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REVIEW ARTICLE



# Effectiveness of laughter therapies on students' mental health: a meta-analytic review

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**ABSTRACT**

Laughter holds intrinsic value as an accessible component of therapies to address mental health issues, including stress, anxiety and depression. This meta-analysis examined the effects of laughter therapies on students' mental health by synthesising nine studies with 17 effect sizes, employing a robust variance estimation method. The findings revealed that laughter therapies or interventions had a significant medium effect on improving students' mental health (effect size Hedges' $g$ = 0.774). Subgroup analyses further demonstrated varying effect sizes for laughter therapies that addressed students' stress levels, anxiety and depression, respectively. Moreover, moderator analyses found that the duration of the therapy was a significant moderator affecting outcomes, but types of laughter, type of practitioners and gender of participants were not significant moderators. This study enhances the understanding of laughter-based interventions and their effectiveness in supporting students' mental health and well-being. Implications for future research and practical applications in educational settings are briefly discussed.

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## Introduction

It has been estimated that every school has some students who are struggling with mental health issues (Rossen & Cowan, 2014). Those students may experience lower academic achievement (Bas, 2021) and are over-represented in high school dropout rates (Hjorth et al., 2016). Ultimately, if their mental health issues are not addressed, the consequences can limit their opportunities to live happy and fulfilling lives as adults.

Given the prevalence and impact of these mental problems, a wide range of interventions for mental health have been implemented in schools (Ali et al., 2019; Graham et al., 2011). In recent years, laughter therapy as a non-pharmacological technique has gained popularity due to its convenience and effective features (Eraydin & Alpar, 2022). Laughter therapy has been identified as a useful technique for addressing students' mental health problems such as stress (Guleria & Manta, 2021), depression (Ozturk & Tekkas-Kerman, 2022) and anxiety (Eraydin & Alpar, 2022).

It should be noted, however, that despite numerous studies on various forms of laughter therapy, there still remain many questions about their effectiveness. Notably, it seems that no systematic meta-analysis and review has been conducted to examine the effects of laughter therapy on improving students' mental health, specifically in schools. Additionally, previous empirical studies have

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reported mixed results regarding the effects of these interventions. Finally, there has been a lack of research on how the characteristics of these interventions influence their effectiveness on students' mental health. This study aimed to synthesise evidence of the effectiveness of laughter therapies or yoga in enhancing students' mental health and to quantify the magnitude of any effects. The study also explored the possible influences of various factors such as the gender of the participant, duration of therapy, type of therapy and characteristics of the therapist.

## *Defining laughter & theoretical foundation*

Laughter refers to "a psychophysiological response to humour or any other favourable external or internal stimuli (positive emotions, pleasant thoughts, self-induced laughter or by their spreading, etc.)" (Mora-Ripoll, 2013, p. 1). Several theories have attempted to explain how laughter produces some psychological benefits in overcoming mental health problems. From a biological perspective, for example, laughter seems to be a useful and healthy way to overcome stress by decreasing stress-producing hormones found in the blood (Farifteh et al., 2014). Additionally, according to release theory, laughter is a physical manifestation of repressed desires and motivations (Louie et al., 2016). Laughing is seen as a relief of nervous energy, potentially making it an ideal antidote for stressful situations by releasing "anti-stress and joyful hormones" (Ghodsbin et al., 2015).

The various theoretical explanations for the impact of laughter have led to various "categories of laughter" being identified in previous literature (Stiwi & Rosendahl, 2022; Yim, 2016),but from a therapeutic point of view, research has mainly focused on two types – *spontaneous* and *simulated* laughter (van der Wal & Kok, 2019). Spontaneous laughter is triggered by external stimuli, whereas simulated laughter is self-induced (Stiwi & Rosendahl, 2022). A related theory, known as "the motion creates emotion theory" (MCET) (Louie et al., 2016), argues that the body cannot distinguish between *intentionally* laughing and laughing *instinctively*. If individuals induce themselves to laugh (by simulating laughter), the body can be prompted to produce the same physiological response as when they laugh spontaneously. This theory argues that simulated laughter can harness the positive benefits of spontaneous laughter (Mora-Ripoll, 2010). In essence, both types of laughter can yield similar physiological and psychological health benefits (Woodbury-Fariña & Rodríguez Schwabe, 2015). For the purpose of this meta-analytic review, the Motion Creates Emotions Theory (MCET) was applied when investigating the impact of both spontaneous and simulated laughter on students' mental health.

## *Laughter therapy*

Influenced by the above theories and viewpoints, the past two decades have seen the emergence of more therapies and interventions involving the use of laughter as a therapeutic tool (Bahari & Lorica, 2019; Demir Doğan, 2020; Kheirandish et al., 2015). Laughter therapy is a type of intervention that deliberately uses laughter to relieve a person of their psychological distress through spontaneous and/or simulated laughter (van der Wal & Kok, 2019). This form of therapy has been widely used as an independent therapy or part of other interventions (Alici & Dönmez, 2020; Stiwi & Rosendahl, 2022; van der Wal & Kok, 2019). One typical laughter therapy (Laughter Yoga) was developed by Kataria (2011) and combines laughter with body exercise to improve physical and mental health. Laughter Yoga is cost-effective, not requiring any special place or preparation. It is gaining popularity as a complementary therapy with other psychopharmacological treatments (Deshpande & Verma, 2013).

## *Effectiveness of laughter therapies and/or yoga*

Given its unique features and therapeutic values, an increasing number of laughter therapies have been implemented to mitigate or reduce individuals' stress (Lee & Lee, 2020) (Geetha, 2021) (Guleria

& Manta, 2021), depression (Ozturk & Tekkas-Kerman, 2022) (Zhao et al., 2020) or anxiety (Ozturk & Tekkas-Kerman, 2022)(Eraydin & Alpar, 2022). Specifically, a randomised controlled study reported a significant decrease in anxiety scores in the intervention group compared to a control group (Eraydin & Alpar, 2022). A quasi-experimental study conducted with nursing students supported the effectiveness of laughter therapy in lowering students' depression (Yazdani et al., 2014). Furthermore, an online intervention for first-year nursing students also indicated the effectiveness of laughter yoga exercises in lowering students' stress levels (Geetha, 2021).

However, findings related to the effectiveness of laughter therapy or yoga varied in some previous research. For instance, in specific school or educational settings, findings of one laughter therapy with high school students showed that the therapy has an effect on reducing the level of stress (Shyla Heema & Rani, 2017). By contrast, surprisingly, online laughter therapy during the Covid-10 pandemic found no significant difference in stress levels between intervention and control groups (Ozturk & Tekkas-Kerman, 2022). Moreover, the effect size of laughter therapy or yoga has shown mixed results in previous research. For example, Eraydin and Alpar (2022) found a large significant effect size for laughter therapy on lowering nursing students' anxiety (Hedges' $g = 0.905$). By contrast, in an empirical study, Ozturk and Tekkas-Kerman (2022) reported a relatively small effect size of laughter intervention on anxiety levels. Likewise, inconsistent results have been found regarding the effect of such therapy on mitigating students' depression levels (e.g. Ozturk & Tekkas-Kerman, 2022, Hedges' $g = 0.776$; Kim et al., 2018, Hedges' $g = 0.433$). These mixed results highlight the need for a systematic review of the existing evidence on laughter therapy to determine its overall effectiveness in improving students' mental health.

Additionally, most reviews conducted to date have used data from adults (often with elderly people or patients in a medical setting)(e.g. Alici & Dönmez, 2020; Stiwi & Rosendahl, 2022). To our knowledge, to date, there has been no similar review specifically drawing on data from *school settings*. However, given the recent increase in laughter therapy or yoga sessions delivered in school settings (e.g. Eraydin & Alpar, 2022; Lee & Lee, 2020; Dönmez et al., 2023; Ozturk & Tezel, 2021; Ozturk & Tekkas-Kerman, 2022) it is time to pool results to detect overall effects through meta-analysis. This will help quantify the effects and gain a better understanding of whether the intervention positively impacts students' mental health.

### *Potential moderators of effectiveness*

Some core components of interventions, such as content, delivery, duration, focus and type of therapist, can significantly impact effectiveness (Blase & Fixsen, 2013). Noticeable variations in forms of laughter therapy or yoga in the literature, along with mixed findings reported in existing studies, suggest that certain factors related to intervention characteristics require further investigation. Although some previous systematic reviews summarised some characteristics of laughter therapies or yoga in tabular format (e.g. Gonot-Schoupinsky et al., 2020; Alici & Dönmez, 2020; Stiwi & Rosendahl, 2022; van der Wal & Kok, 2019), none have examined the influence of types of laughers, types of practitioners and duration of therapy on the effectiveness of the interventions. Therefore, in the current analysis, type of intervention, gender, type of practitioners, and duration of intervention were examined to determine whether they influence the effectiveness of an intervention. This can contribute to a better in-depth understanding of how to design effective laughter therapy or yoga that optimises desired outcomes in enhancing students' mental health.

#### *Type of intervention*

According to Katrinia's theory, both spontaneous laughter and simulated laughter can contribute to health-related benefits (Kataria, 2011; Mora-Ripoll, 2010). This view is supported by a recent study finding that simulated laughter and spontaneous laughter may have a similar impact on reducing cortisol levels (Fujisawa et al., 2018). This view is not supported by Law et al. (2018), who found that the two types of laughter therapy had different effects on physiological outcomes. Similarly, some systematic reviews with meta-analysis reported noticeable differences between simulated-

oriented and spontaneous laughter-based therapies in terms of their effects on mental health outcomes (Stiwi & Rosendahl, 2022; van der Wal & Kok, 2019). More information is needed on the effects of different types of laughter intervention with students and how type of intervention may moderate overall effectiveness. It is important to investigate what makes interventions more or less effective in order to make evidence-based recommendations for school counsellors and professional practitioners.

### *Gender*

Participants' gender may impact the effect of laughter therapy on outcomes. For example, several studies have reported that women laugh more than men (Mora-Ripoll, 2013), and previous research also indicated some differences existed when investigating the effect of a laugher intervention on a biological outcome, reporting that the impact of intervention applied in females was more efficacious in reducing blood pressure compared with male counterparts (Kasenda & Jael, 2016).

### *Type of practitioners*

Another potential moderator may be the type of practitioners delivering the intervention. It is widely believed that the quality of the therapist or practitioner plays an important role in the effectiveness of any intervention (Barkham et al., 2021). In the field of laughter therapy, there appears to be a variety of practitioners conducting such an approach (Alici & Dönmez, 2020; Bressington et al., 2018; Zhao et al., 2019). In any meta-analysis, it is therefore necessary to examine the potential moderating effect of the type of practitioner on the effectiveness of a given laughter therapy.

### *Duration of intervention*

Finally, the duration of therapy may affect the outcomes. Interventions may range from a one-off session to sessions delivered over several months (Bressington et al., 2018). A meta-analysis reported that increasing treatment duration had a positive effect (Stiwi & Rosendahl, 2022), and Mora-Ripoll (2013) suggested that to achieve significant health effects, laughter therapy needs to be of sufficient duration to ensure that "intense laughing out loud" occupies at least 3 minutes per session.

In the meta-analysis reported here, types of laughter therapy, participants' gender, types of practitioners, and duration of therapy were investigated.

## Study purpose

The analysis aimed to investigate the effectiveness of laughter therapies on students' mental health in school or other educational settings. Advancing our knowledge about the effectiveness of laughter interventions will be achieved by synthesising existing evidence systematically. Systematic reviewing and quantitative analysis of previous studies could extend our understanding of the influence of intervention characteristics, thus generating more practical insights for school counsellors and professional practitioners.

The following research questions guided the review and analysis:

1. What are the overall effects of laughter therapies on mental health problems?
2. What are the effects of laughter therapies on (a) students' stress levels, (b) anxiety levels and (c) depression?
3. Are the effects of laughter therapies on students' mental health moderated by types of laughter therapy, the percentage of females, types of practitioners, and duration of therapy?

It was hypothesised that:

1. laughter therapies would have a significant positive effect on students' mental health outcomes;

2. the effects of the intervention significantly affected students' stress levels, anxiety levels and depression;
3. the effects of laughter therapies would not be significantly moderated by types of intervention, but significantly moderated by the percentage of female participants, duration of the intervention, and types of practitioners.

## Method

This meta-analytic study was conducted following the PRISMA Checklist Guidance (Moher et al., 2009).

### *Literature search*

Five electronic databases were searched, and relevant studies were retrieved from PsycINFO, PubMed, Cochrane Library, Scopus and Web of Science, up to May 31, 2023. Search terms were: laughter (and), intervention, therapy, yoga, programmes, or exercises. A manual search covered the reference lists of included articles and relevant previous review articles for possible other studies for inclusion.

### *Inclusion and exclusion criteria*

Inclusion criteria to optimise the quality of studies covered, all articles must report: (1) randomised controlled trials or quasi-experimental studies; (2) participants were students studying in school or other educational institutions; (3) control groups and experimental groups were used; and (4) studies must include at least one measure of students' mental health outcome (i.e. stress, anxiety or depression). Exclusion criteria: (1) studies not published in English; (2) full-texts were not available for assessing their eligibility and extracting relevant information; and (3) studies did not report sufficient data for analytic purposes.

### *Study selection*

Two independent reviewers screened the identified studies in two stages: first, they screened the title and abstract to determine whether the full manuscript should be reviewed. This judgement was based on two criteria: (1) the study must investigate laughter intervention, therapies, yoga and/or programmes; and (2) the study must include relevant outcomes related to at least one mental health indicator (i.e. stress, anxiety or depression). The second stage involved retrieving full-text copies and reviewing their methods.

### *Data extraction*

To avoid potential bias, two researchers coded the material independently and resolved any differences by discussion. Included studies were surveyed in terms of (1) study characteristics (authors, year of publication, country, study design, target population, measures used); (2) intervention characteristics (e.g. type of intervention, percentage of females, duration, length of each session, and type of practitioner); and (3) data information (sample size, means and standard deviation of measures).

### *Data analysis*

The effect size (Hedges' *g*) of each study was calculated by using ram data extracted from each therapy or intervention, comparing scores between experiment and control groups (Borenstein et al., 2021). Given that most studies included multiple effects within the same study, robust variance estimation (RVE) was used to handle possible issues related to within-study dependence

(Tanner-Smith et al., 2016). The R package "robumeta", including small-sample corrections by Tipton and Pustejovsky, estimated a random effects model in order to calculate each pooled effect size estimate, and a mixed-effects model for the moderation analysis. Publication bias and heterogeneity were assessed. First, a funnel plot was employed to graphically display the potential of publication bias and then assessed for funnel plot asymmetry using Egger's regression test that tests the prediction of effect size estimated by a measure of their sampling error. Second, $I^2$ estimates were calculated for all pooled effects, which provides the amount of heterogeneity relative to the total amount of variance in the true effects. Finally, subgroup analysis and moderators' analysis were conducted to explore the sources of heterogeneity.

## Results

### *Overview of included studies and effect sizes*

Using the five databases, 2549 possible sources were first identified (Figure 1). An additional 9 studies were identified by checking secondary sources cited in the literature and screening relevant previous reviews. After applying strict criteria for inclusion, only 382 articles remained to be reviewed in full text. After this close review, another 373 papers were excluded, leaving only 9 studies for meta-analysis. Detailed information for each selected study can be found in Table 1.

The meta-analysis of 9 studies yielded 17 effect sizes, with a total sample size of 651 participants. The percentage of females in the samples ranged from 0% to 87.5%. Studies were from South Korea (33.4%), India (11.1%), Turkey (44.4%) and Iran (11.1%). Among all effect sizes regarding different mental health outcomes, 6 effect sizes were for the effectiveness of laughter therapy on stress, 7 effect sizes were extracted for the impact of therapy on anxiety, and 4 effect sizes were extracted for the impact on depression.

### *Study characteristics and intervention characteristics*

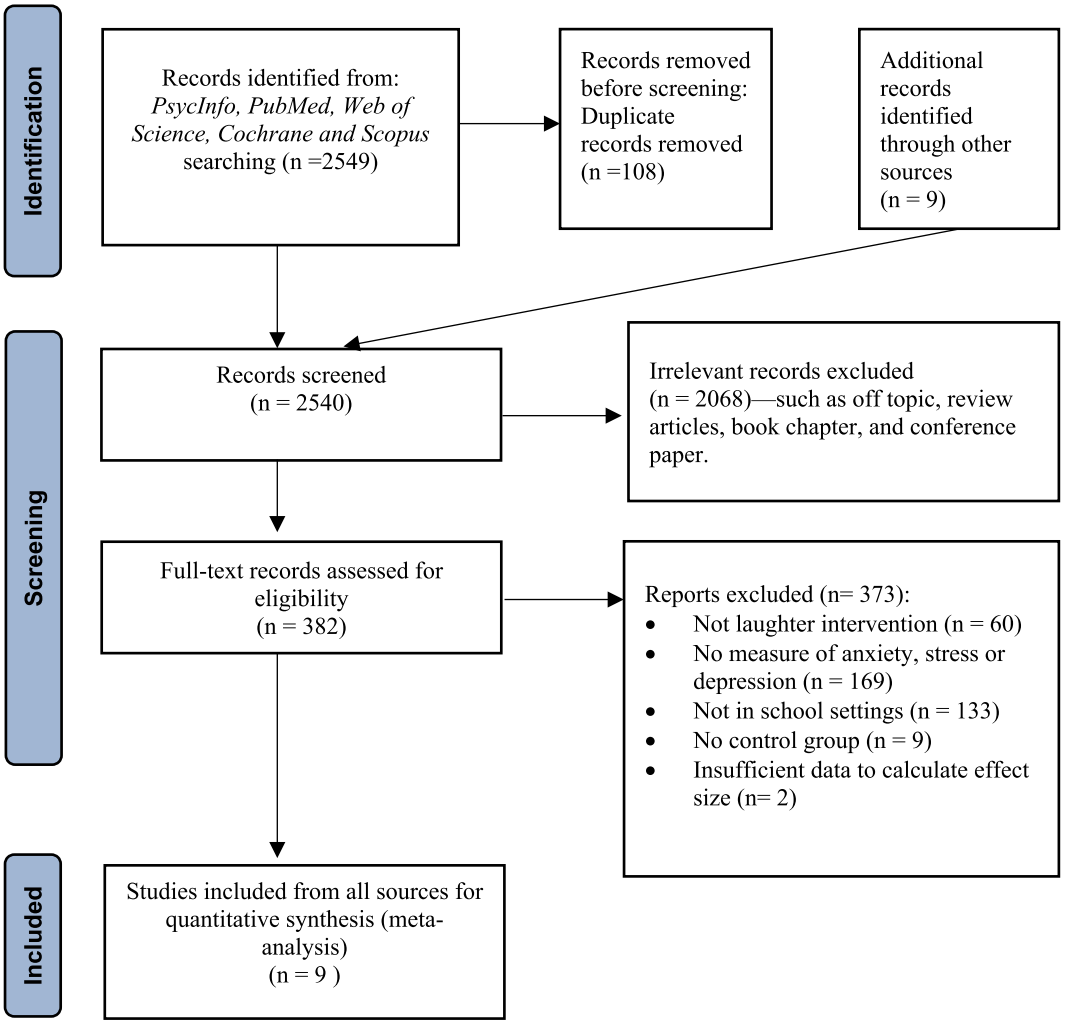
In this systematic review, 9 studies can be grouped under two categories, in terms of types of laughter and study design. Regarding different types of laughter, one study used *spontaneous-driven laughter* therapy; 8 studies employed therapy based on *simulated* laughter. Design characteristics: 5 studies employed randomised controlled trials; 4 studies employed quasi-experimental study design.

Regarding study characteristics (Table 1): most participants in the intervention were nursing students; number of sessions of intervention ranged from 4 to 10 sessions; duration of whole intervention varied from 1 day to 16 weeks. Almost all laughter therapies were conducted by either professional therapists or certificate holders. Finally, the content of laughter therapies varied but shared some common elements such as warm-up exercises or self-introduction, activities including muscle stretching, clapping hands, palm touching, dancing or singing, breathing-related exercises, simulated or spontaneous laughing and meditation.

### *Strengths of included laughter therapies*

A significant overall effect was found in laughter therapy aimed at improving students' mental health outcomes in school settings. The pooled standardised mean difference (SMD) comparing the intervention groups to control groups was a medium effect size of laughter therapy (Hedges' $g = 0.774$, SE = 0.207, 95% CI = (0.295, 1.25), $p < 0.01$), indicating that laughter therapy or yoga has a significant positive effect in improving students' mental health. Additionally, there was evidence of statistical heterogeneity ($I^2 = 78\%$) (Figure 2).

**Figure 1.** PRISMA-style Flowchart. *Note*. PRISMA-style flowchart showing the selection of studies for meta-analysis. Adapted From: Page M.J., McKenzie J.E., Bossuyt P.M., Boutron I., Hoffmann T.C., Mulrow C.D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372(71). doi: 10.1136/bmj.n71.




### *Subgroup analyses*

Regarding the effectiveness of laughter therapy on respective mental health outcomes (i.e. stress levels, anxiety or depression), the results were (Figures 3–5): (a) a medium effect size (Hedges' $g$ = 0.625) was found in the effectiveness of laughter therapy on reducing students' stress levels (SE = 0.108, 95% CI = (0.413, 0.836), $p < 0.001$); (b) a medium effect size (Hedges' $g$ = 0.691) was found in the effectiveness of laughter therapy on reducing students' anxiety (SE = 0.095, 95% CI = (0.505, 0.807), $p < 0.001$); (c) a medium effect size (Hedges' $g$ = 0.703) was found in the effectiveness of laughter therapy on reducing students' depression (SE = 0.139, 95% CI = (0.431, 0.976), $p <$ 0.001). These results indicate that laughter therapy significantly affects students' stress, anxiety, or depression levels respectively, suggesting that laughter therapy has a positive effect on enhancing students' mental health problems (e.g. lowering stress, anxiety or depression levels).

**Table 1.** Summary of intervention characteristics of included studies.

| Study No. | Participants | Types of laughter | No. Session | Duration | Types of practitioners | Key Content |
|---|---|---|---|---|---|---|
| 1 | Elementary students | Spontaneous laughter | 4 * 40 mins | 4 Weeks | Laughter therapists | – Self-introduction through humor videos, songs and PPT<br>– Humor practice: laughing and clapping hands; face stretching; making facial expression<br>– Sharing playful experience and playing humour games |
| 2 | Nursing students | Simulated laughter | NR | NR | NR | NR |
| 3 | Nursing students | Simulated laughter | 8 * 60 mins | 16 Weeks | Instructors specialising in laughter therapy | – Positive self-introduction<br>– Facial musical stretching; smile power; making laughter muscle<br>– Happiness sharing and communication<br>– Laughter together; laughter diet exercise |
| 4 | Nursing students | Simulated laughter | 10 * 60 mins | 5 Weeks | International laughter yoga leader certificate holder | – Hand-clapping and warm up exercises<br>– Deep breathing exercises<br>– Elicit and trigger simulated laughter (e.g. singing and dancing)<br>– Elicit unconditional laughter (e.g. Zipper laughter) |
| 5 | Nursing students | Simulated laughter | 8 * 40 mins | 4 Weeks | International laughter yoga leader certificate holder | – Deep breathing exercises<br>– Warm-up exercises (e.g. clapping the hands and palms facing)<br>– Children playfulness<br>– Laughter exercises (e.g. elevator, hot soup, national lottery etc.) |
| 6 | College students | Simulated laughter | 4 * 60 mins | 1 Day | Laughter therapy professional instructor | – Games (applause induction, stretch, opposite the finger, dance and sing)<br>– Relax laughter muscles (stretch of laughter muscles, big laughter, lion laughter)<br>– Mediation and dance |
| 7 | Nursing students | Simulated laughter | 8 * 45 mins | 4 Weeks | Instructor trained in laughter therapy | – Clapping and warm-up exercises<br>– Deep breathing exercises<br>– Childlike playfulness<br>– Laughter exercises |
| 8 | Male nursing students | Simulated laughter | 8 * 60 mins | 4 Weeks | Researchers | – Relaxation techniques, deep breathing exercise and warm up (e.g. clapping)<br>– Artificial laughter and Pranayama breathing exercises to stimulate natural laughter<br>– Meditation and breathing exercises |
| 9 | Nursing students | Simulated laughter | 4 * 10 mins | 1 Day | Certified laughter yoga instructor | – Hand clapping and warm-up exercises (e.g. palm touching)<br>– Deep breathing exercises |

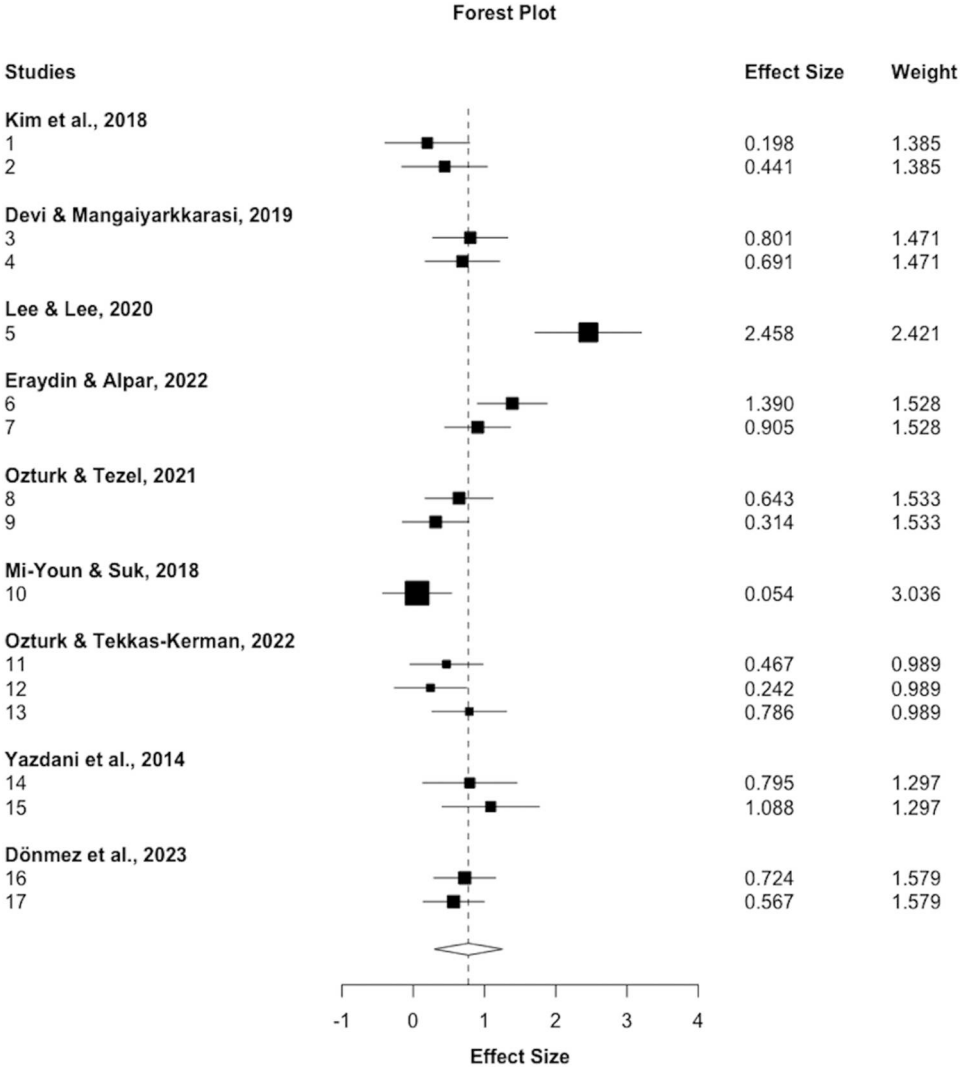
(*Continued*)

**Table 1.** Continued.

| Study No. | Participants | Types of laughter | No. Session | Duration | Types of practitioners | Key Content |
|---|---|---|---|---|---|---|
| | | | | | | – Childlike games<br>– Laughter yoga exercises (e.g. milkshake laughter, lion laughter, hot soup etc.) |

Note. NR: not report.

**Figure 2.** Effect for the effectiveness of laughter therapy on students' mental health problems.




## *Moderator analyses*

The possible moderation of effectiveness of laughter therapy by influences of type of laughter therapy, type of practitioners, the percentage of female participants, and duration of intervention

**Figure 3.** Effect for the effectiveness of laughter therapy on students' stress levels.

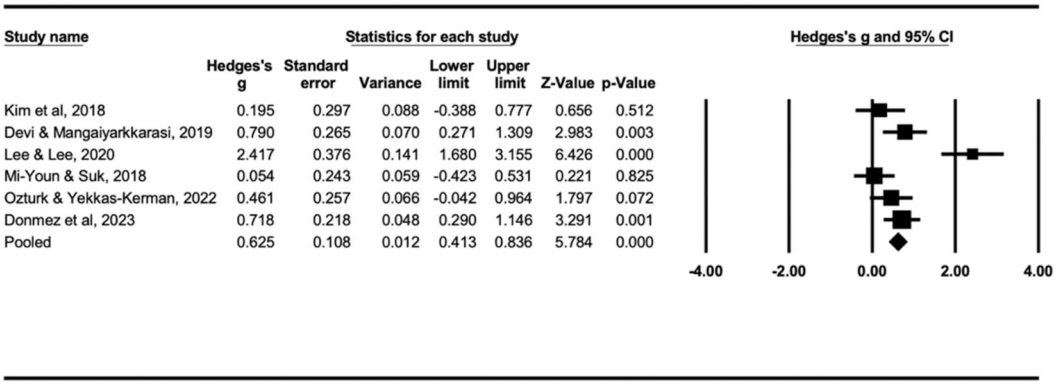



**Figure 4.** Effect for the effectiveness of laughter therapy on students' anxiety levels.

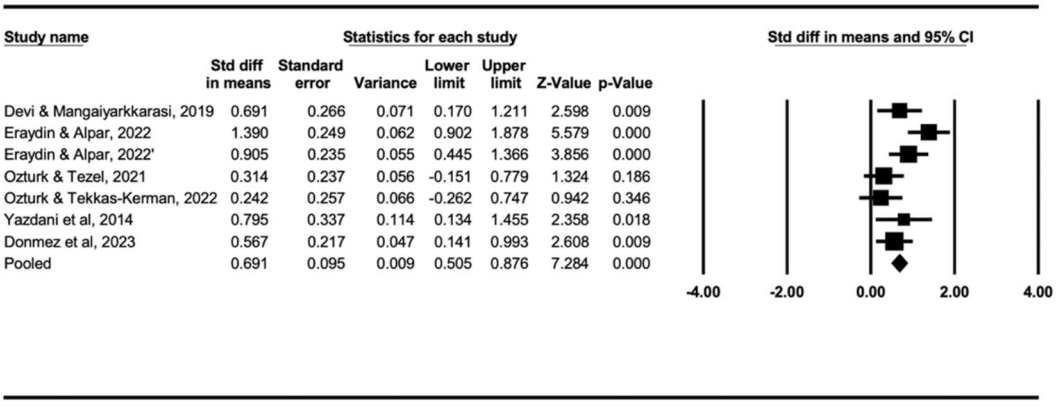
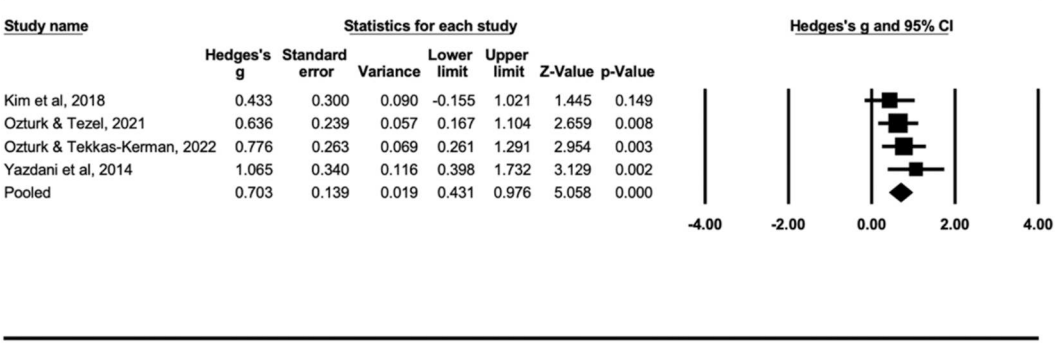



**Figure 5.** Effect for the effectiveness of laughter therapy on students' depression levels.




was assessed using the method of moments meta-regression. Moderator analyses revealed no significant difference between the type of laughter therapy and the type of practitioners; both did not influence the effect of laughter intervention on students' mental health problems. Specifically, regarding types of laughter, there was no significant impact of the type of laughter intervention

on effect size (slope = −0.326, SE = 0.405, $p = 0.434$), indicating no differences between spontaneous-driven and simulated-driven laughter therapies. Likewise, no significant impact of the type of practitioners on effect size (slope = −0.187, SE = 0.688, $p = 0.789$), suggesting that both laughter therapy specialists and instructors with relevant training are effective in delivering the interventions. Regarding the percentage of females, the result of meta-regression revealed that the percentage of females did not significantly influence the effect size of the impact of the intervention (slope = 0.596, SE = 1.028, $p = 0.576$), indicating that laughter therapy positively affects both female or male participants. Duration of laughter intervention had a significant impact on effect size (slope = 0.131, SE = 0.032, $p < 0.01$), indicating an increasing effect of therapy with increasing duration of the intervention.

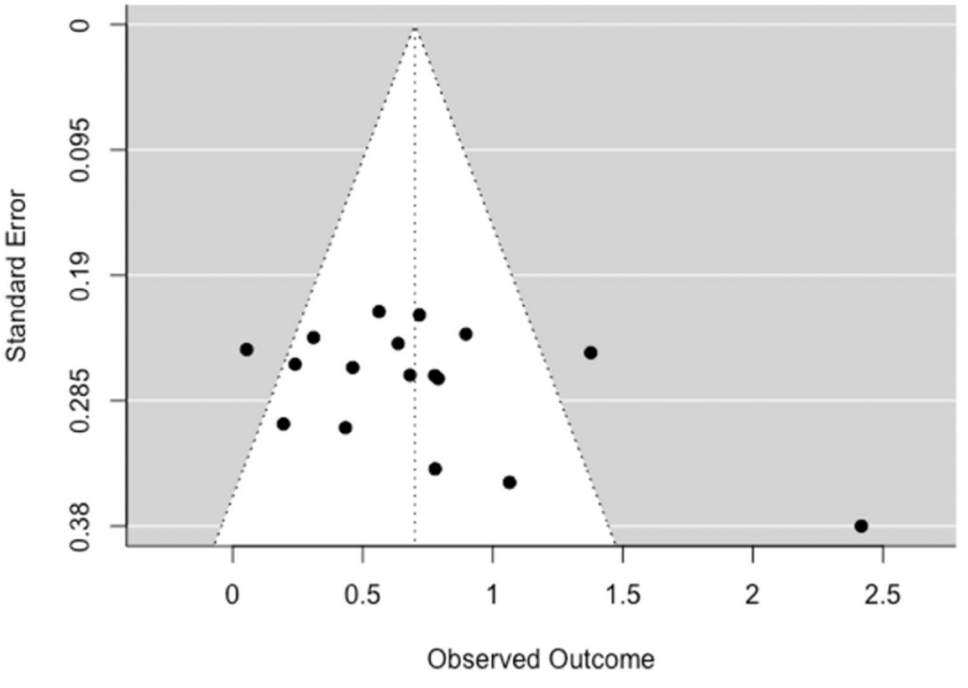
### *Publication bias*

Publishing bias occurs when journal editors and reviewers tend to accept only papers where the results show a positive finding rather than a neutral or null result. This is particularly likely in the case of studies that try to prove the efficacy of a particular method or treatment, but it can occur with other types of research. In this study, publication bias was examined by a funnel plot of effect size against standard error. Here the funnel plot appeared to be minimally asymmetrical, a slight indication of possible bias (Figure 6). This was explored further using the Egger regression test, with reporting Egger's coefficient (intercept = 2.177, $p < 0.05$), which indicated a minor bias. Taken together, these findings indicate minimal risk for publication bias.

## Discussion

This meta-analysis contributes to the body of knowledge concerning the effects of laughter therapies on students' mental health issues within educational environments through a comprehensive

**Figure 6.** Funnel plot of effect size against standard error.



review and synthesis of existing research. The primary analysis offers valuable insights that clarify previously mixed findings regarding the effectiveness of laughter therapies in addressing students' mental health challenges. Additionally, through subgroup analyses, we present a more precise and quantitative understanding of the intervention's impact on specific aspects of students' mental well-being – stress levels, anxiety, and depression. An examination of potential moderating factors sheds light on the influence of variables on the effects of laughter therapy including types of laughter therapy, types of practitioners, the proportion of female participants, and duration of interventions. This article provides a thorough discussion of both anticipated and unexpected findings, thereby enhancing our understanding of the potential role of laughter therapies in promoting student mental health within educational settings.

### *The overall strength of laughter therapies on mental health problems*

Across the 9 studies investigating the impact of laughter therapy on students' mental health problems, the intervention had a significant impact, with a medium weighted *Hedges' g* of 0.774. The results support Hypothesis 1, lending support to a body of previous empirical work and reviews in terms of the effectiveness of laughter therapy on mental health. For example, the findings were in accordance with existing research showing the anticipated and useful effectiveness of laughter therapies as an independent or addition to main therapies in improving individuals' well-being (Akimbekov & Razzaque, 2021; Gonot-Schoupinsky & Garip, 2018) and mental health (Bressington et al., 2018; van der Wal & Kok, 2019; Zhao et al., 2019). Further, these results also extend our understanding of the influence of such intervention in a specific social context – schools, which was in line with the findings of some previous research that specifically aimed to investigate the effect of the intervention on adolescents or students' well-being or psychological outcomes (Chang et al., 2013; Ozturk & Acikgoz, 2022). Surprisingly, however, the findings from this meta-analytic review (effect size Hedges' $g = 0.774$) contrast with those of earlier studies – Mi-Youn & Kuk, 2018, Hedges' $g = 0.054$; Ozturk & Tekkas-Kerman, 2022, Hedges' $g = 0.242$. One possible explanation is that the studies selected for analysis in this study were originally published because of their noticeable positive results, or perhaps the characteristics of the interventions were markedly different (Blase & Fixsen, 2013). Further research is needed to investigate how the characteristics of an intervention affect the efficacy of laughter therapy or yoga.

The findings of the meta-analysis are informative for several reasons. First, methodologically, by combining statistically the existing evidence from many studies using different samples with various numbers of participants, this investigation produced results more likely than a single study to be generalisable. Practically speaking, the findings of this study provide insights not only to guide researchers in planning future research but also to provide school counsellors or therapists with a low-cost, simple intervention that can be administered by practitioners (van der Wal & Kok, 2019). This is important because schools serve as a significant social context for students (Ali et al., 2019; Yuen et al., 2012), where educators, school counsellors or therapists can be instrumental in helping students solve mental health problems (Beames et al., 2022; Oberle et al., 2011).

### *Strengths of laughter therapies on stress, anxiety and depression*

Besides the impact of laughter therapies on students' overall mental health, the results of the current analysis found different significant effects of the intervention on reducing students' stress levels, anxiety and depression, with respective *medium* effect sizes. These results fully support Hypothesis 1 and Hypothesis 2. These findings are in line with previous empirical studies that investigated the effects of laughter therapies on stress (Guleria & Manta, 2021; Shyla Heema & Rani, 2017), anxiety (Jahanimoghadam et al., 2023; Ozturk & Tekkas-Kerman, 2022) or depression (Kim et al., 2018). Laughter seems to be a useful and healthy way to overcome stress by decreasing stress-making hormones (Farifteh et al., 2014). Laughing is also seen as a release of nervous energy, potentially making

it an ideal antidote for stressful situations. However, the findings of this review contrast with those of a recent empirical study during the COVID-19 pandemic which found no significant difference in stress levels between intervention and control groups in an online laughter therapy (Ozturk & Tekkas-Kerman, 2022). One possible explanation is that online delivery of an intervention may not be as effective as face-to-face sessions in reducing students' stress levels.

The findings of the analysis also partly explain the sources of heterogeneity across studies. The results of Hedges' *g* of respective mental health outcomes are different, indicating variability in the effect of laughter therapies on each mental health outcome. One logical explanation may be that even though stress, anxiety or depression are under a broader umbrella of mental health, they are essentially different in nature.

### *Moderator analyses*

Four potential moderators were examined through meta-regression, and these results partly support Hypothesis 3. More specifically, types of laughter therapy (spontaneous laughter vs simulated laughter) did not emerge as a significant moderator that influenced the effect of laughter therapies across included studies. Both types of laughter can lead to the same psychological health benefits (Woodbury-Fariña & Rodríguez Schwabe, 2015). However, these results do not accord with some prior reviews that reported variances in the effects of different types of laughter on improving participants' mental health outcomes (Stiwi & Rosendahl, 2022; van der Wal & Kok, 2019). To investigate the exact difference in effect between types of laughter on individuals' mental health conditions, more future empirical studies will be needed.

The type of practitioners did not have a moderating effect on the effectiveness of laughter therapies across these samples. This aligns with findings from previous empirical studies where practitioners were not professional laughter therapists but instructors with appropriate training (e.g. Ozturk & Tekkas-Kerman, 2022; Yazdani et al., 2014). One possible explanation may be that laughing is a human attribute that is influenced by a situation and context rather than by any one individual – everyone can laugh.

The meta-analysis also suggested that the female percentage in the samples was not a moderator that could impact the overall effectiveness of laughter therapies on students' mental health. This is not in line with some previous research, indicating variations between males and females regarding laughter (Mora-Ripoll, 2013) and the impact of a laughter intervention (Kasenda & Jael, 2016). One possible explanation for this may be that as long as an adequate amount and quality of treatment are delivered for both genders there may be no difference in the overall effect of the intervention.

Finally, the analysis revealed that the duration of laughter therapies was a significant moderator of effectiveness. In general, this finding is consistent with previous studies that have found a positive effect of the duration of an intervention on effect size. This highlights the fact that to achieve significant health benefits, intervention using laughter therapy needs to be of sufficient duration (Mora-Ripoll, 2013; Stiwi & Rosendahl, 2022). As one non-medical method of stress reduction, sufficient exposure during the intervention enables laughter therapies to act as a relief of nervous energy, potentially making it an ideal antidote for stressful situations (MacDonald, 2004; Yim, 2016).

### *Research implications*

Many existing studies have investigated the effect of laughter therapy on patients (Morishima et al., 2019; Stiwi & Rosendahl, 2022) or older generations (Alici & Dönmez, 2020; Deshpande & Verma, 2013), but much less attention has been paid to individuals in school and college settings. This meta-analytic review provides quantitative evidence (i.e. a significant medium effect size, Hedges' $g = 0.774$) supporting the effectiveness of laughter therapy in improving students' mental health. The results also indicate that such interventions positively affect reducing students' stress, anxiety and/or depression levels in schools. Given the increasing number of students identified with

various mental health problems (Bas, 2021; Hjorth et al., 2016; Rossen & Cowan, 2014), it is important to direct more research to target school, college, and university students to extend our understanding of interventions that support students' mental health.

According to the results of this study, types of laughter was not a significant moderator that impacted the overall effect size of the intervention. This supports the theory of "Motion Creates Emotions" (Louie et al., 2016), which posits that the body does not distinguish between intentionally laughing and laughing instinctively, and simulated laughter can capture the positive benefits of spontaneous laughter (Mora-Ripoll, 2010). However, since this finding was not in keeping with data from some previous studies (Stiwi & Rosendahl, 2022; van der Wal & Kok, 2019), more research is needed to further explore potential differences between spontaneous and simulated laughter interventions.

### *Practical implications*

Students entering a new school, college or university environment, or during their senior years, may have experiences that can cause depression, anxiety and stress, but few receive professional treatment (Belfer, 2008; McGorry et al., 2013; Steinberg & Morris, 2001). The findings of this study indicate that the introduction of cost-effective and powerful laughter therapies could effectively help these students improve their psychological well-being (Schaefer, 2006) irrespective of spontaneous driven or simulated driven laughter therapy or yoga. Additionally, our study suggests that schools can be targeted as appropriate sites for mental health promotion, and school personnel are considered well placed to improve students' mental health (Reinke et al., 2011), including reducing stress, anxiety and depression levels. Finally, based on the results of moderator analyses, we suggest that not only school psychologists and school counsellors, but also instructors or counsellors with certain training can deliver laughter workshops or seminars for other staff, playing an important role in incorporating laughter therapy in their approach to improving students' mental health.

### *Limitations*

The obvious limitation in this review is the small number of studies included. This was the result of applying strict criteria for inclusion. The interpretations made here are only suggestive, and all findings require further investigation and exploration before they can be generalised to a wider simple.

## Conclusion

The results of this meta-analytic investigation suggest that laughter therapies can have a beneficial impact on students' overall mental health, as well as reducing specific mental health problems. In specific cases where a student is stressed, anxious or depressed, laughter therapies or interventions are capable of serving as useful strategy that can be employed independently or incorporated as a complement to a main therapy. When designing an intervention, the duration should be sufficient to optimise effectiveness.

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## Data availability statement

The data are freely available by contacting the corresponding author upon reasonable request.

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