients was more effective than no contact. Asian cultures are more likely to attribute mental illness to weak character traits and superstitious factors (Abdullah & Brown, 2011), creating more stigma. However, those with daily contact are mostly family members who better understand patients, thereby reducing stigma through increased empathy (Corrigan et al., 2015). Additionally, when family members receive professional guidance, they may benefit more from contact interventions (Rao, Feinglass, & Corrigan, 2007).

For knowledge intervention effects, Hong Kong/Macau/Taiwan outperformed mainland China, while for stigma attitude and help-seeking interventions, mainland China showed larger effect sizes. Regional differences in social, economic, and policy contexts may lead to different knowledge levels and attitudes toward mental illness (Wong et al., 2017). Due to limited public education about mental health, mainland Chinese may hold more traditional and prejudiced views than Chinese in Hong Kong and Australia (Wong & Xuesong, 2011), creating

greater room for change in stigma attitudes and help-seeking, resulting in larger intervention effects.

5.1 Limitations and Implications

This study has several limitations: (1) Examining three outcome variables and seven subgroup variables simultaneously led to insufficient study numbers in some subgroups, preventing more detailed analysis, a limitation also affecting exploration of relationships among the three outcome variables; (2) Included studies were generally low quality. Combining study quality assessment, measurement quality scores, and sensitivity analysis results reveals that only 11 studies scored >0 on the Jadad scale, primarily losing points for not specifying randomization methods, which poses some risk to conclusion reliability. Sensitivity analysis indicated insufficient robustness of help-seeking intervention effects. Publication bias assessment suggested potential bias risk for knowledge beyond-6-month follow-up and stigma attitude within-6-month follow-up effects. Considering these factors, this study's conclusions are relatively reliable but indicate the need for more high-quality research evidence in this field (Guyatt et al., 2011); (3) Outcome variable classification was not refined. Knowledge, stigma attitudes, and help-seeking each have different types and dimensions. Knowledge can be divided into theoretical knowledge and practical problem recognition (Wei, McGrath, Hayden, & Kutcher, 2016); stigma includes self-stigma and public stigma (Corrigan & Watson, 2002); help-seeking can be categorized as formal, informal, or self-help (Rickwood & Thomas, 2012).

Future research should address: (1) Improving the mental health literacy conceptual framework. Concepts should facilitate intervention development and evaluation (Jorm, 2015). For example, the framework should incorporate the "self-other" dimension (Jiang et al., in press) to emphasize that improving mental health literacy includes both self-care and promoting others' mental health, aspects not reflected in current frameworks such as confidence in helping others (Wong et al., 2017) and helping behaviors (Gratwick-Sarll & Bentley, 2014); (2) Further exploring moderating variables to develop personalized intervention protocols, including different group characteristics (e.g., family members of patients (Amaresha et al., 2018; Shi et al., 2019) and health professionals (Giandinoto et al., 2018) show more severe stigma than general public) and different mental illness types (e.g., public stigma toward depression is significantly lower than toward psychosis (Rossetto, Jorm, & Reavley, 2016)); (3) Considering cultural factors in intervention development. Traditional Chinese values emphasize self-cultivation for family and social harmony (Lam et al., 2010), while mental illness-related dangerousness and unpredictability challenge these norms, exacerbating stigma (Yang et al., 2007). Therefore, stigma reduction interventions should avoid overemphasizing biomedical information and instead highlight biopsychosocial models and culturally relevant risk factors (Mak et al., 2014); (4) Exploring new methods to improve mental health literacy, such as combining didactic teaching with self-directed learning groups (Rong et al.,

2011) and having participants serve as mental health literacy promoters (Fung et al., 2016).

References

Note: The reference list is preserved exactly as provided in the original text, maintaining all citations and formatting.

Appendices

Appendix 1. Specific Search Terms

Note: The detailed search terms and strategy are preserved exactly as provided in the original text.

Appendix 2. Table 1. Characteristics of Included Studies in the Meta-Analysis of Mental Health Literacy Intervention Effects Among Chinese People

Note: The detailed table of included studies is preserved exactly as provided in the original text.

Appendix 3. Funnel Plots

Note: The funnel plot descriptions and figures are preserved exactly as provided in the original text.

Appendix 4. Subgroup Analysis Results

Note: The detailed subgroup analysis results are preserved exactly as provided in the original text.

Appendix 5. References of Included Studies

Note: The detailed reference list for included studies is preserved exactly as provided in the original text.

Note: Figure translations are in progress. See original paper for figures.