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Mental health literacy in secondary school teachers and interventions to improve it- A systematic review and narrative synthesis.

Sphoorthi G. Prabhu[1], Pavan Kumar Mallikarjun[2], Amy Palmer[3], Ritwika Nag[1], Prachi Khadeparkar[4], Mutharaju Arelingaiah[1], Krupa Arasanahalli Lakshman[1], Jayalaxmi Kaniyagundi Podiya[1], Janardhana Navaneetham[1], Siobhan Hugh-Jones[3].

1. *Department of Psychiatric Social Work, National Institute of Mental Health and Neurosciences, Bengaluru, India.*
2. *Forward Thinking Birmingham, Birmingham Women's and Children's NHS Foundation Trust, Birmingham, UK.*
3. *School of Psychology, University of Leeds, Leeds, UK.*
4. *Adolescence Health Programs, Sangath, Goa, India.*

Corresponding Author: Dr. Janardhana Navaneetham, Professor, Department of Psychiatric Social Work, National Institute of Mental Health and Neurosciences, Bengaluru- 560029, India. Email Id: janardhannimhans@gmail.com

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Abstract

Background: Adolescent mental health problems have increased in prevalence. Teachers' Mental Health Literacy (MHL) may play an important role in public mental health prevention approaches. This systematic review and narrative synthesis aimed to identify what is known globally about the extent of secondary school teachers' MHL and the types and effectiveness of MHL interventions for secondary school teachers.

Methods: PsycINFO, PubMed, ERIC, EBSCO-Psychological and behavioural sciences collection, Web of Science, and Google Scholar were searched to identify studies until 29/04/2024. Two independent reviewers screened the returns.

Results: Twenty eligible studies were reviewed. Most intervention studies were from high-income countries and used a psycho-educative approach. Pre-intervention, teachers' levels of MHL were mixed across MHL domains. Post-intervention, increases in mental health knowledge and attitudes and decreases in mental health stigma were reported. Low use of standardised MHL measures, lack of randomised controlled trials, and lack of follow-up data affect evidence quality.

Conclusion: Interventions to improve secondary school teachers' MHL can be effective, at least in the short term. Evidence quality needs to be improved to inform recommendations on whether they should be part of a public mental health approach for adolescents.

PRISMA/PROSPERO: We performed a systematic review and narrative synthesis based on PRISMA guidelines, and it was registered in PROSPERO on 10th May 2022, from https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022328170

Keywords: systematic review; teacher; mental health literacy

Introduction

Global Adolescent Mental Health Crisis

Adolescence (12-25y) is a life stage associated with high vulnerability to the emergence of mental ill-health, which is currently the leading global threat to adolescent well-being, health and productivity (McGorry et al., 2022). Young people perceive the contemporary world as pressured, uncertain and often dangerous, adding to the 'perfect storm' constituted by other developmental and contextual conditions which threaten mental health (Moffitt & Caspi, 2019). Globally, one in seven adolescents have a mental health condition, such as anxiety, depression or post-traumatic stress disorder, and suicide is the fourth leading cause of adolescent deaths worldwide (WHO, 2023). Mental health conditions account for 45% of the overall burden of disease in 10–24-year-old (Gore et al., 2011) and can have devastating effects on a young person and their families as well as on communities, civil society and economies.

Treatment approaches for adolescents are fraught with access, equity, suitability (Signorini et al., 2017), funding and efficacy concerns and have shown little effect on the burden associated with mental health disorders (Colizzi et al., 2020; Weisz et al., 2013). Preventative action is therefore a global priority (Mei et al., 2020), defined as that which reduces the prevalence, severity and recurrence of mental health conditions (Arango et al., 2018). Prevention programs aim to strengthen protective factors, reduce exposure to risk factors and target putative mediating causal mechanisms (WHO, 2004).

It has been argued that, for prevention of adolescent mental health conditions, "the center of gravity must be located in the community" (p64, McGorry et al., 2022). This should involve educating every layer of society, especially those in contact with young people, about adolescent mental ill-health, its causes and nature, and what protects mental health (Arango et al., 2018). Schools have been recognised as critical

sites for prevention approaches in many high-income countries and some low-and middle-income countries (Betancourt & Chambers, 2016; Fazel et al., 2014; Patel et al., 2018; Vieira et al., 2014). Efforts have largely focused on social and emotional learning and anti-bullying programs (Bradshaw et al., 2021; Cipriano et al., 2023; Gaffney et al., 2019). However, there is increasing recognition of aspects of the school system which may be underutilising protective factors or leaving risk factors unaddressed (Hoover & Bostic, 2021). Teacher Mental Health Literacy (MHL) is one such component. This has been gaining global recognition as a route to boost protective factors and for reducing risk factors for youth mental health (e.g., Hugh-Jones et al., 2022; Nalipay & Simon, 2023).

Mental Health Literacy

Evolving from the seminal work of Jorm et al. (1997), the concept of MHL is proposed to have four components: the knowledge of how to obtain and maintain good mental health, understanding mental health conditions and their treatment, decreasing stigma related to mental health disorders, and enhancing help-seeking efficacy (Furnham & Swami, 2018; Kutcher et al., 2017). Notably, the concept of MHL seeks to mirror that of health literacy, i.e., understanding health information to enable management of one's own and others' physical health (Furnham & Swami, 2018). Health literacy is reported to be a stronger predictor of health than education, employment status, income, or ethnic/racial group, possibly because it empowers people to take action (Nutbeam, 2000). It is argued that similar outcomes could be supported via improved mental health literacy, especially among significant figures in adolescents' lives such as parents and teachers.

Teacher Mental Health Literacy:

To date, teacher MHL programs have focused on improving teachers' ability to identify and respond to mental health disorders (e.g. Anderson et al., 2019), but is broadening to include their ability to promote positive adolescent mental health in line with a prevention agenda (Nalipay & Simon, 2023). Teacher MHL matters for several reasons. First, they are often well placed to notice changes in an adolescent's behaviour and functioning but recognising a mental health concern during this life stage can be difficult, both for young people and adults, given other life stage changes (e.g. mood changes). This can lead to under-identification of mental health conditions (Radez et al., 2021) or the over-interpretation of normative 'problems in living' (e.g. stress) as mental health conditions (Foulkes & Andrews, 2023). Second, myths and misunderstandings about the causes and legitimacy of poor mental health abound in the public, in schools and among peers, and influence outcomes (Krendl & Pescosolido, 2020). Unhelpful teacher beliefs can influence whether an adolescent seeks help, feels shame, conceals their distress or finds unhealthy ways to cope (Aghukwa, 2009; Aguirre Velasco et al., 2020). For adolescents in particular, mental health stigma in educational settings can fuel isolation and loneliness, experiences often associated with suicidal behaviours (WHO, 2023). Finally, the MHL of teachers can influence that of adolescent students, with implications for self-understanding and help-seeking (Miller et al., 2019).

Despite some disquiet about schools as places for public mental health work (e.g. Eisenbach & Frydman, 2023; Shinde et al., 2020), evidence suggests that teachers worldwide are generally open to improving their MHL so that they can deliver responsible and effective front-line responses to young people whose mental health is of concern (e.g., Kutcher et al., 2015; Langeveld et al., 2011; Masillo et al., 2012; Nguyen et al., 2020). Indeed, programs to develop secondary school teachers' MHL have been

proliferating in high- (Kutcher, Bagnell et al., 2015; Kutcher, Wei, Gilberds et al., 2016; Martínez et al., 2015) and middle-to-low-income countries (Ginige et al., 2021; Kutcher et al., 2017; Shah & Kumar, 2012).

Reviews of program effectiveness are emerging. Anderson et al. (2019) reviewed MHL programs for teachers in middle and senior schools (k=8). They found that, whilst these programs improved teachers' mental health knowledge and attitudes, they did not significantly impact teachers' helping behaviours, students' mental health or teachers mental health, which were secondary outcomes in some studies. Yamaguchi et al. (2020) examined programs for primary (k=4) and secondary school teachers (k=11). Most of their included studies reported a significant improvement in teacher mental health knowledge and helping behaviour and/or confidence in helping students and reduced stigmatising beliefs. However, the review concluded that better quality evidence was needed before the effectiveness of MHL programs for teachers could be claimed. Ohrt et al.'s (2020) review of MHL programs for teachers from all school grades (k=15) mentions that eight studies, which mainly aimed at enhancing teachers' mental health knowledge, reported significant improvements in both mental health knowledge and mental health literacy, in attitudes, and a reduction in stigmatizing attitudes. However, it is unclear which specific attitudes improved. Whether all these outcomes translate into better teacher communication with students about mental health, and whether they are sustained over time, has not been established.

The existing reviews have not focused uniquely on MHL programs and outcomes for secondary school teachers, who encounter young people at a time of vulnerability to poor mental health. Given the global acceleration of teacher MHL programs, updated evidence reviews are important to inform understanding of whether these programs are working, which can inform program commissioning, as well as

identifying continuing knowledge gaps and where research methodologies need to improve. Therefore, the aim of our review was to identify what is known globally about the extent of secondary school teachers' MHL as well as the types and effectiveness of interventions to improve teacher MHL.

Materials and Methods

We performed a systematic review and narrative synthesis based on PRISMA guidelines, and it was registered in PROSPERO on 10th May 2022, (CRD42022328170). A meta-analysis of the data from the intervention studies was not conducted due to the heterogeneity of intervention types (e.g. first-time vs refresher programs), outcomes (i.e. different sub-components of MHL were assessed in different studies, the use of bespoke tools that lacked psychometric testing), and variation in assessment time points.

Search Strategy

A systematic search was conducted using the following databases: PsycINFO, PubMed, ERIC, EBSCO-Psychological and Behavioural Sciences Collection, and Web of Science. Google Scholar was used as a final search engine. The search strategy was adapted to each database. The review considered studies from the year 2000 to 29.04.2024 to be relatively current. Publications were restricted to those in English or an Indian language known to the team (Kannada and Hindi). Reference lists of the papers eligible for inclusion were scrutinised for additional publications not returned in the database search. Grey literature was searched for doctoral theses (not conference papers). As the search field was reasonably narrow, we opted to include doctoral theses as they (i) are peer reviewed and therefore of at least acceptable quality; (ii) have the potential to be informative about important research outcomes; and (iii) may be a key

route to data from low-middle-income-countries which may not have as easy access to publication as work in high-income-countries.

The search terms were: School* OR "secondary school*" OR "high school*" AND Teacher* OR Staff AND Training OR education* OR workshop OR program* OR intervention AND "Mental health literacy" OR "Mental health knowledge". A combination of controlled vocabulary and free text was used (see supplementary materials for the search strategy).

Inclusion and Exclusion Criteria

With regards to inclusion criteria, studies were eligible if:

- they involved in-service teachers or staff (principals, support staff, administrative staff) in secondary (high) schools in any country. Inclusion of this range of staff was to be as inclusive as possible at the search stage.
- their aim was to enhance MHL in secondary school teachers/staff and whose primary or main outcome was a measure or indicator of teacher MHL.
- they included any form of training, delivery or implementation approach with or without a comparison group.
- they were intervention studies that used randomised controlled trials (individual, parallel or clusters), quasi randomised controlled trials or pre-post-test designs.
- they were non-intervention studies that measured or described teacher MHL (e.g. descriptive studies, studies with qualitative designs, cross sectional designs, comparative studies).
- they were published in English, Kannada or Hindi.

Studies were not eligible if:

- they involved pre-service teachers, combined secondary school teachers with those from other school years and/or which did not report outcomes separately for secondary school staff.
- their aim was to train teachers to deliver MHL programs to students or where the primary aim was other than to improve teacher MHL. Studies with teacher MHL as a secondary outcome were not eligible as they may not have been powered to detect a change in this outcome.
- were review papers, research protocols or conference abstracts.

Study Selection

This review followed the PRISMA guidance (M. J. Page et al., 2021) for study selection. All documents and data from reviewed papers were stored in Rayyan (Ouzzani et al., 2016). Duplicate papers were removed after search returns. The titles and abstracts of the studies from the preliminary search were screened independently by two reviewers (SP and RN/AP) for eligibility. A manual search of the reference list of eligible papers was conducted. Full texts of returned papers were independently checked for eligibility by two reviewers (PK/RN/AP and SP).

Data Extraction

A data extraction template was prepared to suit the review objectives informed by the Cochrane Collaboration recommended templates for different research designs. Three papers were randomly selected to test the template and the completeness and accuracy of data extraction was reviewed by a second reviewer (AP). The domains for data extraction were:

- For intervention and non-intervention studies: study objectives, participants (number and selection), setting and country, and domains of MHL (as proposed by Kutcher et al. (2016).
- For intervention studies: theory basis, measures of MHL, mode of intervention, intervention dosage, topics covered, delivery agent and training, implementation details, control group details, evidence of intervention effectiveness, primary and secondary outcomes, follow-up periods, fidelity or monitoring checks and process evaluation data.
- For non-intervention studies, the following were also extracted: details of the study process, measures, primary and secondary outcomes, analysis methods and results.

Quality Assessment

The quality of the included papers was assessed by two independent reviewers (SP & AP) using the 'Quality Assessment Tool for Studies with Diverse Designs' (QATSSD) (Sirriyeh et al., 2012). This includes 14 items applicable to qualitative or quantitative design papers and 16 items for evaluating mixed design papers. Each item has a scoring of 0 to 3. The maximum score is 48 for qualitative or quantitative design studies and 48 for mixed design studies. The inter-rater reliability between the two reviewers was high (Kappa=0.785, $p<0.001$).

Results

Study Selection

Following title and abstract screening, 32 papers were deemed eligible. An additional five papers were identified as eligible following a manual search of the reference list of these 32 papers. The full texts of these 37 papers were independently reviewed for

eligibility by two reviewers (PK/RN/AP and SP). Difference in eligibility of reviews were discussed and a consensus was reached. A final total of 20 papers were deemed eligible for inclusion. All 20 papers reported one study each, except for one paper (Nguyen et al., 2020) which reported two studies (including study by Phoeun et al., 2019). Phoeun et al. (2019) was included only once in the review. The study selection process is reported in Figure 1.

Study Characteristics

As shown in Table 1, all study participants were secondary school teachers. Only three studies (D. Page et al., 2024; Arslan & Karabey, 2023; Phoeun et al., 2019) also included some administrative staff. The studies included RCTs (Jorm et al., 2010; Moor et al., 2007; Nguyen et al., 2020; Phoeun et al., 2019), quasi-experimental designs (pre-post) (Bichoualne et al., 2023; Kutcher et al., 2013; Kutcher, Wei, Gilberds et al., 2016; Wei et al., 2014 b, 2021; Wei & Kutcher, 2014 a), mixed designs (Eustache et al., 2017), cross sectional survey designs (Aluh et al., 2018; Arslan & Karabey, 2023; Masillo et al., 2012; Mulla & Bawazir, 2020; Ngwenya et al., 2022; Özabacı, 2010; D. Page et al., 2024; Yamaguchi et al., 2021), and cross-sectional comparison designs (Langeveld et al., 2011).

Eleven studies were conducted in high-income countries (Jorm et al., 2010; Kutcher et al., 2013; Langeveld et al., 2011; Masillo et al., 2012; Moor et al., 2007; Mulla & Bawazir, 2020; D. Page et al., 2024; Wei et al., 2014 b, 2021; Wei & Kutcher, 2014 a; Yamaguchi et al., 2021). Seven studies were conducted in a Low and Middle-Income country (Aluh et al., 2018; Bichoualne et al., 2023; Eustache et al., 2017; Kutcher, Wei, Gilberds et al., 2016; Nguyen et al., 2020; Ngwenya et al., 2022; Phoeun et al., 2019). The studies by Arslan et al. (2023) and Özabaci et al. (2010) were conducted in an Upper-Middle-Income country.

The intervention studies had various aims including evaluating a program (Eustache et al., 2017; Nguyen et al., 2020) and program effects on: MHL (Phoeun et al., 2019); mental health understanding (Bichoualne et al., 2023; Jorm et al., 2010; Kutcher et al., 2013; Kutcher, Wei, Gilberds et al., 2016; Moor et al., 2007; Wei et al., 2014 b, 2021; Wei & Kutcher, 2014 a); stigma (Jorm et al., 2010; Wei et al., 2021); attitudes (Bichoualne et al., 2023; Eustache et al., 2017; Kutcher et al., 2013; Kutcher, Wei, Gilberds et al., 2016; Moor et al., 2007; Wei et al., 2014 b; Wei & Kutcher, 2014 a); and self-efficacy towards student mental health. Other outcomes included: reporting mental illness in pupils (Moor et al., 2007); triage and support (Wei & Kutcher, 2014 a); supporting students and colleagues (Jorm et al., 2010); seeking information about mental health and one's mental health (Jorm et al., 2010); and the use of mental health resources (Kutcher et al., 2013).

The aims of the non-intervention studies included examining: MHL (Aluh et al., 2018; Langeveld et al., 2011; D. Page et al., 2024; Yamaguchi et al., 2021); mental health understanding (Arslan & Karabey, 2023; Mulla & Bawazir, 2020); understanding about a specific mental health disorder (Masillo et al., 2012; Ngwenya et al., 2022; Özabacı, 2010); readiness to support (Mulla & Bawazir, 2020); and interest in improving knowledge (Masillo et al., 2012). Arslan et al. (2023) also aimed to assess teacher beliefs, help seeking attitudes and stigma.

Participant details were given only by five studies (Bichoualne et al., 2023; Kutcher et al., 2013; Kutcher, Wei, Gilberds et al., 2016; Moor et al., 2007; Wei & Kutcher, 2014 a). Teachers teaching diverse subjects participated in Bichoualne et al.'s study (2023). Teachers in Kutcher et al.'s (2016) study had received earlier training on the use of a mental health resource ('The Guide') and were attending refresher training. In Wei & Kutcher's study (2014 a), teachers identified by students as those they were

comfortable with, received MHL training during professional development days. Similarly, in Kutcher et al. (2013), all grade nine teachers teaching the healthy living component of the provincial school curriculum were involved in the training that took place during their professional development day. In Moor et al.'s study (2007), out of 151 participants, 69 were teachers with responsibility for pupil pastoral care.

Fourteen studies focussed on general MHL. Jorm et al. (2010) focussed on general MHL and depression. Studies by Langeveld et al. (2011) and Masillo et al. (2012) focussed on teachers' literacy about psychosis. Four studies (Aluh et al., 2018; Moor et al., 2007; Ngwenya et al., 2022; Özabacı, 2010) assessed depression literacy in teachers.

The quality rating shows that there was substantial agreement between the raters indicated by the Kappa value of 0.785 (p=0.000). One cross-sectional design study (D. Page et al., 2024) attained a score above 30 indicating high quality; i.e., the study was methodologically strong. The rest of the studies scored below 30, indicating moderate quality. The study by Wei et al. (2014 b) was rated to be of low quality. The mean quality score of the studies was 22.8, indicating moderate quality. This can be attributed to the low number of randomized controlled trials, lack of follow-up assessments and poor methodological rigor.

Intervention Details

Table 2 reports intervention details. Only two studies (Eustache et al., 2017; Wei & Kutcher, 2014 a), reported the use of a theoretical framework for intervention design. All studies, except one (Bichoualne et al., 2023), delivered interventions in schools and in-person to participants. Intervention dosage ranged from two hours to three days. Wei

et al. (2021) delivered their intervention across six sessions with a different duration for each session, and Bichoualne et al.'s (2023) sessions were over six weeks (two hours per week).

Interventions were based primarily on psychoeducation and all studies provided information on either types/ classification of mental health disorders or their symptoms and identification. Additionally, Eustache et al. (2017) and Jorm et al. (2010) covered regional laws and policies related to child mental health. Training to respond to students or to deliver a MHL intervention to students was a part of two studies (Jorm et al., 2010; Nguyen et al., 2020). Other common topics delivered across studies were: brain function concerning mental health and illness (Kutcher et al., 2013; Nguyen et al., 2020; Wei et al., 2014); understanding mental health and illness or wellness (Bichoualne et al., 2023; Kutcher, Wei, Gilberds, et al., 2016; Phoeun et al., 2019); and people's experiences of mental illness (Kutcher, Wei, Gilberds, et al., 2016; Phoeun et al., 2019; Wei et al., 2014).

Delivery agents were mostly trained personnel external to the school or those who knew about the intervention content (Jorm et al., 2010; Kutcher et al., 2013; Wei et al., 2021; Wei & Kutcher, 2014 a). In several studies, delivery agents were the study investigators (Eustache et al., 2017; Moor et al., 2007; Nguyen et al., 2020; Phoeun et al., 2019; Wei et al., 2021), some of whom were also practitioners (Eustache et al., 2017; Kutcher, Wei, Gilberds, et al., 2016; Nguyen et al., 2020).

In terms of intervention implementation, Bichoualne et al. (2023) provided online training. Kutcher et al.'s (2013) & Jorm et al.'s (2010) research team worked with the school to plan the intervention schedule. Eustache et al. (2017) started the programme just before the start of the academic year and Wei et al. (2014 a) delivered

the intervention on teacher professional development days.. Other studies did not report implementation details.

Four intervention studies (Jorm et al., 2010; Moor et al., 2007; Nguyen et al., 2020; Phoeun et al., 2019) included control groups. Randomisation was either based on schools (Nguyen et al., 2020), teachers from one school (Phoeun et al., 2019) or teachers across schools (Moor et al., 2007). Nguyen et al. (2020) and Phoeun et al. (2019) did not provide any intervention to the control group. Moor et al. (2007) provided interventions to both the control and intervention group in parallel and differed only in the assessment timeline and a filler task. Jorm et al. (2010) involved a waitlist group which received the intervention following the intervention group. Seven studies (Bichoualne et al., 2023; Eustache et al., 2017; Kutcher et al., 2013; Kutcher, Wei, Gilberds, et al., 2016; Wei et al., 2014 b, 2021; Wei & Kutcher, 2014 a) did not have a control group and utilised a pre-post-test design.

Follow-up data was collected by Eustache et al. (2017) six to nine weeks post-intervention and by Jorm et al. (2010) six months post-intervention

MHL Levels

Table 3 reports levels of MHL across domains. Standardised measures were used by two intervention studies (Nguyen et al., 2020; Phoeun et al., 2019) and five non-intervention studies (Aluh et al., 2018; Langeveld et al., 2011; Masillo et al., 2012; Mulla & Bawazir, 2020; Ngwenya et al., 2022). Arslan et al. (2023), Bichoualne et al. (2023) and Page et al. (2024) used both questionnaires and standardised measures. Commonly used measures were the ‘Mental Health Literacy Scale’ by O’Connor & Casey (2015) which (Nguyen et al., 2020; Phoeun et al., 2019) adapted to the study context and Beliefs Towards Mental Illness Scale by Hirai & Clum (2000). The

investigators of the Canadian Go-To-Educator-Training programme developed a questionnaire to measure teacher knowledge and attitudes towards mental health and disorders. This questionnaire was used by studies which evaluated that programme (Bichoualne et al., 2023; Kutcher et al., 2013; Kutcher, Wei, Gilberds et al., 2016; Phoeun et al., 2019; Wei et al., 2014 a, 2021; Wei & Kutcher, 2014 b). Bespoke questionnaires were developed by Eustache et al. (2017), Jorm et al. (2010) and Moor et al., (2007) for their intervention studies and by Page et al. (2024), Yamaguchi et al. (2021), and Ozabaci et al. (2010) for their cross-sectional surveys.

Findings pertaining to the level of teacher MHL, across domains, are reported below, informed by baseline data collected by studies prior to intervention delivery.

Knowledge of how to obtain and maintain positive mental health.

None of the studies assessed knowledge about ways to obtain and maintain positive mental health. Although Eustache et al.'s (2017) intervention aimed to promote resilience, no data was reported.

Understanding mental disorders and their treatments

Four studies (Jorm et al., 2010; Kutcher et al., 2013; Wei et al., 2014 b; Wei & Kutcher, 2014 a) reported high levels of teacher understanding of mental health disorders and their treatment. Moderate scores were reported by Page et al. (2024), Bichoualne et al. (2023), Nguyen et al. (2020) and Kutcher et al. (2016), and low scores were reported by Wei et al. (2021).

Jorm et al. (2010) reported that 81.8% (n=221) of their participants knew about depression. Similarly, Yamaguchi et al. (2021) reported that 54.1% (n=665) of their participants correctly identified depression and panic disorder; only schizophrenia was

understood by less than 50% (35.3%, n=665). Mulla et al. (2020) reported that 74.1% (n=306) of their participants had poor understanding of mental health conditions.

Arslan et al. (2023), Aluh et al. (2018) and Ozabaci et al. (2010) reported that less than 50% of participants had adequate understanding of mental health conditions. Among 241 participants, only 45.5% understood depression, 47.9% understood schizophrenia, and 27.9% understood social phobia (Arslan & Karabey, 2023). Aluh et al. (2018) found that, in their study, only 16.3% (n=17) correctly identified and labelled the depression vignette, and only 30.8% (n=32) reported diminished ability to concentrate as a symptom of distress for depression. Ozabaci et al. (2010) assessed depression literacy and found that less than 50% of the participants had an understanding about the condition and the professionals to be consulted.

Studies by Ngwenya et al. (2022) and Masillo et al. (2012) showed mixed results. Masillo et al. (2012) reported that a case vignette of psychosis was correctly identified by only 25.1% (n=65); 40.7% (n=105) of teachers who had pupils with psychosis stated that they did not understand the progression of the illness; 71.3% (n=185) believed psychotherapy was the treatment option; 11.4% (n=30) indicated family or relationship therapy; and only 9.8% (n=25) answered pharmacological therapy. However, their understanding of illness aetiology was good.

Decreasing stigma related to mental health disorders

Most of the studies assessed whether teachers held stigmatising beliefs about people with mental health conditions. Jorm et al. (2010) showed mixed views: 53.9% (n=221) strongly disagreed with the statement that depression is a personal weakness and 72.3% (n=221) strongly agreed with the statement that people with depression should be avoided. A small percentage disagreed with the following stigmatising items related to

depression: one could snap out of one's illness (32.1%), the illness is not real (45%), and that people with depression are dangerous (35.6%) and unpredictable (8.1%). Nguyen (2020) reported high stigma scores from teachers; they believed that a person with a mental health condition was dangerous, that mental health conditions are incurable and they were unwilling to interact with those with mental illness. Nguyen (2020) also reported that teachers had moderate scores on the perception that individuals with mental illness have poor interpersonal social skills. Similarly, Phoeun et al. (2019) reported variation in teacher's stigmatising beliefs: teachers showed high levels of stigmatising belief about dangerousness associated with mental illness, incurability of mental illness, and unwillingness to interact, but had low levels of stigmatising beliefs about people with mental illness having poor interpersonal social skills.

Bichoualne et al. (2023) reported moderate levels of stigmatising beliefs in their teacher sample. Low levels of stigmatising beliefs were found in a number of students Wei et al. (2021), Yamaguchi et al. (2021), Eustache et al. (2017), Kutcher et al. (2016), Wei et al. (2014 a), (2014 b), Kutcher et al. (2013)).

Enhancing help-seeking self-efficacy (Knowing when and where to seek help)

Six studies assessed help-seeking self-efficacy. (Arslan & Karabey, 2023) reported that more than 50% of their participants knew where to seek help for anyone with depression. Three studies reported moderate help-seeking self-efficacy among teachers (Bichoualne et al., 2023; Nguyen et al., 2020; Phoeun et al., 2019). Mixed results were reported by Masillo et al. (2012); participants reported that, if faced with the suspicion of a pupil suffering from psychosis, help-seeking should be targeted at counselling services (72%, n=180), family (64.7%, n=165) or another specific service (11.4%, n=29). Only 13.5% (n=14) of participants from Aluh et al.'s study (2018) identified a

psychiatrist or psychologist as a professional who could help a student (vignette) with depression.

Evidence of Intervention Effectiveness

Table 4 shows that significant intervention effects were found across MHL domains in several studies. The assessment points varied across studies.

Understanding mental health disorders and treatment

Significant improvements in mental health knowledge were reported by Bichoualne et al. (2023), Wei et al. (2021), Eustache et al. (2017), Kutcher et al. (2016), Wei et al. (2014 a & b), Kutcher et al. (2013), and Jorm et al. (2010). Jorm et al. also measured intervention effects on the recognition of depression but no significant improvements were reported post-intervention nor at follow-up. Eustache et al.'s and Jorm et al.'s (2010) studies showed sustained improvement in knowledge scores at follow up.

Decreasing stigma related to mental disorders

Studies by Wei et al. (2021), Nguyen et al. (2020), Phoeun et al. (2019) and Jorm et al. (2010) reported a decline in stigmatising beliefs about mental health post intervention. Jorm et al. (2010) measured depression literacy and found that, compared to untrained teachers, trained teachers were less likely to see depression as due to personal weakness and were less likely to be reluctant to disclose depression to others. They were also more likely to believe that other people see depression as due to personal weakness and more likely to see other people as reluctant to disclose. However, Jorm et al.'s (2010) training did not have an effect on the following items related to personal stigmatising attitudes towards depressed students: that they could snap out of it, that it was not a real illness, that they were dangerous, that it was best to avoid them, that they are unpredictable.

Significant, positive intervention effects on attitude scores were reported by Bichoualne et al. (2023), Kutcher et al. (2013; 2016), and Wei et al. (2014 b; 2014 a). Eustache et al. (2017) measured attitudes towards mental illness across three time points and reported significant improvements at post intervention and follow up.

Help-seeking self-efficacy

Help-seeking self-efficacy improved post intervention in the studies by Bichoualne et al. (2023), Nguyen et al. (2020) and Phoeun et al. (2019)

Others

Other areas that improved post-intervention were: discussing a mental health problem with other teachers or counsellors with the intention to help students (Jorm et al., 2010); confidence in helping a student (Jorm et al., 2010); confidence about one's knowledge of mental illness (Moor et al., 2007); strategies used to help a student with a mental health problem like reviewing school policies, improving relationships within school, or having a written policy in school to respond to students with mental health problems (Jorm et al., 2010); beliefs about mental illness (Nguyen et al., 2020), a decrease in labelling of students to be symptomatic; confidence in one's knowledge and confidence in assessing and recognition of symptoms (Moor et al., 2007).

Due to diverse study designs and measured outcomes, we conducted a narrative synthesis, not a meta-analysis. Tables 3 & 4 highlight the differences in the MHL outcomes across studies and show that, although most studies measured understanding of mental health, there were differences in the sub-components investigated (Table 4). Unlike other studies, Kutcher et al. (2016) examined the impact of refresher training.

Likewise, apart from measuring the effect of an intervention on teachers' MHL, Wei et al. (2014b) also measured the impact of the intervention on trainers.

Discussion

This systematic review involving 20 studies highlights the level of secondary school teacher MHL and the effectiveness of teacher MHL enhancement interventions. Most intervention studies included in our review were from high-income countries, used a psycho-educative approach and were conducted face-to-face. All of the included studies were published in English. We did not identify any studies in Indian languages. Levels of teachers' MHL (pre-intervention) varied across most MHL domains. MHL interventions largely improved teachers' mental health understanding and positive attitudes, reduced stigma towards people with mental health conditions, improved behaviours like discussing a student's problem with colleagues, consulting a school counsellor, and delivering broad school-level strategies to help a student with mental health problem. When measured, interventions to improve teacher MHL did not translate into improved student mental health. However, Jorm et al. (2010) found that students reported receiving more mental health information once teachers had received a MHL intervention. Nguyen et al. (2020) and Phoeun et al. (2019) reported improved student mental health knowledge when teachers delivered the mental health literacy intervention to students.

Three existing reviews on teacher MH interventions (Anderson et al., 2019; Ohrt et al., 2020; Yamaguchi et al., 2020) included both primary and secondary school teachers. Our review reports distinct results for secondary school teachers. Our review found only four studies (Bichoualne et al., 2023; Eustache et al., 2017; Jorm et al., 2010; Kutcher et al., 2013) which reported intervention implementation which included

online administration and integration of training to the teacher's schedule. Reviews by Anderson et al. (2019), Yamaguchi et al. (2020), and Ohrt et al. (2020) did not report intervention implementation approaches. Our findings about intervention content, delivery agents and the most delivered programmes align with the reviews by Anderson et al. (2019), Yamaguchi et al. (2020), and Ohrt er al. (2020).

Our findings on post-intervention increases in teacher mental health understanding and decreases in stigmatising beliefs about people with mental health conditions are consistent with findings by Ohrt et al. (2020), Yamaguchi et al. (2020), and Anderson et al. (2019). The review found variability in depression literacy across studies. One possible reason is the differences in the measures used. Only Ngwenya (2022) used a standardised measure. Three studies (Aluh et al., 2018; Moor et al., 2007; Özabacı, 2010) utilized different case vignettes. For example, Aluh et al.'s (2018) questionnaire included both clinical and non-clinical cases and followed DSM criteria, which were not reported in other studies. In Özabacı et al.'s (2010) study, teachers tasked with diagnosing a case vignette expressed uncertainty about the term 'probably' used in the questionnaire, preferring the broader term 'possibly/probably' instead. Additionally, cultural perspectives on depression might have influenced depression literacy, as highlighted by Ohrt et al. (2020). The use of alternative terms for depression like 'emotional problems' and 'emotional stress' (Aluh et al., 2018) and the unfamiliarity of psychiatric concepts commonly used in assessment tools (Özabacı, 2010) are other factors that may impact the findings on depression literacy across studies.

Our review identified inconsistency in the use of standardised MHL outcome measures. Most of the studies used non-standardised MHL outcome measures, making

it difficult to determine their validity, increasing the probability of bias, and making it difficult to generalise and replicate them. Use of non-standardised measures could be driven by the absence of enough MHL scales that precisely measure teacher MHL or the areas of interest to intervention designers and/or schools. As shown by Wei et al.'s (2016) systematic review of tools measuring mental health knowledge, 15 of 17 were from Western countries, with 35% of the studies being conducted in the United States (n=6). Only two studies were conducted in non-western countries. Thus, addressing the absence of culturally validated tools could improve rigour and consistency in measuring MHL.

The following challenges were reported by some of the studies in delivering their interventions: schools dropping out of the study due to changes in circumstances (e.g. change in the school principal (Jorm et al., 2010) issues in the availability of programme developers and core trainers, and poor training site preparation (Wei et al., 2021). The solutions to these challenges included online training (Wei et al., 2021), integrating teachers' MHL training into the system and ensuring school mental health continuity through an inbuilt system (Kumar, 2021), e.g., allocation of professional development days for teachers and adding the MHL enhancement component into training. These strategies might improve participation from teachers.

The low to moderate quality of studies reflects poor to moderate methodological rigor. It is therefore difficult to conclude about the impact of teacher MHL interventions and to offer clear recommendations for their use.

The findings of our review should be considered in light of a number of limitations. We conducted a narrative synthesis and not a meta-analysis due to diverse study designs and outcomes measured. Our search did not include studies on beliefs,

attitudes, and disorder-specific literacy potentially missing important evidence. During the search process, we included only English or Indian language studies known to authors; possibly missing evidence published in other languages. Data was extracted by only one person for all the studies. The quality assessment tool used in this review (QATSSD) has limitations such as not measuring publication/ reporting bias and lacks a large-scale validation study.

Although teacher MHL programmes have shown to be effective in improving the understanding of mental health disorders and treatment, stigma, help seeking self-efficacy, and confidence in helping students, sustainability of effects (up to 6 months) in some of the MHL components was established by only two studies (Eustache et al., 2017; Jorm et al., 2010). Measuring the teachers' behaviours is crucial as it is associated with student mental health outcomes. However, as reported by Anderson et al. (2019), measuring the specific teacher behaviours might also be difficult as it requires time for a student problem to arise to which the teachers could respond. The extent to which mental health knowledge has been useful in addressing teachers' own mental health needs, if any, is also not reflected in this or other reviews. These issues are worthy of investigation in future research. Additionally, eight of the 20 studies tested the Canadian Mental Health Curriculum (The Guide) and its adapted versions and have shown positive outcomes. Future research could localise and test this programme rather than developing and testing a new programme.

Conclusion

This review gives an insight into the levels of secondary school teacher MHL and the effectiveness of teacher MHL programs. It also reflects the need for research studies in low and middle-income countries, with a paucity of research in this area. Evidence is

needed on the potential impact of improved teacher MHL on student MHL, the student-teacher relationship, teachers' response to students with mental health needs and their own well-being and support systems.

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Declaration of Interest

The authors declare no conflict of interest.

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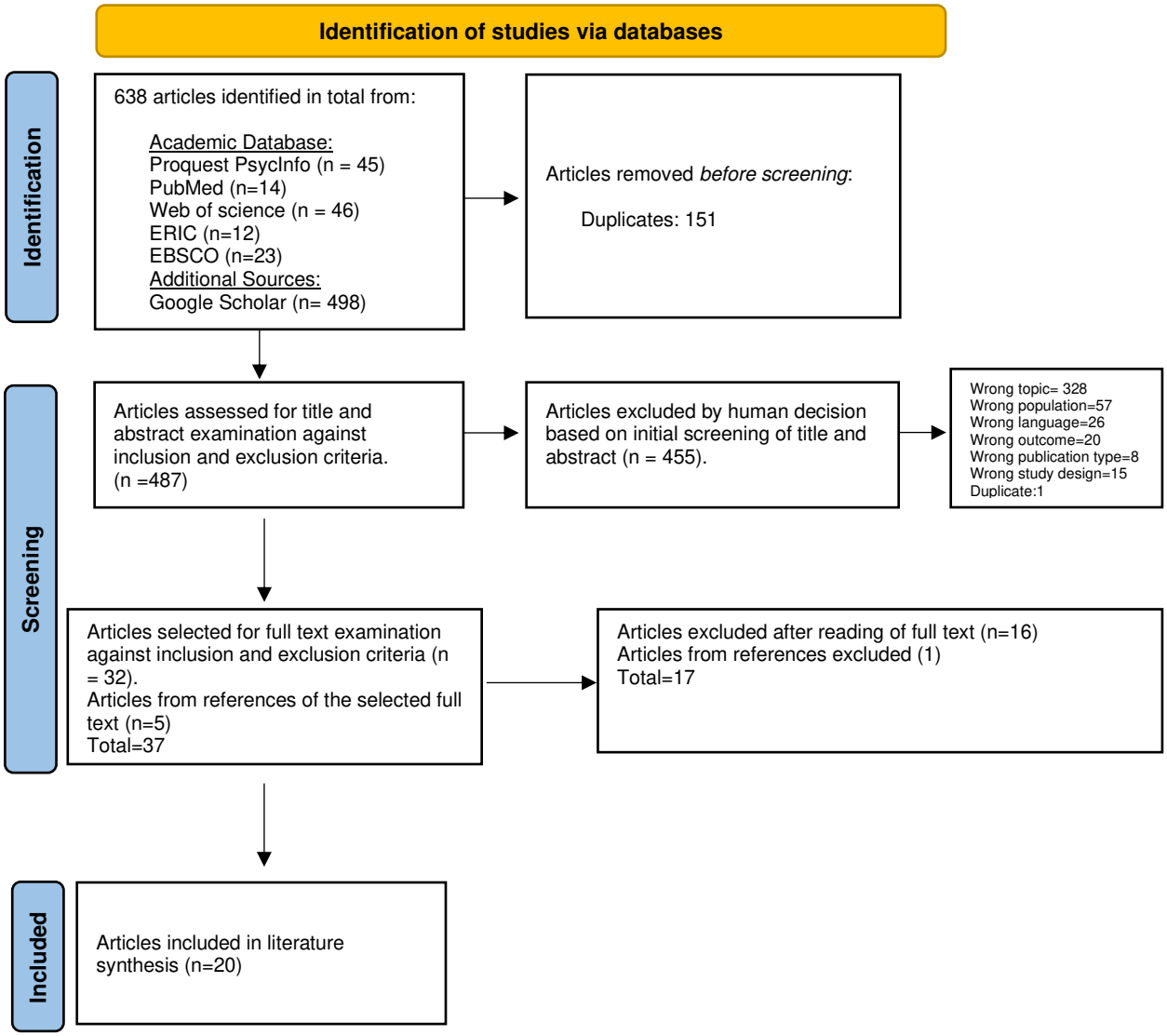
Yamaguchi, S., Foo, J. C., Kitagawa, Y., Togo, F., & Sasaki, T. (2021). A survey of mental health literacy in Japanese high school teachers. *BMC Psychiatry*, *21*(1), 478. https://doi.org/10.1186/s12888-021-03481-y

Yamaguchi, S., Foo, J. C., Nishida, A., Ogawa, S., Togo, F., & Sasaki, T. (2020). Mental health literacy programs for school teachers: A systematic review and narrative synthesis. *Early Intervention in Psychiatry*, *14*(1), 14–25. https://doi.org/10.1111/eip.12793

Figure 1: **Study Selection Process**



To be located immediately after the heading “Study Selection” under the Results section. This figure will be followed by the text explaining the table results.

Table 1: Study Characteristics

Sl.No	Author, Year, Country & Intervention Name	Study Design	Study Objectives	Selection of Participants and Number of Participants	QA Rater 1	QA Rater 2
1.	Bichoualne et al. (2023). Morocco. Teacher Mental Health Literacy Training Programme (basically Mental Health Curriculum Guide).	Quasi-Experimental Design (Pre-post intervention study).	(1) To investigate the relationship between high school teachers' program training and their knowledge, attitude, and self-efficacy toward mental health. (2) To estimate the causal impact through pre–post intervention applied to the sample population.	Only mentions the use of purposeful sampling. The teachers taught different subjects. n=36	29	29
2.	Wei et al. (2021). Canadian provinces. Go-To Educator Training.	Quasi-Experimental Design (Pre-post intervention study).	(1) To evaluate the impact of the GTET programme on teacher MHL, knowledge and stigma. (2) To understand if GTET has different impacts by locations, gender (male and female), years of professional practice and from whom recipients received their training.	(1) Participants were recruited from six Canadian provinces by local school boards or health authorities. (2) Local school principals chose educators (to whom students would go to for support) from their schools. n=949	23	23
3.	Nguyen et al. (2020). Vietnam. The Guide.	Trial Design (Randomized Controlled Trial).	To evaluate the efficacy of an evidence-based MHL program, initially developed in Canada, for use in Vietnam following adaptations made by the research team.	(1) 20 schools were randomly selected from a pool of 36 possible schools in the coastal Vietnamese city of Danang. (2) 10 schools each were randomly assigned to intervention and control group. (3) Eighty teachers (two per grade per school) were randomly selected out of a total of 110 available teachers (53 in the intervention schools and 57 in the control schools). n=80 (53 in intervention, 57 in control)	27	27

4.	Phoeun et al. (2019). Cambodia. The Mental Health and High School Curriculum Guide.	Trial Design (Randomized Controlled Trial).	To evaluate the effectiveness of culturally adapted version of a school based MHL programme on teacher and student MHL.	(1) One private school was chosen from Phnom Penh capital city of Cambodia based on feasibility. (2) Consenting teachers were considered. (3) The teachers who had to play the role of training the students were selected in consultation with the school director. A total of 100 staff were contacted for recruitment. n= 73 (intervention: n = 36; control: n = 37) consented and returned the baseline assessment. Of those, 67 provided complete data for analysis (intervention: n = 34, 94%; control: n = 33	26	26
5.	Eustache et al. (2017). Rural Haiti. 'Teachers as *Accompagnateurs* Pilot Study (TAPS)'.	A prospective and convergent mixed methods design.	To deliver and evaluate the teacher training components of 'Teachers as Accompagnateurs Pilot Study' (TAPS).	(1) Schools were selected based on convenience and purpose for location. (2) Teachers from these schools were selected by the principals. N= 4 schools. n=22 teachers. (Out of the 24 teachers nominated, 22 teachers enrolled.)	25	25
6.	Kutcher et al. (2016). Tanzania. African Guide.	Quasi-Experimental Design (Pre-post intervention study).	To evaluate the impact of a culturally adapted MHL resource for refresher training on the mental health knowledge and attitudes of teachers.	Teachers were selected purposefully by the education administrative authorities from 35 secondary schools, Arusha and Meru district council. 75 teachers completed the refresher training. 61 completed the 3 days training.	23	23
7.	Wei et al. (2014 a). Canada. Go-To Educator Training (GTET).	Quasi-Experimental Design (Pre-post intervention study).	To evaluate the effectiveness of GTET training in early identification of mental disorders, triage and support, and attitudes toward mental illness conducted with the Halifax Regional School Board (HRSB) in the province of Nova Scotia, Canada.	Participants were selected by the principals of the Halifax Regional School Board, Canada. n=134 (from 40 schools.)	16	17
8.	Wei et al. (2014 b). Canada (nova scotia). Mental Health and High School Curriculum Guide.	Quasi-Experimental Design (Pre-post intervention study).	To study the impact on MHL (knowledge and attitude towards mental disorders) of teachers who were learning how to implement the GUIDE in classrooms.	(1) Seven English school boards (2) Teachers and trainers of these 7 boards were trained. n=228	13	13

9.	Kutcher et al. (2013). Canadian province of Nova Scotia. Mental Health Curriculum Guide.	Quasi-Experimental Design (Pre-post intervention study).	(1) To assess the effect of educator training on the use of 'Mental Health Curriculum Guide' and on the teacher knowledge and attitude towards mental disorders. (2) To evaluate the training outcomes on the use of mental health curriculum guide.	All grade 9 teachers from 37 schools of the Halifax Regional School Board (HRSB) were selected. These teachers taught the healthy living component of the provisional school curriculum at the school board. n=89. (Matched pre-post data available from 79 participants for the knowledge test, 74 participants for the attitudes test and 76 for the workshop evaluation survey.)	18	18
10.	Jorm et al. (2010). Australia. Modified Youth Mental Health First Aid Training.	Experimental Design (Cluster randomized controlled Trial).	To evaluate the impact of the intervention on teachers' mental health knowledge, stigmatizing attitudes, helping students, helping behaviours towards their students, knowledge of school policies and procedures for dealing with student mental health problems, support given to colleagues with mental health problems, seeking information about mental health problems and their own mental health.	The schools of South Australia were sent a letter by South Australian Department of Education and Children's Services explaining the study and inviting participation. The school had to be willing to be randomized. Schools were randomly assigned to waitlist or intervention group. Eligible and consenting teachers were included. 16 schools. n=327 (221 in the intervention group and 106 in the control group).	25	24
11.	Moor et al. (2007). Scotland. Schools Based Psychoeducational Intervention	Trial Design (Randomized Controlled Trial).	1. To understand the extent to which teachers report depressive illness in their pupils. 2. To know the effect of training on teacher recognition of depression. 3. To understand if combination of teacher training plus the use of pupil self-report data enhances the identification of depressed pupils. 4. To understand the effectiveness of a specially developed brief educational intervention in changing teachers' attitudes about adolescent depression.	(1) Eight secondary school were selected based on their willingness to participate and ability of the school to conduct the study within the research time frame and on the availability of an adequate number of teachers who could be released to participate in the teaching intervention. (2) The teachers with pastoral responsibilities were included. (3) The selected teachers were randomly assigned to experimental or control group. n=151	22	22
NON-INTERVENTION STUDIES						

12.	Page et al. (2021) Canada (Nova Scotia). Not an intervention study.	Cross sectional survey.	1. To explore the mental health literacy (MHL) of educators. 2. To explore if training and experience explains differences in MHL.	Doesn't give details. Only mentions about the Centres for Education from where the participants were recruited. n=81	37	37
13.	Arslan et al. (2023). Turkey. Not an intervention study.	Cross sectional survey.	To assess high school students' and teachers' knowledge levels, treatment beliefs, help-seeking attitudes, and stigmas toward mental illnesses.	From the selected schools, teachers who were present on the day of data collection were selected randomly. n=253	24	25
14.	Ngwenya et al. (2022). Estwatini. Not an intervention study.	Cross sectional survey.	To assess depression literacy among teachers in Eswatini and to explore the role of 'urbanicity'.	(1) Permission sought from the school's head teacher. (2) Invited eligible teachers to participate in the study and obtained their informed consent. n=983	29	29
15.	Yamaguchi et al. (2021). Japan (Nigata prefucture). Not an intervention study.	Cross sectional survey.	To examine MHL in East Asian high school teachers.	(1) In a seminar for Principals (n=75), details about the study were given. (2) 27 principals expressed interest in their school's participation. (3) Teachers from these schools participated in the study. n=665	19	19

16.	Mulla et al. (2020). Saudi Arabia (Riyad region). Not an intervention study.	Cross sectional survey.	To explore the mental health knowledge levels and the perceived barriers and readiness of teachers and staff in secondary schools in Riyadh to support their students' mental health.	(1) 35 schools were shortlisted from 120 female secondary schools. (2) On the day of the school visits, the teachers present were oriented about the study. (3) Those who agreed to participate, were given the informed consent and enrolled in the study. n=413	29	29
17.	Aluh et al. (2018). Southeast Nigeria.	Cross sectional survey.	To assess MHL among teachers in Nigeria, with a focus on depression.	Schools were randomly selected from South-East Nigeria. From these schools, all consenting teachers (120) were included. N=5 secondary schools. n=120 teachers. (104 questionnaires were adequately completed).	14	14
18.	Langeveld et al. (2011). Norway (Rogland County and Nord Trondelag County). Not an intervention study.	A cross sectional comparison design.	To find the effects of: (1) An early detection programme composed of an ongoing Information Campaign. (2) Low-threshold access to an early detection psychosis team. (3) MHL training programme on high school teachers' literacy about psychosis symptoms. (4) On teachers' confidence in the benefits of psychosis treatment on the mental health of pupils with psychotic symptoms.	(1) Principals were contacted for participation of the school. (2) On agreement, electronic link of the survey sent to all teachers. Anonymity was maintained and reminders were sent to non-respondents. (3) Some teachers responded. n=441 (Rogland: 318 teachers invited. 226 completed the survey. Nord Trondelag 366 were contacted, 220 completed the survey.)	21	21
19.	Masillo et al. (2012). Italy (Rome). Not an intervention study.	Cross sectional survey.	(1) To investigate the level of perception of psychosis and the ability to recognize a first psychotic episode among Italian secondary school teachers. (2) To assess the teachers' level of interest in increasing their knowledge of early signs of psychosis through educational courses.	(1) 8 schools were selected by the MHPs. (2) 268 out of 300 teachers agreed to fill the questionnaire. These 268 were the final participants. n=268	20	20

20.	Ozabaci et al. (2010) . Turkey (Eskisehir). Not an intervention study.	Cross Sectional survey.	To assess current knowledge about depression among teachers.	(1) Four schools who had adequate number of teachers, were willing and had the ability to take part within the timeframe were selected. (2) Interested teachers from these four schools. were selected. n=209	16	15
QA: Quality assessment						

To be located immediately after the heading “Study Characteristics”. This table will be followed by the text explaining the table results.

Table 2: Intervention Details

Author, Year, Country, Intervention Name	*Intervention Content Elements*		*Theory based*	*Duration*	*Implementation Details*	*Delivery Agent*	*Control Group Details*	*F/U*
1) Bichoualne et al. (2023). Morocco. Mental Health Curriculum Guide.	(1) Child and adolescent development/ mental health	×	×	Over 6 weeks. Each week had a 2-hour course.	✓	×	No control group.	×
	(2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	✓						
	c) Symptoms/ Identification strategies	×						
	(3) Treatment approaches	×						
	(4) Referral or access to mental health care	×						
	(5) Policies/ law	×						
	(6) Supporting strategies/students	✓						
	(7) Delivering intervention/curriculum with students	×						
	(8) Stigma	✓						
	(9) Others:	✓						
2) Wei et al. (2021). Canadian provinces. Go-To Educator Training.	1) Child and adolescent development/ mental health	✓	×	Varied across 6 sessions	With trainers- ✓ With teachers- ×	Study team members & Trained Core trainers.	No control group.	×
	2) Mental health disorders							
	a) Aetiology	✓						
	b) Types/ Classification	✓						
	c) Symptoms/ Identification strategies	✓						
	3) Treatment approaches	✓						
	4) Referral or access to mental health care	×						

	5) Policies/ law	×						
	6) Supporting strategies/students	✓						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	×						
	9) Others:	✓						
3) Nguyen et al. (2020). Vietnam. The Guide.	1) Child and adolescent development/ mental health	✓	×	3 days	×	MHP.	Did not receive intervention .	×
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	✓						
	c) Symptoms/ Identification strategies	×						
	3) Treatment approaches	×						
	4) Referral or access to mental health care	×						
	5) Policies/ law	×						
	6) Supporting strategies/students	×						
	7) Delivering intervention/curriculum with students	✓						
	8) Stigma	✓						
	9) Others:	✓						
4) Phoeun et al. (2019) Cambodia. The Mental Health and High School Curriculum Guide.	1) Child and adolescent development/ mental health	×	×	2+1 day	×	Lead researcher.	Did not receive intervention .	×
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	✓						
	c) Symptoms/ Identification strategies	×						
	3) Treatment approaches	×						

	4) Referral or access to mental health care	×						
	5) Policies/ law	×						
	6) Supporting strategies/students	✓						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	✓						
	9) Others:	✓						
5) Eustache et al. (2017). Rural Haiti. 'Teachers as *Accompagnateurs* Pilot Study (TAPS)'.	1) Child and adolescent development/ mental health	✓	✓	2.5 days	✓	Study team (clinicians).	No control group.	✓ (6-9 weeks after the training)
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	×						
	c) Symptoms/ Identification strategies	✓						
	3) Treatment approaches	✓						
	4) Referral or access to mental health care	✓						
	5) Policies/ law	✓						
	6) Supporting strategies/students	✓						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	×						
	9) Others:	✓						
6) Kutcher et al. (2016). Tanzania. African Guide.	1) Child and adolescent development/ mental health	×	×	Master trainers- 2 days. Teachers- 3 days.	×	MHPs (trained)	No control group.	×
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	✓						
	c) Symptoms/ Identification strategies	×						

	3) Treatment approaches	×						
	4) Referral or access to mental health care	×						
	5) Policies/ law	×						
	6) Supporting strategies/students	×						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	✓						
	9) Others:	✓						
7) Wei et al. (2014a). Canada. Go-To Educator Training (GTET).	1) Child and adolescent development/ mental health	×	✓	1 day.	✓	Programme team.	No control group.	×
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	×						
	c) Symptoms/ Identification strategies	×						
	3) Treatment approaches	✓						
	4) Referral or access to mental health care	✓						
	5) Policies/ law	×						
	6) Supporting strategies/students	✓						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	✓						
	9) Others:	✓						
8) Wei et al. (2014b). Canada (nova scotia). Mental Health and High School Curriculum Guide.	1) Child and adolescent development/ mental health	×	×	One day per school. Overall intervention	×	Study team.	No control group.	×
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	✓						

	c) Symptoms/ Identification strategies	×		period- 18 months.				
	3) Treatment approaches	✓						
	4) Referral or access to mental health care	✓						
	5) Policies/ law	×						
	6) Supporting strategies/students	×						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	✓						
	9) Others:	✓						
9) Kutcher et al. (2013). Canadian province of Nova Scotia. Mental Health Curriculum Guide.	1) Child and adolescent development/ mental health	✓	×	8 hrs	✓	Programme team.	No control group.	×
	2) Mental health disorders							
	a) Aetiology	×						
	b) Types/ Classification	×						
	c) Symptoms/ Identification strategies	×						
	3) Treatment approaches	×						
	4) Referral or access to mental health care	×						
	5) Policies/ law	×						
	6) Supporting strategies/students	×						
	7) Delivering intervention/curriculum with students	✓						
	8) Stigma	×						
	9) Others:	✓						
10) Jorm et al. (2010). Australia. Modified Youth Mental Health First Aid Training.	1) Child and adolescent development/ mental health	×	✓	Two days. 7 hours each day.	✓	Trained instructors.	Waitlist received intervention	✓
	2) Mental health disorders							
	a) Aetiology	×						

	b) Types/ Classification	✓					after the trial.	(6 months after intervention.)
	c) Symptoms/ Identification strategies (depression)	×						
	3) Treatment approaches	×						
	4) Referral or access to mental health care	×						
	5) Policies/ law	✓						
	6) Supporting strategies/students	✓						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	×						
	9) Others:	✓						
11) Moor et al. (2007). Scotland. Schools Based Psychoeducational Intervention	1) Child and adolescent development/ mental health	×	×	2 hrs	×	Study team (MHPs)	Received intervention .	×
	2) Mental health disorders							
	3) Aetiology	×						
	a) Types/ Classification	×						
	b) Symptoms/ Identification strategies (depression)	✓						
	c) Treatment approaches	✓						
	4) Referral or access to mental health care	✓						
	5) Policies/ law	×						
	6) Supporting strategies/students	×						
	7) Delivering intervention/curriculum with students	×						
	8) Stigma	×						
	9) Others:	✓						
MHP: Mental health professional. F/U: Follow Up. NA: Not applicable. ✓: Information available. ×: Information unavailable (or probably not a part of the study)								

To be located immediately after the heading titled “Intervention Details”. This table will be followed by the text explaining the table results.

Table 3: Study reports of Levels of MHL across domains

Author and Year	Study measures	How to obtain and maintain positive mental health.	Understand mental health disorders and treatment.	Decreasing stigma related to mental disorders.	Enhancing help-seeking self-efficacy (Knowing when and where to seek help)
1. Bichoualne et al. (2023).	1) Teacher Mental Health Literacy Curriculum Guide program survey. 2) The Devaluation of Consumer Scale (DCS) (Struening et al., 2001) 3) The Student Mental Health Self-Efficacy Teacher Survey (SMH-SETS, Brann et al., 2020).	NA	M	MS	M
2. Wei et al. (2021)	'Knowledge and stigma Questionnaire' developed and validated by the study investigators.	NA	L	LS	NA
3. Nguyen et al. (2020)	(1) The Vietnamese version of the 'Mental health Literacy Scale' (O'Connor & Casey, 2015). (2) Beliefs Towards Mental Illness Scale (BMI) (Hirai & Clum, 2000).	NA	M	Dangerousness-HS Interpersonal skills-MS Incurability-HS Willingness to interact-HS	M
4. Phoeun et al. (2019)	(1) Mental Health Knowledge Quiz (Kutcher, 2016). (2) Adapted version of the Mental Health Literacy Scale by O'Connor & Casey (2015). (3) Beliefs toward Mental Illness (Schunert, Khann, Kaoet et al, 2012).	NA	Mixed	NA	M
5. Eustache et al. (2017)	A questionnaire designed by the study investigators.	NR	58.8% (n=22)	LS	NR
6. Kutcher et al. (2016)	The questionnaire designed by Kutcher, Wei, McLuckie & Bullock (2013).	NA	M	LS	NA

7. Wei et al. (2014 a)	'Knowledge and Attitudes Questionnaire' designed by the study team.	NA	H	LS	NA
8. Wei et al. (2014 b)	Evaluated mental health knowledge and attitudes. Details of questionnaire were not reported.	NA	H	LS	NA
9. Kutcher et al. (2013)	A questionnaire designed by the study investigators.	NA	H	LS	NA
10. Jorm et al. (2010)	Questionnaires designed by the study investigators specifically for this study.	NA	H. Depression: 81.8% (n=221)	Mixed results	NA
11. Moor et al. (2007)	Questionnaires designed by the study investigators specifically for this study.	NA	Depression- Unclear	NA	NA
NON-INTERVENTION STUDIES					
12. Page et al. (2024)	(1) A bespoke questionnaire on student behaviours. (2) A bespoke questionnaire to measure mental health knowledge. (3) Stigma questionnaire (Milin et al., 2016).	NA	M	LS	NA
13. Arslan et al. (2023)	(1) Mental Health Literacy Questionnaire (MHLQ) (Jorm, 1997, 2006). Also had vignettes about depression, schizophrenia and social phobia. (2) Belief towards mental illness scale (Hirai et al, 2000).	NA	Depression: 45.5% (n=241). Schizophrenia: 47.9% (n=241). Social phobia: 27.9% (n=241). Poor MHL: 49.8% (n=120)	NR	(n=241). For depression: Psychologist: 90.9%. For schizophrenia: Psychiatrist: 90.9% For social phobia: Psychologist: 90%
14. Ngwenya et al. (2022).	Adolescent Depression Knowledge Questionnaire (Hart et al., 2014).	NA	Mixed results	NA	NA
15. Yamaguchi et al. (2021)	Mental Health Literacy questionnaire (in Japanese) designed by the study investigators.	NA	(n=665) Depression: 54.1% Schizophrenia- 35.3% Panic disorder- 78% Others: 58.1%	LS	NA
16. Mulla et al. (2020)	The Knowledge, Barriers and Perceived Readiness Survey (Reinke et al., 2011).	NA	Poor knowledge: 74.1% (n=306)	NA	NA
17. Aluh et al. (2018)	A bespoke questionnaire that contained vignettes depicting a depressed student adapted from Burns and Rapee (2006).	NA	Less than 50%.	NA	L

18. Masillo et al. (2012)	Italian version of the Knowledge and Experience of Social Emotional Difficulties among Young People (KESEDY) questionnaire.	NA	Mixed results	NA	Mixed results
19. Langveld et al. (2011)	Adapted version of the 'Questionnaire on Knowledge and Experience of Social and Emotional Difficulties Among Young People' by Doherty R, McLoughlin K, Johnson S et al. (2006).	Not applicable as the study was conducted after one of the sites was the recipient of a national programme on mental health.			
20. Ozabaci et al. (2010)	Questionnaire on attitude towards adolescent depression designed by the study investigators specifically for this study.	NA	Less than 50% on multiple items.	NA	NA

NR: Not reported.
NA: Not assessed.
H: High positive scores.
M: Moderate positive score.
L: Low positive scores.
HS: High stigma.
LS: Low stigma.
MS: Moderate stigma.

To be located immediately after the heading "MHL Level". This table will be followed by the text explaining the table results.

Table 4: Evidence of intervention effectiveness

Sl.No	Author & Year	Measures & time of assessment	Evidence of intervention effectiveness	Effectiveness outcomes at follow-up
1.	Bichoualne et al. (2023).	1. Knowledge 2. Attitude 3. Sefl-efficacy	Cohen's d 1. d=0.894, p<0.001. 2. d=0.983, p<0.001. 3. d=0.729, p<0.001.	NA
2.	Wei et al. (2021)	1. Knowledge 2. Stigma No details of time of assessment.	Cohen's d 1. d = 2.12, P < 0.001. 2. d = 0.14, P < 0.001.	NA
3.	Nguyen et al. (2020)	1. MHLS recognition 2. MHLS help-seeking self-efficacy 3. MHLS Stigma 4. MHLS willingness to interact 5. BMI dangerousness 6. BMI poor interpersonal & social skills 7. BMI incurability PT: Approximately 5 weeks after the training.	Partial eta square 1) R^2=.36, p<0.0001. 2) R^2=.19, p<0.0001. 3) R^2=.07, p<0.05. 4) R^2=.46, p<0.0001. 5) R^2=.30, p<0.0001. 6) R^2=.16, p<0.001. 7) R^2=.03	NA
4.	Phoeun et al. (2019)	1. MHLS recognition 2. MHLS help-seeking self-efficacy 3. MHLS stigma 4. MHLS willingness to interact 5. BMI dangerousness 6. BMI poor interpersonal & social skills 7. BMI incurability 8. MHL knowledge PT: Exact timeline is Unclear. A week after teachers delivered the intervention to students.	Semi-partial eta-square 1. R^2=.07, p<0.05. 2. R^2=.07, p<0.05. 3. R^2=.09, p<0.05. 4. R^2=.27, p<0.0001. 5. R^2=.19, p<0.0001. 6. R^2=.08, p<0.01. 7. R^2=.09, p<0.01. 8. .258	NA
5.	Eustache et al. (2017)	1. Knowledge 2. Attitude PT: Immediately after training F/U- 6-9 weeks after training	Cohen's d 1. d = 1.32, p < 0.001. 2. d = 0.60, p = 0.039.	Cohen's d 1) d = 1.28, p < 0.001. 2) d = 1.00, p = 0.002. Decline between measures in post-test and follow-up-No. 1. d = 0.14, p = 0.42. 2. d = 0.12, p = 0.64.
6.	Kutcher et al. (2016)	1. Mental health specific knowledge 2. Curriculum specific knowledge 3. Overall knowledge 4. Mental health attitude 5. Comfort in addressing mental health needs: d=0.19.	Cohen's d 1. d=1.14, p <0.001. 2. d=0.63, p <0.01. 3. d=.14, p <0.001. 4. d=0.61, p <0.001. 5. d=0.19, p>0.05.	NA

		PT: Approximately after a year.		
7.	Wei et al. (2014 a)	1. Knowledge 2. Attitude PT: Immediately after the training.	Cohen's d 1. d=2.3, p <0.0001. 2. d=0.36, p <0.0001.	NA
8.	Wei et al. (2014 b)	1. Knowledge 2. Attitude 3. Trainer teacher knowledge 4. Trainer teacher attitude PT: Immediately after the training.	Cohen's d 1. d= 1.85, p<0.0001. 2. d=0.51, p<=0.0001. 3. d =2.0, p =0.0001. 4. d=0.53, p<=0.046.	NA
9.	Kutcher et al. (2013)	1. Knowledge in general mental health literacy 2. Attitude PT: Immediately after the training	T-test 1. t (79) ¼ 9.52, p<0.0001 2. (t (74) ¼ 5.11, p<0.0001	NA
10.	Jorm et al. (2010)	1. Knowledge a. Knowledge Quiz b. Beliefs about treatment for depression 2. Personal stigma a. Depression as personal weakness b. Non-disclosure 3. Perceived stigma a. Non-disclosure by others 4. Intention to help others a. Discuss their concerns with another teacher b. Discuss their concerns with a counsellor 5. Confidence in helping students and staff with mental health problems a. In talking with students b. In helping a colleague 6. Strategies to support students with mental health problem a. Review/ changes in school policy b. Improve the relationships within the school c. Written policy in school to deal with student mental health PT: Immediately after the training. F/U: 6 months after training.	Mean diff./OR for pre vs post by intervention interaction (95% CI) 1. Knowledge a. 2.08 (1.38-2.78), p <0.001 b. 0.79 (0.23-1.34), p<0.01 2. Personal stigma a. 3.07 (1.16-8.14), p<0.05 b. 3.79 (1.34-10.71), p<0.05 3. Perceived stigma a. 2.57 (1.04-6.35), p<0.05 4. Intention to help others a. 3.73 (1.31-10.62), p<0.05 b. 3.87 (1.21-12.41), p<0.05 5. Confidence in helping students and staff with mental health problems a. 8.09 (1.89-34.63), p < 0.01 b. 7.22 (1.84-28.4), p<0.01 6. Strategies to support students with mental health problem a. 3.20 (1.12-9.14), p<0.05 b. 3.09 (1.12-8.52), p<0.05 c. 4.57 (1.28-16.26), p<0.05	Mean diff./OR for pre vs follow-up by intervention interaction (95% CI) 1. Knowledge a. 1.79 (1.06-2.52), p < 0.001 b. 0.79 (0.23-1.34), p<0.05 2. Personal stigma a. 2.47 (0.91-6.76) b. 3.42 (1.13-10.32), p<0.05 3. Perceived Stigma a. 1.32 (0.52-3.36) 4. Intention to help others a. 2.46 (0.86-7.05) b. 2.98 (0.90-9.91) 5. Confidence in helping students and staff with mental health problems a. 7.02 (1.65-29.79), p < 0.01 b. 11.65 (2.87-47.32), p < 0.001 6. Strategies to support students with mental health problem a. 2.44 (0.82-7.26) b. 3.26 (1.14-9.27), p<0.05 c. 7.28 (1.92-27.54), p<0.01

11.	Moor et al. (2007)	1. Pupils reported as depressed 2. Recognition of depressed pupils 3. Confidence in knowledge of depression 4. Confidence in ability to recognise depression 5. Skill in assessing for depression in pupils PT: Immediately after the training.	Anova 1. Experimental Vs Control: F=20:84, df=1132, p<0.0001). 2. No improvement McNemar's test 3. 14% pretraining versus 70% post training, p<0.001 4. 9% pre versus 47% post, p<0.001 5. 11% pre versus 61% post, p<0.001	NA
PT: Post Intervention Test. F/U: Follow up assessment				

To be located immediately after the heading "Evidence of Intervention Effectiveness". This table will be followed by the text explaining the table results.

Supplementary 1

Search String by Data Base

Web of Science

Search terms:

The following terms were used under the field of TOPIC:

"Secondary School"

"High School"

School

Teacher

Staff

Program

Intervention

Education

Training

Workshop

"mental health Literacy"

"mental health knowledge"

Combined with appropriate boolean operators.

Filters used:

Excluded: Document Types: Meeting abstracts, review articles, or proceeding papers

language: German

Search Date:

18.03.22

EBSCO (psychological and behavioural sciences collection)

Search terms:

((("secondary school") OR ("high school") OR (school)) AND ((teacher) OR (staff)) AND ((program*) OR (intervention) OR (training) OR (education) OR (workshop)) AND (("mental health literacy") OR ("mental health knowledge")).

Filters Used:

Removed the option of 'full text' (so, basically searches everywhere, not just full text)

Published Date: 20000101-20220231; Scholarly (Peer Reviewed) Journals

Expanders - Apply equivalent subjects

Search modes - Boolean/Phrase

Search date:

03/03/2022

PsychInfo via proquest

Search Terms

(MAINSUBJECT.EXACT.EXPLODE("Secondary Education") OR tiab("secondary school") OR tiab("high school") OR tiab(school)) AND (MJMAINSUBJECT.EXACT("High School Teachers") OR tiab(teacher) OR MJMAINSUBJECT.EXACT("School Administrators") OR tiab(staff)) AND (tiab(training) OR tiab(workshop) OR tiab(program) OR tiab(intervention) OR tiab(education)) AND (MAINSUBJECT.EXACT.EXPLODE("Mental Health Literacy") OR "mental health knowledge")

Filters used

1. Date.
2. Used the following filters:

   (1) Source type (from which I removed the following sources: Books, dissertations & theses)

   (2) methodology (from which I removed Qualitative Study; Interview; Literature Review; Focus Group; Systematic Review)

Search Date

18/03.2022

PUBMED

Search Terms

(#3 OR #4 OR #5) AND (#6 OR #7) AND (#8 OR #9 OR #10 OR #11 OR #12) AND (#13 OR #14)

#3: school[MeSH Major Topic]

#4: "secondary school"[Title/Abstract]

#5: "high school"[Title/Abstract]

#6: teacher[Title/Abstract]

#7: "school staff"[Title/Abstract]

#8: education[MeSH Major Topic]

#9: training[Title/Abstract]

#10: workshop[Title/Abstract]

#11: program[Title/Abstract]

#12: intervention[Title/Abstract]

#13: "mental health literacy"[Title/Abstract]

#14: "mental health knowledge"[Title/Abstract]

Filters Used

Date: 01/01/2000 to 28/02/2022

Search date:

28.03.22

ERIC

Search Terms

School AND (teacher OR staff) AND training AND ("mental health literacy" OR "mental health knowledge") -preschool -university -preservice -"systematic review"

Filters used

There was no option for filter. Studies from 2003 were shown.

Search Date

04/03/2022

Google Scholar

Search Terms

(“secondary school*” OR "high school") AND "Teacher training" AND (“Mental health literacy” OR “Mental health knowledge”) -book -protocol

Filters used

Date: 01/01/2000 to 28/02/2022

Search Date

16/03/2022

Updated Search (Conducted in April 2024)

Web of Science

Search terms:

The following terms were used under the field of TOPIC:

"Secondary School"

"High School"

School

Teacher

Staff

Program

Intervention

Education

Training

Workshop

"mental health Literacy"

"mental health knowledge"

Combined with appropriate boolean operators.

Filters used:

Excluded: Document Types: Meeting abstracts, review articles, or proceeding papers

language: German

Year Filter: 2022 to 2024

Search Date:

29.04.2024

EBSCO (psychological and behavioural sciences collection)

Search terms:

(((("secondary school”) OR ("high school”) OR (school)) AND ((teacher) OR (staff)) AND ((program*) OR (intervention) OR (training) OR (education) OR (workshop)) AND (("mental health literacy”) OR ("mental health knowledge")).

Filters Used:

Removed the option of 'full text' (so, basically searches everywhere, not just full text)

Published Date: 20220101-20241231; Scholarly (Peer Reviewed) Journals

Expanders - Apply equivalent subjects

Search modes - Boolean/Phrase

Search date:

29.04.2024

PsychInfo via proquest

Search Terms

(((mainsubject("Secondary Education") AND pd(2022-2024)) OR (abstract("secondary school") AND pd(2022-2024)) OR (abstract("high school") AND pd(2022-2024)) OR (abstract(school) AND pd(2022-2024))) AND ((mainsubject("High School Teachers") AND pd(2022-2024)) OR (abstract(teacher) AND pd(2022-2024)) OR (mainsubject("School Administrators") AND pd(2022-2024)) OR (abstract(staff) AND pd(2022-2024))) AND ((abstract(training) AND pd(2022-2024)) OR (abstract(workshop) AND pd(2022-2024)) OR (abstract(program) AND pd(2022-2024)) OR (abstract(intervention) AND pd(2022-2024)) OR (abstract(education) AND pd(2022-2024))) AND ((mainsubject("Mental Health Literacy") AND pd(2022-2024)) OR (abstract("mental health knowledge") AND pd(2022-2024)))) AND (stype.exact("Scholarly Journals") AND pd(20220201-20240430))

Filters used

Used the following filters:

1) Date: 2022-2024

2) Journal type: Scholarly Journal.

Search Date

29.04.2024

PUBMED

Search Terms

(#1 OR #3 OR #5) AND (#7 OR #9) AND (#11 OR #13 OR #15 OR #17 OR #19) AND (#21 OR #23)

#23:"mental health knowledge"[Title/Abstract]

#21:"mental health literacy"[Title/Abstract]

#19: intervention[Title/Abstract]

#17: program[Title/Abstract]

#15: workshop[Title/Abstract]

#13: training[Title/Abstract]

#11: education[MeSH Major Topic]

#9: "school staff"[Title/Abstract]

#7: teacher[Title/Abstract]

#5: "high school"[Title/Abstract]

#3:"secondary school"[Title/Abstract]

#1: school[MeSH Major Topic]

Filters Used

2022 to 2024

Search Date

27.04.2024

ERIC

Search Terms

School AND (teacher OR staff) AND training AND ("mental health literacy" OR "mental health knowledge") -preschool -university -preservice -"systematic review"

Filters used

Date: Since 2020.

Search Date

27.04.2024.

Google Scholar

Search Terms

(“secondary school*” OR "high school") AND "Teacher training" AND (“Mental health literacy” OR “Mental health knowledge”) -book -protocol

Filters used

Date: 2022 to 2024

Search Date

27/04/2024

My responses:

✓: Reported.

×: Not reported

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	✓ Pg 1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	✓ Abstract. Pg 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	✓ Introduction
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	✓ Introduction: Last paragraph
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	✓ Inclusion & exclusion criteria in the methods section.
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	✓ Search strategy and supplementary material.
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	✓ Supplementary material.
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	✓ Section on study selection.
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	✓ Section on Data extraction.
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	✓ Inclusion criteria.
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	×
Study risk of bias	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how	✓ Section on Quality assessment.

Section and Topic	Item #	Checklist item	Location where item is reported
assessment		many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	NA as we did not use meta-analysis.
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	NA
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	NA
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	NA
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Just mentioned that narrative synthesis will be conducted.
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	NA
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	NA
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	NA
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	✓ Study selection in the Results section.
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	NA
Study characteristics	17	Cite each included study and present its characteristics.	✓ Table 1 and its explanation (Results section).
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	✓ Table 5 and its explanation (Results section).
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	NA
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	NA
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If	NA

Section and Topic	Item #	Checklist item	Location where item is reported
		comparing groups, describe the direction of the effect.	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	NA
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	NA
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	NA
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	✓ First paragraph (Discussion section)
	23b	Discuss any limitations of the evidence included in the review.	✓ Paragraphs 4 and 8.
	23c	Discuss any limitations of the review processes used.	✓ Paragraph 7
	23d	Discuss implications of the results for practice, policy, and future research.	✓ Pragarph 8.
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	✓ Materials & methods: First paragraph.
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	✓ Materials & methods: First paragraph, first 3 lines.
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	✓ Acknowledgment.
Competing interests	26	Declare any competing interests of review authors.	✓ Declaration of interest.
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	×

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71