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Systematic Review

The Effect of Belonging-Oriented Psychosocial Interventions for Medical Students: An Exploratory Systematic Review and Meta-Analysis

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Abstract

Although one of the most common coping strategies for medical students is seeking interpersonal support, evidence shows that they often experience social isolation and low levels of emotional support and belonging, putting them at risk for increased stress and depression. In this exploratory systematic review and meta-analysis, we completed a comprehensive literature search including multiple databases to identify interventions used to increase belonging-oriented psychosocial outcomes among medical students. $N = 5$ articles ($k = 7$) were eligible for inclusion. Meta-analysis with the random effects model suggests that belonging-oriented psychosocial interventions may have a small, positive effect on improving feelings of belonging, $g = 0.25$, 95% *CI* [0.01–0.50], 95% *PI* [−0.52–1.02], $p = 0.045$. However, heterogeneity was substantial ($Q = 9.92$, p of $Q = 0.04$, $I^2 = 59.69\%$, $T = 0.21$, $T^2 = 0.04$), and risk of bias was substantial. Subgroup analysis was precluded by the low number of primary studies. Further investigation into belonging-oriented psychosocial support among medical students would be beneficial to determine if these interventions are effective, and if so, ideal intervention types, modalities, facilitators, and durations.

Keywords: social support; emotional support; belonging; medical students; medical education

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1. Introduction

Medical students have higher rates of suicide, depression, burnout, and anxiety than the general population [1–6]. This has been attributed to rigorous coursework, perceived lack of control over their own time, and exposure to patient mortality [5]. The high amounts of stress medical students experience contribute to negative effects such as poor mental health and substance use [5]. It has been shown that medical student depression progressively worsens throughout their education, although students begin their training with the same level of depression as their non-medical student peers [7]. Further research supports that burnout and depression among medical trainees leads to more errors in the field throughout their careers [8]. Therefore, there is a need for programs which reduce the risk of chronic stress and burnout for students in order to better support them as future physicians [9].

One of medical students' most utilized coping mechanisms is seeking social support [10]. It has been shown that feeling emotionally and psychologically supported while

in educational training reduces the risk of burnout [9,11–13]. Nevertheless, wellness programs at medical schools may not commonly focus on social support or may provide opportunities for social connection and belonging without tracking outcomes [14]. At least one previous study has shown a negative correlation between social support and academic performance, attributing these results to the social demands on medical student's time, and suggesting that interventions may need to balance time management with social support in order to avoid negatively impacting student performance [15].

For the purposes of this exploratory review of emerging interventions, we included outcomes of belonging, loneliness, social isolation, and interpersonal support, which are related but not interchangeable concepts [16–18]. With more research in this area, future studies should be able to distinguish between each construct, and which interventions best address each concern. With a limited number of primary studies, we wished to do a preliminary evaluation with the broadest possible definition, which we labeled "belonging-oriented psychosocial interventions." Research supports that medical students who have little sense of belonging would also be likely to report loneliness, social isolation, and low interpersonal support, but this deserves further attention as the field expands [16–18]. For example, a study among n = 154 medical students found that a sense of belonging significantly predicted less loneliness [17]; in n = 386 health profession students, loneliness was significantly associated with social isolation [18]; and among n = 466 medical students, higher social support was associated with less loneliness [19].

Peer and near-peer support has been identified as potentially the most beneficial level of support for medical students [20,21]. Barriers to seeking support from faculty or professionals in the medical field include fear of impacting their future careers negatively, and belief that the support would not be as helpful as that from peers [21]. As we wanted to focus on belonging-oriented outcomes, we chose to focus on peer and near-peer groups and exclude interventions such as career mentorship and faculty advising that come from a separate social group and may have a power differential [22]. Belonging-oriented psychosocial interventions focus on a sense of being connected in one's social network, participating in peer groups, and a feeling of togetherness [16].

Therefore, the current systematic review and meta-analysis had the following aims: (1) assess the effect of peer-to-peer or near-peer social support interventions on belonging among medical students, and (2) identify which interventions and interventional characteristics may show the most promise for increasing social support and belonging among medical students.

2. Materials and Methods

This article adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [23]. The review was not pre-registered. Decisions to use the random effects model, selection of outcome measures, and coding decisions were all made a priori (see Document S1 for Codebook document).

2.1. Inclusion and Exclusion Criteria

Inclusion criteria were set as articles which (1) included a social support, emotional support, interpersonal support, or belonging intervention for medical students inclusive of interventions which provided peer or near-peer support in the medical school setting (classmates, upper- or lower-classmen in the same program, upper- or lower-classman in other health professions programs); (2) had an outcome measure of belonging, interpersonal support, emotional support, loneliness, social isolation, or similar; (3) consisted of a medical student population anywhere in the world in a medical doctor, osteopathic doctor, or bachelors/master's in medicine program; and (4) any study design including

randomized controlled trial (RCT), quasi-experimental two-arm study, or pre–post studies. Exclusion criteria were set as (1) mixed population without separately reported outcomes (e.g., medical and dental students combined); (2) gray/unpublished literature; (3) reviews, opinions, or articles not published in a peer-reviewed journal; (4) alternative physician trainees (e.g., naturopathic physicians); (5) support focused on career mentorship as opposed to broader emotional support; and (6) not written in or translated into English. No limitations were placed on date, location, or sample size.

2.2. Search Strategies

Databases were searched between 5 and 20 November 2025 and included EBSCOhost (Academic Search Elite; Alt Healthwatch; Business Source Elite; CINAHL; ERIC; Health Source-Consumer Edition; Health Source-Nursing/Academic Edition; Library, Information Science & Technology Abstracts; MAS Ultra-School Edition; Military & Government Collection; Primary Search; APA PsycInfo; and MEDLINE); PubMed; and Web of Science. Search terms included "(medical students or medicine students or students in medicine) AND (social support or social networks or social relationships or belonging or community or emotional support or interpersonal support) AND intervention." Filters were used for English language and peer-reviewed. Bibliographic searching was not used as there were no journals with multiple eligible studies identified.

2.3. Data Management

Zotero (v8.0.4) was used for search results, duplicate numbers, and citation tracking and Excel for codes and inclusion/exclusion criteria.

2.4. Data Extraction and Coding

Guidance from Cooper et al. assisted in developing a codebook [24]. Authors were trained in meta-analytic techniques. Codes included article information (e.g., authors, title, year of publication, country of research), sample characteristics (e.g., degree, mean age, gender, race), design components (e.g., study design, blinding, randomization), intervention details (e.g., name, goal, duration, frequency), outcomes (e.g., name, time point, direction of effect) and information for effect size (e.g., sample size, pre/post measure mean, standard deviation or standard error, p level). The most proximal post-intervention point was chosen if multiple time points were completed. The PI screened titles and abstracts, and two authors independently screened each full-text article, coded eligible articles and then compared codes. When there was disagreement, discussion ensued and the PI was the tie-breaking vote.

2.5. Data Analysis

Comprehensive Meta-Analysis Software (v4) was used for meta-analysis [25]. The random-effects model was used due to the source of articles from the literature and expected heterogeneity [26]. Hedge's g was used to determine the standardized mean difference effect size [27]. p-values less than 0.05 were set as statistically significant. Cohen's classifications of effect sizes were used: small ($\leq$0.20), medium (~0.50), or large ($\geq$0.80) [28]. A positive effect size was chosen to indicate an intervention which increased social support or sense of belonging and vice versa, and directionality was set accordingly.

Primary studies' risk of bias was evaluated with Cochrane's Risk of Bias tool version 2 (RoB2) for RCTs and the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) for quasi-experimental and pre/post studies [29,30]. Each study was rated independently by two researchers (AL and ELS for RoB2, HM and NW for ROBINS-I) and reconciled with discussion. The RoB2 assesses bias arising from (1) randomization or lack thereof, (2) protocol deviations, (3) data missingness, (4) outcome measure validity, and (5) selection

of reported results [29]. The final evaluation is "low risk of bias," "some concerns," or "high risk of bias" [29]. The ROBINS-I has researchers rate domains related to pre-intervention (e.g., participant selection), intervention (e.g., protocols), and post-intervention (e.g., drop-outs) [30]. Publication bias was assessed with the Trim and Fill test, funnel plot, and Egger's regression intercept [31–33].

3. Results

Database searching identified 2222 articles, from which 462 duplicates were removed, leaving 1760 abstracts for screening (Figure 1). Not all searched constructs were found in eligible articles (e.g., no eligible primary articles on "community support" were found). From Burt-Miller et al. [34] we extracted the PROMIS Social Isolation-Short Form and the Modified Simple School Belonging measures, which were combined in CMA. Li et al. [35] used the Interpersonal Support Evaluation List (ISEL) scale, of which we extracted only the Belonging subscale data. From Cheng et al. [16] we extracted data from the PROMIS Social Isolation Scale and Social Connectedness Scale. See Tables 1 and 2 for outcome measure data. After title/abstract screening 41 full texts were sought for retrieval with one unable to be retrieved. Thirty-four of the full texts were excluded, leaving five articles to be included in the meta-analysis (see Figure 1). Articles' characteristics are in Table 1.

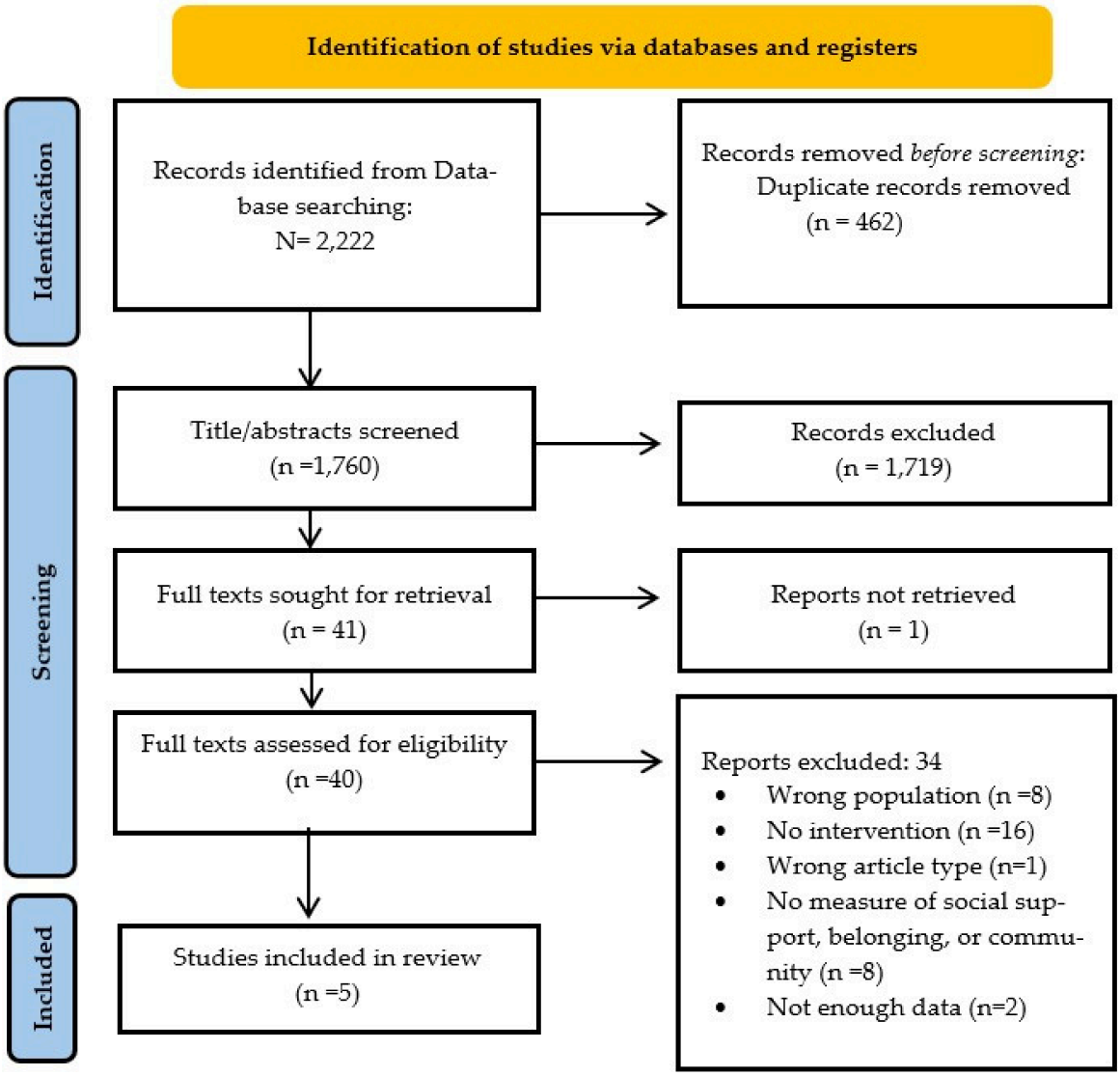


Figure 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flowchart of search [18].

Table 1. Characteristics of eligible articles with interventions for social support for medical students.

Study/Location	Design	Intervention	Sample Characteristics	Results/Outcome Measure
Burt-Miller et al. (2025) [34] United States	Pre/post one-arm	Duration in wks: 8 Session duration: 1 h Frequency: 1x/wk Total no. sessions: 8	*n*: 48 Mean age: 24.9 (SD: 2.6) % female: 72.9 % White: 54.2	g = 0.30 PROMIS Social Isolation Short-Form and Modified Simple School Belonging Scale
Cheng et al. (2022) [16] United States	Pre/post one-arm	Duration in wks: 1 AY Session duration: 30 min Frequency: NR Total no. sessions: 3	*n*: 63 Age range: 24–26 % female: 66.7 % White: 55.6	g = 0.35 PROMIS Social Isolation Short-Form and Social Connectedness Scale
Gold et al. (2019) [14] United States	Pre/post one-arm	Duration in wks: 26 Session duration: 1 h Frequency: Bimonthly Total no. sessions: 13	*n*: 25 Mean age: NR % female: 83.3 % White: NR	g = 0.55 Revised UCLA Loneliness Scale
Li et al. (2014) [35] China	Non-randomized two-arm trial	Duration in wks: 8 Session duration: 1 h Frequency: 1x/wk Total no. sessions: 8	*n*: 29 Mean age: 23.5 (1.0) % female: 55.2 % White: NR	g = 0.51 Interpersonal Support Evaluation List (ISEL) Belonging subscale
Perry et al. (2021) [36] United States	RCT	Duration in wks: 3 Session duration: 1 h Frequency: 1x/wk Total no. sessions: 3	*n*: 416 Mean age: 25.2 (3.0) % female: 58 % White: 43.8	g = −0.06 Situational Belonging scale

AY: academic year; h: hour(s); NR: not reported; RCT: randomized controlled Trial; SD: standard deviation; wks: weeks.

3.1. Study and Participant Characteristics

Five studies were eligible, inclusive of seven separate datasets (see Table 1). Four of the studies took place in the United States and one in China [35]. Three of the studies were one-arm pre/post design [14,16,34], one was a two-arm quasi-experimental study [35], and one an RCT [36] (see Table 1). Participant number ranged from 25 to 416. All studies had a higher percentage of female compared to male participants, ranging from 55.2 to 83.3%. Three studies reported race demographics [16,34,36]. Individual effect sizes ranged from g = −0.06 to 0.55. All studies used different outcome measures except two used the PROMIS Social Isolation-Short Form along with other measures [16,34], resulting in six separate outcome measures (see Tables 1 and 2).

3.2. Intervention Characteristics

The Williams LifeSkills training intervention had students participate in eight two-hour sessions led by peers, directed at improving coping skills and providing peer-to-peer interpersonal support [35]. This involved increasing awareness of distressing situations and empathy development, as well as listening, positive interactions with others, and problem-solving skills [35]. The modes of learning in the training sessions included role-playing and group practice exercises [35]. Interpersonal support increased significantly within the intervention group (p = 0.008) and was unchanged in the control group [35].

The Build and Belong intervention utilized peer-to-peer interactions to normalize uncertainty around belonging [16]. Third- and fourth-year medical students were responsible for writing reflections on challenges they had faced in medical school thus far and how they overcame them, as well as sharing the reflections in a video [16]. First- and second-year medical students then watched the videos in small, facilitated groups where they could discuss the content, for example, the assertion from upperclassman that a feeling of belonging increases over time [16]. Students recognized their own experiences and became more comfortable with building the community of support around themselves [30]. Social isolation decreased significantly post-intervention ($p < 0.001$), with the largest reductions in male and African American students [16].

The Self-Affirmation study compared Black and White students' experience of belonging during medical school and tested if a self-affirmation intervention assisted with increasing sense of belonging [36]. Second-year students in the intervention completed a values-affirmation task on three occasions over the course of one year [36]. In the task, students made a ranking of personal values such as relationships, creativity, and religion and were then asked to write about why the top-ranked value was important to them [36]. Black students, compared to White students, were found to have a lower sense of belonging both before and after the intervention [36].

Stanford reflection groups held 1.5 h meetings for first- and second-year medical students every other week for a minimum of six months, facilitated by pairs of psychiatry residents [14]. The goal of these meetings was to create a safe space to regularly discuss their shared experiences under the guidance of near peers (residents recently removed from the medical school experience) [14]. Contents of the group meetings were student-generated and unstructured, with a focus on stress, identity as a medical student, relationships, and clinical obstacles [14]. The aim was to increase connectedness among peers and decrease loneliness, as well as to teach coping skills and self-awareness [14]. Students agreed that the groups increased feelings of connection, but attrition was high, with students reporting they were too overwhelmed by coursework to attend groups [14].

Drawn from the South African philosophy *Ubuntu* (meaning "I am because you are"), small groups were created to foster connection and reduce social isolation via sharing stories [34]. For eight weekly one-hour meetings, prompts centered on both positive and negative life experiences (e.g., share about a time you were in a group who identified differently than you) [34]. Social isolation was significantly improved post-intervention [34].

Please see Table 2 for the psychometrics of the belonging-oriented psychosocial outcomes, and the connections of outcomes to underlying constructs.

Table 2. Characteristics of the belonging-oriented psychosocial outcomes.

Study	Outcome Measure and Direction	Underlying Construct(s)	Psychometric Properties	Construct Definition
Burt-Miller et al. (2025) [34]	(1) PROMIS Social Isolation Short-Form [37] Higher score = greater social isolation (2) Modified Simple School Belonging Scale [38] Higher score = greater sense of belonging	Belonging and Social isolation	PROMIS Reliability: Standard error of measurement $\leq$ 3.0 (~0.9 reliability) Validity: Pearson's correlation coefficients r = 0.52 to 0.76 [39] Simple School Belonging Scale: Reliability: Cronbach's α = 0.91 Construct validity r = 0.64 [40]	Belonging: The "extent to which students feel personally accepted, respected, included and supported by others in the school environment" [38] "Quality of social support refers to functional aspects of supportive relationships, i.e., interpersonal relationships that serve particular functions. This includes the interactive process by which emotional, instrumental or informational support is obtained from one's social network. It also includes companionship, feeling cared for and valued as a person, communication with others, and feelings of belonging and trust." [40]
Cheng et al. (2022) [16]	(1) PROMIS Social Isolation Short-Form [38] (see above) (2) Social Connectedness Scale [41] Higher score = better connectedness	Social isolation and social connectedness	PROMIS: See above Social Connectedness Scale Reliability: Raykov's rho 0.78–0.81 Validity: High convergent and discriminatory validity [42]	"Social connection/connectedness is a multidimensional construct that is defined as a continuum of the size and diversity of one's social network and roles, the functions that these relationships serve, and their positive or negative qualities." [41]
Gold et al. (2019) [14]	Revised UCLA Loneliness Scale [43] Higher score = greater loneliness	Loneliness	Reliability: Cronbach's α = 0.89–0.96 [41,42] Test–retest reliability r = 0.73 [44] Construct validity shown by "significant relationships with measures of interpersonal relationships" [44]	". . .designed to measure one's subjective feelings of loneliness as well as feelings of social isolation." [45] ". . .reflection groups may be a feasible, effective intervention to improve loneliness and social belonging in medical school." [36]
Li et al. (2014) [35]	Interpersonal Support Evaluation List (ISEL) [46] Four subscales; only Belonging subscale coded here. Higher score = greater interpersonal support	Belonging	Reliability: Cronbach's α = 0.83 Validity: Moderate relationship between ISEL (r = 0.45) and belonging subscale (r = 0.38) and the Lubben Social Network Scale (LSNS) [47]	". . .belonging support [refers] to the perceived availability of others for companionship." [35]

Table 2. *Cont.*

Study	Outcome Measure and Direction	Underlying Construct(s)	Psychometric Properties	Construct Definition
Perry et al. (2021) [36]	Adapted from the Situational Belonging scale [48] Higher score = greater sense of belonging	Belonging	Reliability: Cronbach's $\alpha = 0.91$ Validity: not reported [48]	"One important psychological threat that people may be vigilant to is social identity threat—a threat that occurs when people recognize they may be devalued in a setting because of one of their social identities. . . by triggering objective experiences of identity threat (e.g., cognitive and physiological vigilance) and subjective experiences of identity threat (e.g., a decreased sense of belonging. . .). . . subtle situational cues may have powerful and far-reaching effects. . ." [48]

3.3. Mapping Scale Constructs to Belonging-Oriented Psychosocial Interventions

Three of the six outcome measures directly measured belonging, while two others measured loneliness [14] and social isolation [16]; see Tables 1 and 2. For the two articles which did not directly measure belonging, both Burt-Miller et al. [34] and Cheng et al. [16] used the Patient-Reported Outcomes Measurement Information System (PROMIS) social health framework [37,39], specifically the Social Isolation Subscale. Social health in this framework comprises social function and social relationships, each with several sub-constructs, including social isolation [37]. The definition of social isolation specifically called out belonging: "...companionship, feeling cared for and valued as a person, communication with others, and feelings of belonging and trust." [37] Cheng et al. also used the Social Connectedness Scale, which is defined as a person's social network and roles, the functions that the relationships contribute to, and their positive or negative qualities [42]. Social connectedness directly links to belonging [42]. Gold et al. used the Revised UCLA Loneliness Scale, which defined loneliness as "one's subjective feelings of loneliness as well as feelings of social isolation..." [45]. Participants identified belonging as one of the benefits of the groups, and the authors suggest that social belonging was a positive benefit of their intervention, with further research warranted on belonging among medical students [14].

3.4. Summary Effect Size

Belonging-oriented psychosocial interventions may have a small effect on improving feelings of belongingness (g = 0.25, 95% *CI* [0.01–0.50], 95% *PI* [−0.52–1.02], p = 0.045; Figure 2). However, heterogeneity was significant and substantial (Q = 9.92, p of Q = 0.04, I^2 = 59.69%, T = 0.21, T^2 = 0.04). A one-study-removed sensitivity analysis was completed which did not alter the results. Additionally, a sensitivity analysis was performed by assessing results with the removal of the RCT [36], which theoretically would have higher rigor; this increased the summary effect size to g = 0.36, p < 0.001, indicating that the RCT is decreasing the overall effect size. Separate meta-analyses with RCTs vs. non-randomized studies are recommended, but with only one RCT we have left it in to avoid artificially inflating the summary effect size.

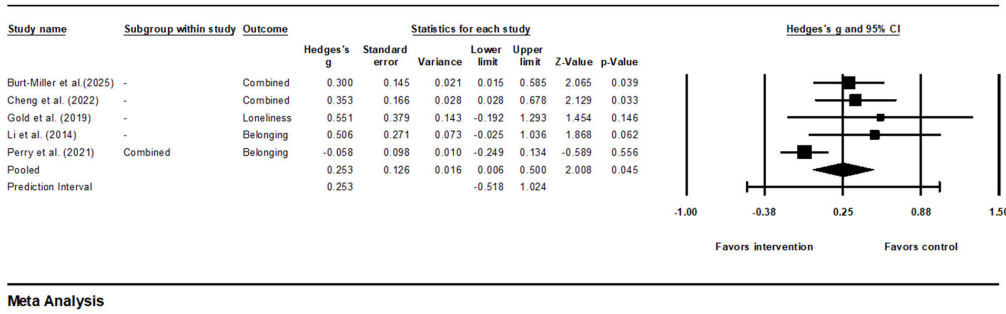


Figure 2. Forest plot of social support interventions from eligible primary articles. Burt-Miller et al. (2025) [34]; Cheng et al. (2022) [16]; Gold et al. (2019) [14]; Li et al. (2014) [35]; Perry et al. (2021) [36].

3.5. Publication Bias

Several statistical tests are used to evaluate if publication bias may have affected results of the meta-analysis, including the Trim and Fill, funnel plot, and Egger's regression intercept [31–33]. The Trim and Fill test delivers an adjusted mean by correcting for how many studies "should" be in the funnel plot to balance it; the test for this meta-analysis revealed an adjusted g = 0.12 [31]. The funnel plot (Figure 3) can be visually inspected to assess for "empty spaces" which should hypothetically have studies, particularly in the lower left of the pyramid in which studies with lower effect sizes and lower sample sizes would appear [32]. In Figure 3 the lack of studies in the lower left section of the

pyramid can be appreciated. Egger's regression intercept test regresses the primary article's standardized effect sizes on their associated precisions, which without publication bias should result in a regression intercept of 0 [32,49]. In this case the regression intercept is 2.90, $p = 0.07$ (non-significant). With a small sample size, publication bias estimates may not be reliable and are likely to underestimate bias.

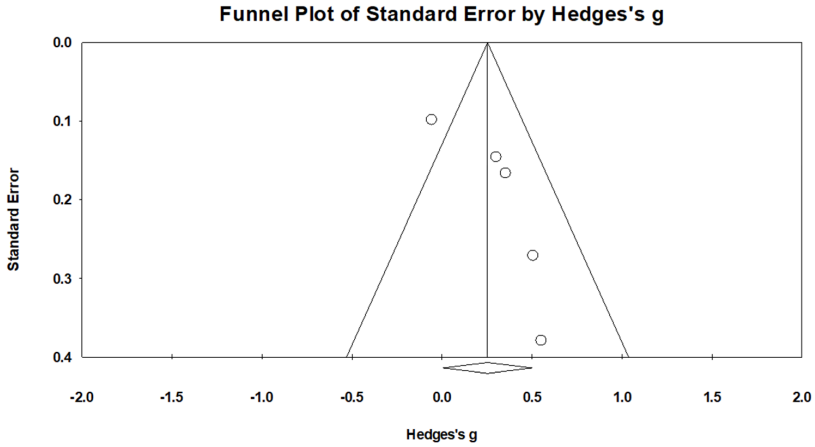


Figure 3. Funnel plot of publication bias for primary articles.

3.6. Moderator Analyses

Meta-regression was performed on available continuous variables (number of weeks of intervention, frequency of sessions per month, average duration of sessions in hours, and total number of sessions). No meta-regressions were significant. There was not enough data to perform subgroup analyses (e.g., preclinical vs. clinical students), as subgroups are recommended to have a minimum of four data points [26].

3.7. Risk of Bias in Primary Studies

All studies posed some or high risk of bias in their summary rating (see Figure 4a,b). Bias due to potential confounding and classification of interventions was common.

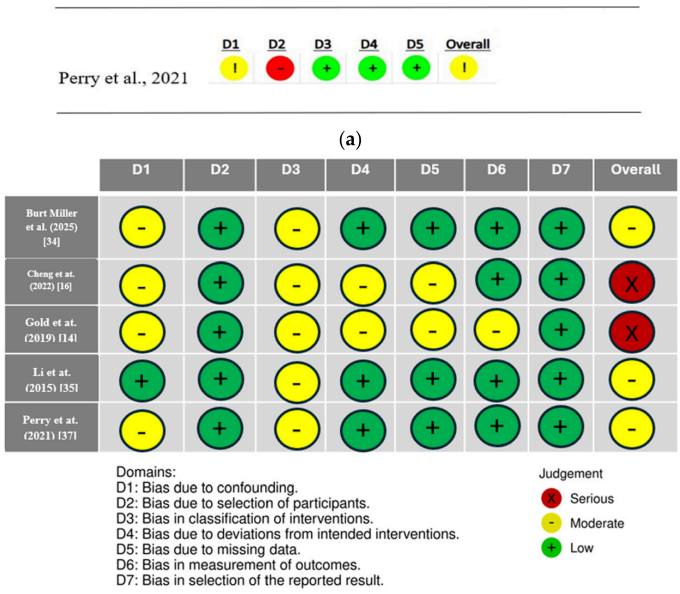


Figure 4. (**a**) RoB2 risk of bias in the single RCT study [29]. Key: Green: low risk; Yellow: some concerns; Red: high risk; D1: randomization process; D2: deviations from intended interventions; D3: missing outcome data; D4: measurement of outcomes; D5: selection of reported results [29]. (**b**) ROBINS-I risk of bias in the non-randomized studies [30].

4. Discussion

This exploratory systematic review and meta-analysis is a preliminary evaluation of the efficacy of belonging-oriented psychosocial interventions among medical students, with a small sample size of five eligible articles ($k = 7$). The results suggest that belonging-oriented psychosocial interventions may have a small but significant effect on increasing feelings of belonging ($g = 0.25$, $p = 0.045$), but the results need to be interpreted with caution due to sample n and k, high heterogeneity, high risk of bias, and likely publication bias. More research is needed, particularly RCTs, of which there was only one. The literature advances that support for the emotional, mental, and physical needs of students in vigorous training programs such as medical school likely need to be multi-factorial, but social support may be under-utilized as an option [17]. Small-group interventions may be flexible, low-cost, and able to address the needs of multiple students at once but should be weighed against other viable options [14,16,34–36].

Meta-regressions were not significant but a trend towards belonging-oriented psychosocial interventions with more hours per session was noted. Further investigation into the session length's relationship to efficacy should be done when more primary studies are eligible. Hypothetically, interventions with longer sessions may allow for a deeper sense of interpersonal connection and willingness to share about oneself, which may then have a more significant impact on sense of support [50,51]. In small groups, time together has been shown to establish comfort and increase vulnerability [51,52]. This suggests that focusing on the depth of the individual sessions may be more important than frequency or total number of sessions. Given the time restraints on medical students, fewer, slightly longer sessions may be preferrable, but further research is needed before any conclusions can be drawn.

Three of the six outcome measures directly measured belonging [34–36], while others included loneliness [35], social isolation [16,34], and social connectedness [16], which are associated with belonging through their conceptual models [14,16,34–37,42,45]. However, even among the primary articles which measured belonging, definitions varied (see Table 2). While the importance of belonging among classmates is well known, there is a lack of consistency in how belonging is defined and operationalized [52,53]. There are many related constructs in the literature [49], and theories of social health have used different conceptual models from different disciplines [37]. Available measures reflect these variable theoretical frameworks [37]. The wide variety of ways in which social support has been defined and measured may point to a need for specificity in defining social support [47].

4.1. Practical Implications for Medical Education

The life of a medical student is often structured with little discretionary time. Students may spend 10–12 h a day studying; one outline of a typical day in the life of a first-year medical student described lectures from 8 am to 4 pm, studying from 4:30 pm until 7 pm, and then "at 8:00 pm to late night-study, study, and more studying until you fall asleep, and do it all over again the next day" [54]. Therefore, academic workload may pose a significant barrier to the implementation of belonging-oriented psychosocial interventions. In the study by Gold et al., student groups were scheduled to meet every other week for 1.5 h, but 84% did not continue due to feeling overwhelmed by coursework [14]. Cheng et al. cited a 60.3% retention rate, explaining challenges retaining third- and fourth-year students due to factors such as clinical and audition rotation schedules [16]. Previous studies have shown a negative correlation between social support and academic performance due to the demands that social activities placed on medical students' time [15].

However, the finding of longer individual sessions improving belonging-oriented outcomes, with no significant impact of the total number of weeks, frequency of sessions per

month, or total number of sessions, may suggest a strategy to maximize the effectiveness of the intervention while decreasing time burden. It also opens the door to more infrequent interventions to benefit belonging, such as medical student retreats, social programming, or "Wellness Weeks" [55]. One example of this is "Wellness-in-Action," a session in which students pick from a wide variety of wellness activities like dodgeball, pet therapy, board games, and Zumba [55].

Longitudinal programs such as learning communities and peer mentorship may offer robust psychological and social support benefits [55–57]. Studies have found that creating academic communities for longitudinal academics and extracurriculars results in an increased sense of community and sense of connectedness to faculty, and that peer mentoring programs result in both academic benefits as well as improved connection, relationships, and communication [56–58].

4.2. Recommendations for Future Research

This systematic review and meta-analysis explores the preliminary research on belonging-oriented outcomes from medical students globally, and much more research is needed before conclusions can be drawn. Further investigation is needed to test and optimize implementation of belonging-oriented psychosocial interventions across the medical school trajectory. Future research should examine how psychological needs evolve over time, from the initial transition into medical school and adjustment to extracurricular demands, to the challenges of the clinical years. Evaluating school-specific policies and systems may help identify which approaches most effectively promote social support and belonging. Confounding factors identified in this analysis, such as exam schedules and clinical demands, suggest that timing may be important. Implementing belonging-oriented interventions earlier in the curriculum, or avoiding periods of peak academic stress, may improve effectiveness or retention, but more investigation is necessary.

Further studies can determine the unique strengths of student-led, peer-led, and faculty-led interventions, as well as combined systems that employ multiple layers of support. For example, students may benefit most from a combination of peer connection, career mentorship, and participation in longitudinal learning communities. Continuously incorporating student feedback into intervention design may further enhance engagement while allowing for flexibility and appropriate timing for events. In addition, research should focus on identifying students who are more vulnerable to social isolation, including those facing caregiving responsibilities, language barriers, or cultural isolation, in order to better target interventions.

Team intramural sports may represent a promising area in studying medical student wellbeing. Competitive athletes have well documented academic and psychological success in medical school, and team sports may predict success in surgical residency [59,60]. Former collegiate athletes have outperformed their non-athlete peers on standardized tests and clinical clerkships, performing better on shelf exams, clinical scores, and number of Honors clerkships [59]. Grit, hardiness, and resilience apply to both success in athletics and medical school, as well as time management skills [59]. However, the psychological benefits of sports are not limited to high-level athletes. Even moderate levels of team physical activity and sport are associated with lower levels of burnout, anxiety, and depression, and improved belongingness and social support [60–63].

4.3. Limitations

Several very important limitations should be kept in mind. First, the number of articles that were eligible for the analysis was very small, with only five meeting criteria for inclusion. This precluded subgroup analysis, such as program type (allopathic vs osteo-

pathic) or preclinical versus clinical students, etc. Publication bias was very likely, which biases the results towards a significant effect which may not exist. There was considerable heterogeneity, leading to difficulty assessing the efficacy of specific interventional methods. Interventions varied, with some centered on discussions about personal experiences (Ubuntu groups and Stanford reflection groups), while others involved more structured wellness activities (Williams Lifeskill Training). In addition, studies used different outcome measures, precluding comparison of outcome measures or assessment of outcome measure impact on effect size.

There was moderate or high risk of bias in all studies, leading to concern about the results of the primary studies and, therefore, the results presented here. Specifically, lack of randomization and missing data were major concerns. Follow-up of drop-outs was very limited and drop-out rates were often high. In all of the included studies, voluntary participation easily may have led to selection bias, creating groups of participants who benefit more than an average medical student. Selective reporting may have also occurred in primary studies, given the high risk of bias, which may have influenced results. The review was not pre-registered, increasing risk of bias in eligibility criteria selection, outcome selection, and analytic flexibility. Removal of the one RCT in the study resulted in an increased effect size, indicating that the inclusion of the RCT reduced the summary effect size and suggesting that more rigorous research methods may demonstrate little to no effect on belonging. Further RCTs should be conducted in this population to determine if significant effects actually exist. Gray literature should also be considered in future reviews.

5. Conclusions

This exploratory review and meta-analysis of $n = 5$ ($k = 7$) articles suggests that belonging-oriented psychosocial interventions may have a small effect on belonging-related outcomes among medical students, but further research is needed before drawing conclusions on efficacy. Meta-regression suggested that further analysis of session length may be useful. Social support and belonging in medical school is an emerging area of research with limited published research thus far. Further investigation into belonging-oriented psychosocial interventions is necessary to determine efficacy.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/ime5020054/s1, Document S1: Codebook.

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Abbreviations

The following abbreviations are used in this manuscript:

AY	Academic year
CI	Confidence interval
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analysis
PROMIS	Patient-Reported Outcomes Measurement Information System
NR	Not reported
RCT	Randomized controlled trial
RoB2	Risk of Bias—version 2
ROBINS-I	Risk of Bias in Non-Randomized Studies of Interventions
SD	Standard deviation
UCLA	University of California—Los Angeles

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