Publikációs Jegyzék

MTA-PTE Innovatív Egészségpedagógia Kutatócsoport

A kutatócsoport MTMT azonosítója: 23415
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- Egyéb: 3

I. Tudományos folyóiratcikk

Külföldi kiadású szakfolyóiratban idegen nyelven:

1. Patja, Kristiina ; Huis, in 't Veld Tessa ; Arva, Dorottya ✉ ; Bonello, Marjorie ; Orhan, Pees Rana ; Soethout, Marc ; van, der Esch Martin *Health promotion and disease prevention in the education of health professionals: a mapping of European educational programmes from 2019* BMC MEDICAL EDUCATION 22 : 1 Paper: 778 , 8 p. (2022) DOI WoS Scopus PubMed Szakcikk (Folyóiratcikk) | Tudományos[33261300] [Egyeztetett] *SJR indikátorok az utolsó év (2022) alapján: Education: Q1 Medicine (miscellaneous): Q1*

Közlésre benyújtott kéziratok, melyek legalább egy bírálati körön átestek pozitív minősítéssel:

1. ***Ágnes Juhász***, Nóra Sebestyén, Dorottya Árva, Veronika Barta, Katalin Pártos, Zoltán Vokó, Zsuzsa Rákosy: "We Need Better Ways to Help Students Avoid the Harms of Stress: Results of a Meta-analysis on the Effectiveness of School-Based Stress Management Interventions": Journal of School Psychology- *SJR indikátorok az utolsó év (2022) alapján: Education: D1, Developmental and Educational Psychology: D1*

2. Dorottya Árva, Zoltán Vokó, Mária Sápi, Zsuzsa Cselkó, ***Zsuzsa Rákosy***: The Influence of Institutional Characteristics on Implementing School-based Universal Addiction Prevention: A Hungarian Mixed-Methods Nationwide Study on the State of Implementation, Barriers, and Facilitators: Frontiers in Education , *SJR indikátorok az utolsó év (2022) alapján: Education: Q2*

Hazai kiadású szakfolyóiratban magyar nyelven:

1. Rákosy, Zsuzsa ; Bogos, Krisztina ; Cselkó, Zsuzsa: *Komplex gyermekegészség-fejlesztési program a Budakörnyéki régióban 2018–2021* NÉPEGÉSZSÉGÜGY 100 : 1 pp. 58-68. , 11 p. (2023), Egyéb URL, Szakcikk (Folyóiratcikk) | Tudományos[34133201] [Egyeztetett]

2. Rákosy, Zsuzsa ; Árva, Dorottya ; Vokó, Zoltán ; Sápi, Mária ; Cselkó, Zsuzsa

Függőségmegelőzés az általános iskolákban: országos vizsgálat a megvalósításról és befolyásoló tényezőiről, NÉPEGÉSZSÉGÜGY 100 : 2 pp. 94-95. , 2 p. (2023) Absztrakt / Kivonat (Folyóiratcikk) | Tudományos[34157043] [Admin láttamozott]

3. Sebestyén, Nóra ; Juhász, Ágnes ; Árva, Dorottya ; Vokó, Zoltán ; Rákosy, Zsuzsa *Mennyire hatásosak az iskolai stresszkezelő programok? Egy metaanalízis eredményei* NÉPEGÉSZSÉGÜGY 100 : 2 pp. 92-92. , 1 p. (2023) Absztrakt / Kivonat (Folyóiratcikk) | Tudományos[34157037] [Admin láttamozott]

4. Rákosy, Zsuzsa: *Innovatív pedagógiai eszközök és multimédiás megoldások a 21. század gyermekeinek egészségfejlesztéséhez* NÉPEGÉSZSÉGÜGY 99 : 2 pp. 217-217. , 1 p. (2022) Absztrakt / Kivonat (Folyóiratcikk) | Tudományos[34157063] [Admin láttamozott]

II. Könyvrészlet

1. Rákosy, Zsuzsa ; Árva, Dorottya**:** *A hazai iskolai egészségfejlesztés: gyakorlatok, nehézségek, perspektívák egy országos felmérés tükrében* In: Buda, András; Kiss, Endre (szerk.) Interdiszciplináris pedagógia és a korszakváltás bizonytalansága. XIII. Kiss Árpád emlékkonferencia: tartalmi összefoglalók. Debrecen, Magyarország : Debreceni Egyetem Bölcsészettudományi Kar, Nevelés- és Művelődéstudományi Intézet (2023) pp. 44-44. , 1 p. Absztrakt / Kivonat (Könyvrészlet) | Tudományos[34156988] [Admin láttamozott]

2. Sápi, Mária ; Rákosy, Zsuzsa: *Egészségfejlesztési tevékenységhez szükséges kompetenciák és ismeretek oktatásának újszerű megközelítése a pedagógusképzésben* In: Buda, András; Kiss, Endre (szerk.) Interdiszciplináris pedagógia és a korszakváltás bizonytalansága. XIII. Kiss Árpád emlékkonferencia: tartalmi összefoglalók. Debrecen, Magyarország : Debreceni Egyetem Bölcsészettudományi Kar, Nevelés- és Művelődéstudományi Intézet (2023) pp. 46-46. , 1 p. Absztrakt / Kivonat (Könyvrészlet) | Tudományos[34156997] [Admin láttamozott]

3. Szanyó, Gáborné *Hogyan lehet egy egész tantestületet bevonni az iskolai egészségfejlesztésbe?- jó gyakorlat a talentum református általános iskolából* In: Buda, András; Kiss, Endre (szerk.) Interdiszciplináris pedagógia és a korszakváltás bizonytalansága. XIII. Kiss Árpád emlékkonferencia: tartalmi összefoglalók. Debrecen, Magyarország : Debreceni Egyetem Bölcsészettudományi Kar, Nevelés- és Művelődéstudományi Intézet (2023) pp. 50-50. , 1 p. Absztrakt / Kivonat (Könyvrészlet) | Tudományos[34157002] [Nyilvános]

4. Rádi, Orsolya Márta ; Kerekes, Valéria ; Tarkó, Klára ; Prievara, Dóra Katalin ; Rákosy-Vokó, Zsuzsa: *Többet Észt-tel az egészségért! Észtország nemzeti alaptantervének elemzése az egészségfejlesztés szempontjából* In: Steklács, János; Molnár-Kovács, Zsófia (szerk.) 21. századi képességek, írásbeliség, esélyegyenlőség. Absztraktkötet : XXII. Országos Neveléstudományi Konferencia Pécs, Magyarország: MTA Pedagógiai Tudományos Bizottság, PTE BTK Neveléstudományi Intézet (2022) 573 p. pp. 480-480. , 1 p. Absztrakt / Kivonat (Könyvrészlet) | Tudományos[33263294] [Admin láttamozott]

5. Rákosy, Zsuzsa ; Bene, Viktória ; Fegyverneki, Gergő: *A digitális gamification alkalmazási lehetőségei az egészségpedagógia megújuló módszertanában a függőségmegelőzés és a*

biztonságos internethasználat területén In: Steklács, János; Molnár-Kovács, Zsófia (szerk.) 21. századi képességek, írásbeliség, esélyegyenlőség. Absztraktkötet : XXII. Országos Neveléstudományi Konferencia Pécs, Magyarország : MTA Pedagógiai Tudományos Bizottság, PTE BTK Neveléstudományi Intézet (2022) 573 p. pp. 481-481. , 1 p. Absztrakt / Kivonat (Könyvrészlet) | Tudományos[34157075] [Admin láttamozott]

Egyéb konferenciaközlemény

1. Juhász, Ágnes ; Sebestyén, Nóra ; Árva, Dorottya ; Bartha, Veronika ; Rákosy-Vokó, Zsuzsa *School-based stress management interventions – results from a meta-analysis* In: Health Psychology for all: Equity, Inclusiveness and Transformation - 37th Annual Conference of the European Health Psychology Society : Book of Abstracts (EHPS 2023) Bremen, Németország : European Health Psychology Society (2023) 732 p. p. 712 , 1 p. Teljes dokumentum Absztrakt / Kivonat (Egyéb konferenciaközlemény) | Tudományos[34149338] [Egyeztetett] *SJR indikátorok az utolsó év (2022) alapján: Clinical Psychology Q2, Psychiatry and Mental Health: Q3*

2. Árva, D ; Barta, V ; Pokoraczki, Sz ; Juhász, Á ; Rákosy-Vokó, Zs ; Sebestyén, N *Iskolai stresszcsökkentő intervenciókat mérő randomizált, kontrollált vizsgálatok meta-analízisének protokollja* In: Fiatal Higiénikusok Fóruma XIV. : Program és összefoglalók (2022) 40 p. pp. 8-8. , 1 p. Absztrakt / Kivonat (Egyéb konferenciaközlemény) | Tudományos[33175014] [Admin láttamozott]

Egyéb

1. Sebestyén, Nóra ; Juhász, Ágnes ; Vokó, Zoltán ; Rákosy, Zsuzsa: *Iskolai stresszkezelő programok hatásvizsgálata (2023).* Találkozás a változásban – Változások a találkozásban, A Magyar Pszichológiai Társaság XXX. Országos Tudományos Nagygyűlés, 2023. június 8-10., Pécsi Tudományegyetem, Egyéb URL Nem besorolt (Egyéb) | Tudományos[34157146] [Admin láttamozott]

2. Rákosy, Zsuzsa: *A függőségek megelőzésének iskolai gyakorlata; az innovatív egészségpedagógia módszertan bemutatása (2022)* Tudomány: út a világ megismeréséhez – Út az egészségünkhöz MTA TAB ORVOSTUDOMÁNYI SZAKBIZOTTSÁG EGÉSZSÉGFEJLESZTÉSI MUNKASBIZOTTSÁG RENDEZVÉNYE, Egyéb URL, Nem besorolt (Egyéb) | Tudományos[34157181] [Admin láttamozott]

3. Rákosy, Zsuzsa: *A függőségek megelőzésének iskolai gyakorlata; az innovatív egészségpedagógia módszertan bemutatása (2022)* Egészségre nevelés, egészségfejlesztés a tanítóképzésben: A Károli Gáspár Református Egyetem Pedagógiai Kar, Természettani és Matematikai, valamint Neveléstani és Metodológiai Tanszék, Egyéb URL Nem besorolt (Egyéb) | Tudományos[34157163] [Admin láttamozott]

From: em.jspsy.0.85e974.f0f931c0@editorialmanager.com
<em.jspsy.0.85e974.f0f931c0@editorialmanager.com> On Behalf Of Journal of School Psychology
Sent: Saturday, September 9, 2023 3:02 AM
To: Juhász Ágnes <juhasz.agnes@ppk.elte.hu>
Subject: Your Submission

Ms. Ref. No.: 23-CJ050523-099R1
Title: We Need Better Ways to Help Students Avoid the Harms of Stress: Results of a Meta-analysis on the Effectiveness of School-Based Stress Management Interventions Journal of School Psychology

Dear Dr. Juhász,

Thank you for your patience as we considered your request to reconsider the initial rendered decision of "Reject" for your manuscript "We Need Better Ways to Help Students Avoid the Harms of Stress: Results of a Meta-Analysis on the Effectiveness of School-Based Stress Management Interventions" (23-CJ050523-099R1) for publication consideration in the Journal of School Psychology (JSP). I have conferred both with Reviewer #3 and the Editor in Chief at JSP regarding your requests and clarifications. As a result of these conversations, I have decided to change the decision of "Reject" to "Revise and Resubmit."

As noted throughout this review process, this manuscript has many strengths including an important question and a large sample of relevant studies. Indeed, all of Reviewer # 1's concerns and many of Reviewer # 3's concerns with the manuscript have already been adequately addressed. Yet, there are continuing concerns with some of the methodological choices you employed. Addressing these concerns adequately will be essential for this article to ultimately be published in JSP. There were three points that contributed to my prior decision of reject. I will paraphrase them below and include current recommendations and requirements for further revision.

• Reviewer #3 and I both recommended a greater incorporation of QED. Again, I didn't require this, but the fact that the authors chose not to actually incorporate QED studies (and then include a variable indicating study quality as a moderator or compare QED effect sizes with those from fully experimental studies) was disappointing and did factor into my estimation of the likelihood that authors would address other outstanding points. I maintain that this study would be better if it included QED studies as suggested by Reviewer # 3 and I. As before, I am not requiring this, but if the authors wish to make the strongest contribution to the literature possible, they should reconsider their decision not to follow this suggestion.

• At various points in the manuscript, it appeared as though the authors had conflated within-group and between-group effect sizes. The letter you sent after rejection adequately clarified that you "used a between-group effect size measure in all cases." Yet, the fact that this was unclear to both myself and Reviewer # 3 in the original submission and resubmission calls for greater clarity. Please closely review the manuscript to ensure that upon revision it is absolutely clear that all effect sizes were based on between group comparisons controlling for pre-test scores.

• Both I and Reviewer # 3 recommended that you incorporate all effect sizes (including those in which multiple effect sizes were available for the same constructs). The issue of effect size dependency is an important one in meta-analysis, but significant analytic advances over the past 5+ years have pushed the field to use newer approaches to address effect size dependence. A great discussion of these advances can be found in Tipton et al. (2019). The reviewer provided a number of additional citations for the authors to consider, with an emphasis on using robust

variance estimation meta-analysis or a similar approach (e.g., Hedges et al., 2010; Tanner-Smith & Tipton, 2014). This journal is committed to publishing research using the most appropriate methods currently available and using these new approaches to dependent effect sizes in meta-analysis are among those methods. Therefore, for this publication to continue to progress in the editorial process at JSP, you must attend to this point by including all effect sizes and adjusting via using one of the approaches recommended by Reviewer # 3.

References

Hedges, L. V., Tipton, E., & Johnson, M. C. (2010). Robust variance estimation in meta-regression with dependent effect size estimates. Research synthesis methods, 1(1), 39-65

Tanner-Smith, E. E., & Tipton, E. (2014). Robust variance estimation with dependent effect sizes: Practical considerations including a software tutorial in Stata and SPSS. Research synthesis methods, 5(1), 13-30.

Tipton, E., Pustejovsky, J. E., & Ahmadi, H. (2019). Current practices in meta-regression in psychology, education, and medicine. Research Synthesis Methods, 10(2), 180-194.

I do believe that if these points are all addressed, this manuscript will represent an excellent contribution to the literature and I'm optimistic about your ability to make these modifications, if you so choose. Please note that other issues that become clearer in future drafts may raise further questions about the study that need to be addressed substantively. If you chose to undertake this revision, your revised paper will be sent out again for review to Reviewer # 3.

For your guidance, reviewers' comments are again are appended below.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.

The revised version of your submission is due by Nov 07, 2023.

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Your username is: juhasz.agnes@ppk.elte.hu If you need to retrieve password details, please go to:
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Yours sincerely,

Christopher James Anthony, Ph.D.
Associate Editor
Journal of School Psychology

Journal of School Psychology

We Need Better Ways to Help Students Avoid the Harms of Stress: Results of a Meta-analysis on the Effectiveness of School-Based Stress Management Interventions

--Manuscript Draft--

Manuscript Number:	23-CJ050523-099R1
Article Type:	Review article
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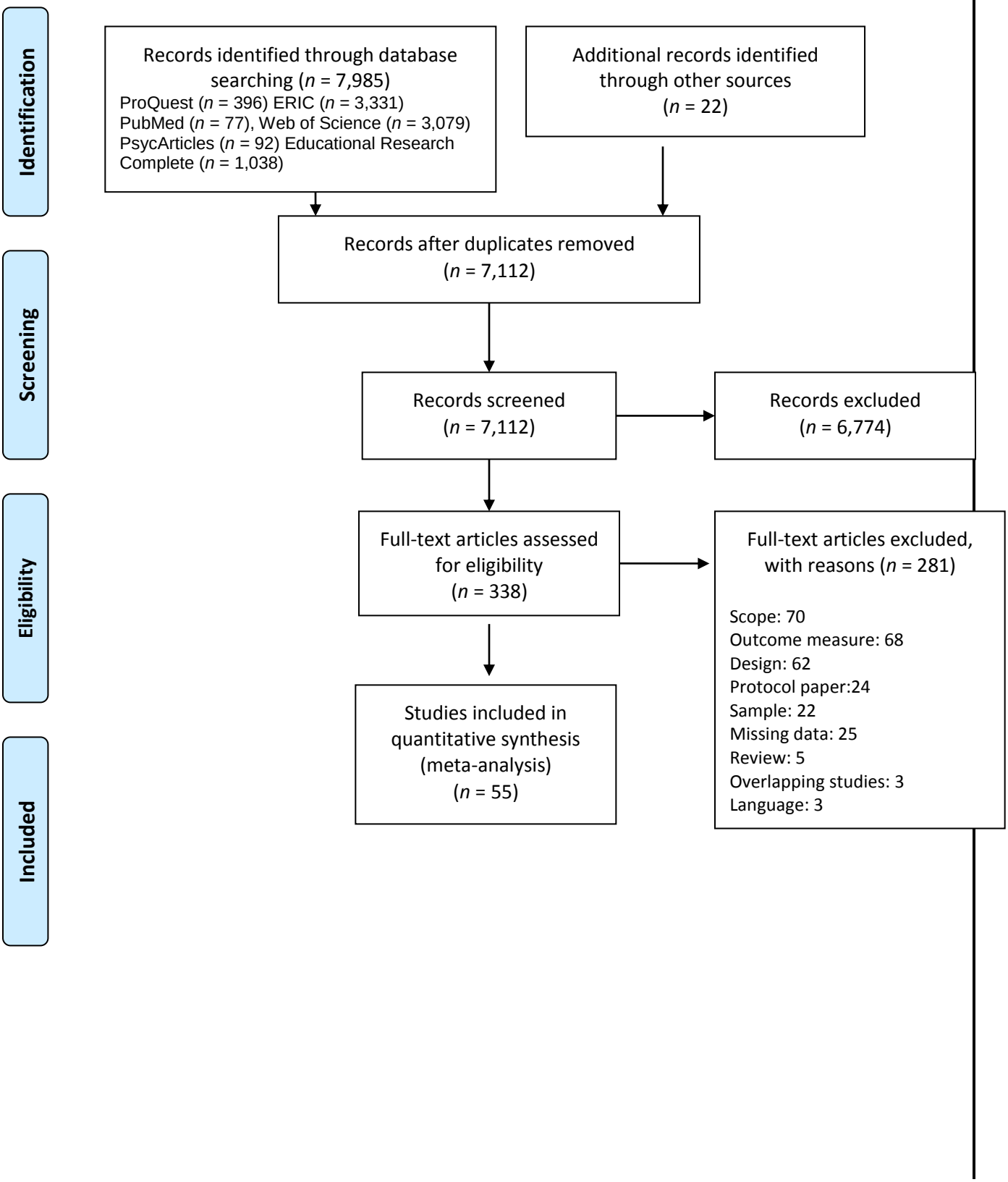
	Dorottya Árva
	Veronika Barta
	Katalin Pártos
	Zoltán Vokó
	Zsuzsa Rákosy

Figure(s)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Screening
Eligibility
Included
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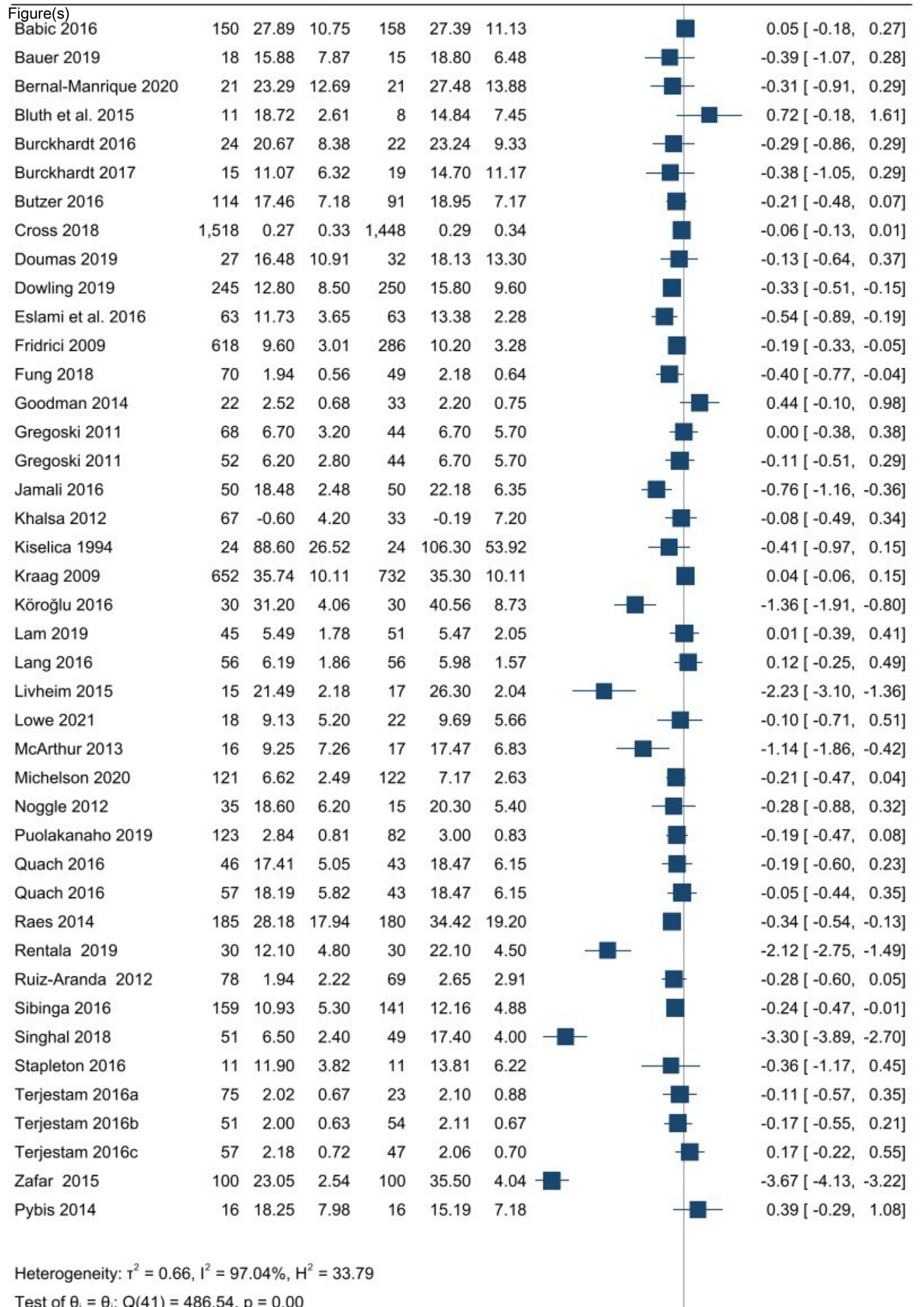
ProQuest (n = 396) ERIC (n = 3,331)
PubMed (n = 77), Web of Science (n = 3,079)
PsycArticles (n = 92) Educational Research Complete (n = 1,038)
Additional records identified through other sources (n = 22)
Records after duplicates removed (n = 7,112)
Records screened (n = 7,112)
Records excluded (n = 6,774)
Full-text articles assessed for eligibility (n = 338)
Full-text articles excluded, with reasons (n = 281)
Scope: 70
Outcome measure: 68
Design: 62
Protocol paper:24
Sample: 22
Missing data: 25
Review: 5
Overlapping studies: 3
Language: 3
Studies included in quantitative synthesis (meta-analysis) (n = 55)

Figure(s)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Bauer 2019 18 15.88 7.87 15 18.80 6.48 -0.39 [-1.07, 0.28]
Bernal-Manrique 2020 21 23.29 12.69 21 27.48 13.88 -0.31 [-0.91, 0.29]
Bluth et al. 2015 11 18.72 2.61 8 14.84 7.45 0.72 [-0.18, 1.61]
Burckhardt 2016 24 20.67 8.38 22 23.24 9.33 -0.29 [-0.86, 0.29]
Burckhardt 2017 15 11.07 6.32 19 14.70 11.17 -0.38 [-1.05, 0.29]
Butzer 2016 114 17.46 7.18 91 18.95 7.17 -0.21 [-0.48, 0.07]
Cross 2018 1,518 0.27 0.33 1,448 0.29 0.34 -0.06 [-0.13, 0.01]
Doumas 2019 27 16.48 10.91 32 18.13 13.30 -0.13 [-0.64, 0.37]
Dowling 2019 245 12.80 8.50 250 15.80 9.60 -0.33 [-0.51, -0.15]
Eslami et al. 2016 63 11.73 3.65 63 13.38 2.28 -0.54 [-0.89, -0.19]
Fridrici 2009 618 9.60 3.01 286 10.20 3.28 -0.19 [-0.33, -0.05]
Fung 2018 70 1.94 0.56 49 2.18 0.64 -0.40 [-0.77, -0.04]
Goodman 2014 22 2.52 0.68 33 2.20 0.75 0.44 [-0.10, 0.98]
Gregoski 2011 68 6.70 3.20 44 6.70 5.70 0.00 [-0.38, 0.38]
Gregoski 2011 52 6.20 2.80 44 6.70 5.70 -0.11 [-0.51, 0.29]
Jamali 2016 50 18.48 2.48 50 22.18 6.35 -0.76 [-1.16, -0.36]
Khalsa 2012 67 -0.60 4.20 33 -0.19 7.20 -0.08 [-0.49, 0.34]
Kiselica 1994 24 88.60 26.52 24 106.30 53.92 -0.41 [-0.97, 0.15]
Kraag 2009 652 35.74 10.11 732 35.30 10.11 0.04 [-0.06, 0.15]
Köroğlu 2016 30 31.20 4.06 30 40.56 8.73 -1.36 [-1.91, -0.80]
Lam 2019 45 5.49 1.78 51 5.47 2.05 0.01 [-0.39, 0.41]
Lang 2016 56 6.19 1.86 56 5.98 1.57 0.12 [-0.25, 0.49]
Livheim 2015 15 21.49 2.18 17 26.30 2.04 -2.23 [-3.10, -1.36]
Lowe 2021 18 9.13 5.20 22 9.69 5.66 -0.10 [-0.71, 0.51]
McArthur 2013 16 9.25 7.26 17 17.47 6.83 -1.14 [-1.86, -0.42]
Michelson 2020 121 6.62 2.49 122 7.17 2.63 -0.21 [-0.47, 0.04]
Noggle 2012 35 18.60 6.20 15 20.30 5.40 -0.28 [-0.88, 0.32]
Puolakanaho 2019 123 2.84 0.81 82 3.00 0.83 -0.19 [-0.47, 0.08]
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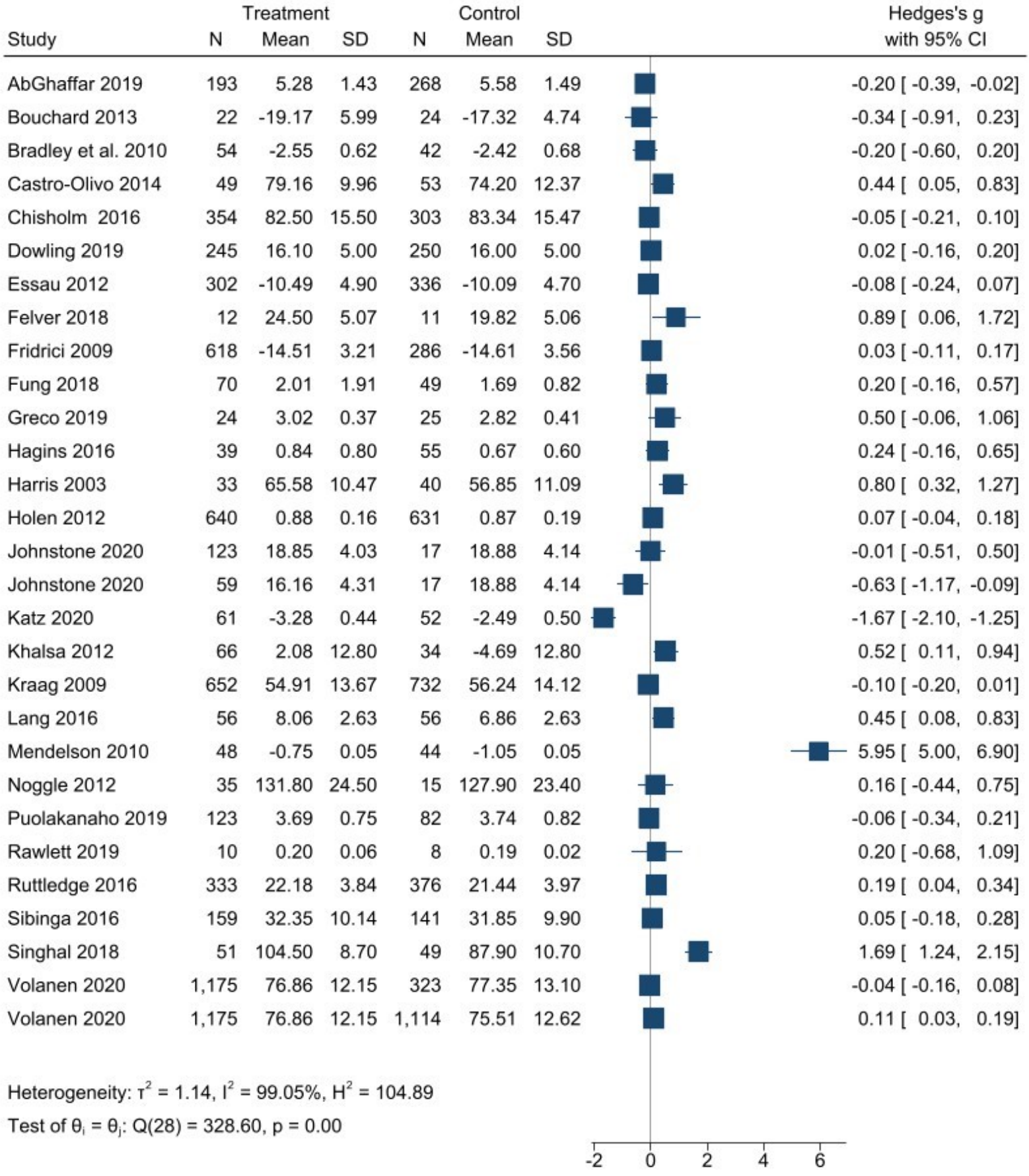
Quach 2016 57 18.19 5.82 43 18.47 6.15 -0.05 [-0.44, 0.35]
Raes 2014 185 28.18 17.94 180 34.42 19.20 -0.34 [-0.54, -0.13]
Rentala 2019 30 12.10 4.80 30 22.10 4.50 -2.12 [-2.75, -1.49]
Ruiz-Aranda 2012 78 1.94 2.22 69 2.65 2.91 -0.28 [-0.60, 0.05]
Sibinga 2016 159 10.93 5.30 141 12.16 4.88 -0.24 [-0.47, -0.01]
Singhal 2018 51 6.50 2.40 49 17.40 4.00 -3.30 [-3.89, -2.70]
Stapleton 2016 11 11.90 3.82 11 13.81 6.22 -0.36 [-1.17, 0.45]
Terjestam 2016a 75 2.02 0.67 23 2.10 0.88 -0.11 [-0.57, 0.35]
Terjestam 2016b 51 2.00 0.63 54 2.11 0.67 -0.17 [-0.55, 0.21]
Terjestam 2016c 57 2.18 0.72 47 2.06 0.70 0.17 [-0.22, 0.55]
Zafar 2015 100 23.05 2.54 100 35.50 4.04 -3.67 [-4.13, -3.22]
Pybis 2014 16 18.25 7.98 16 15.19 7.18 0.39 [-0.29, 1.08]
Heterogeneity: τ^2 = 0.66, I^2 = 97.04%, H^2 = 33.79
Test of $\theta_i = \theta_j$: Q(41) = 486.54, p = 0.00

Figure(s)


Treatment
Control
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Mean
SD
with 95% CI
AbGhaffar 2019 193 5.28 1.43 268 5.58 1.49 -0.20 [-0.39, -0.02]
Bouchard 2013 22 -19.17 5.99 24 -17.32 4.74 -0.34 [-0.91, 0.23]
Bradley et al. 2010 54 -2.55 0.62 42 -2.42 0.68 -0.20 [-0.60, 0.20]
Castro-Olivo 2014 49 79.16 9.96 53 74.20 12.37 0.44 [0.05, 0.83]
Chisholm 2016 354 82.50 15.50 303 83.34 15.47 -0.05 [-0.21, 0.10]
Dowling 2019 245 16.10 5.00 250 16.00 5.00 0.02 [-0.16, 0.20]
Essau 2012 302 -10.49 4.90 336 -10.09 4.70 -0.08 [-0.24, 0.07]
Felver 2018 12 24.50 5.07 11 19.82 5.06 0.89 [0.06, 1.72]
Fridrici 2009 618 -14.51 3.21 286 -14.61 3.56 0.03 [-0.11, 0.17]
Fung 2018 70 2.01 1.91 49 1.69 0.82 0.20 [-0.16, 0.57]
Greco 2019 24 3.02 0.37 25 2.82 0.41 0.50 [-0.06, 1.06]
Hagins 2016 39 0.84 0.80 55 0.67 0.60 0.24 [-0.16, 0.65]
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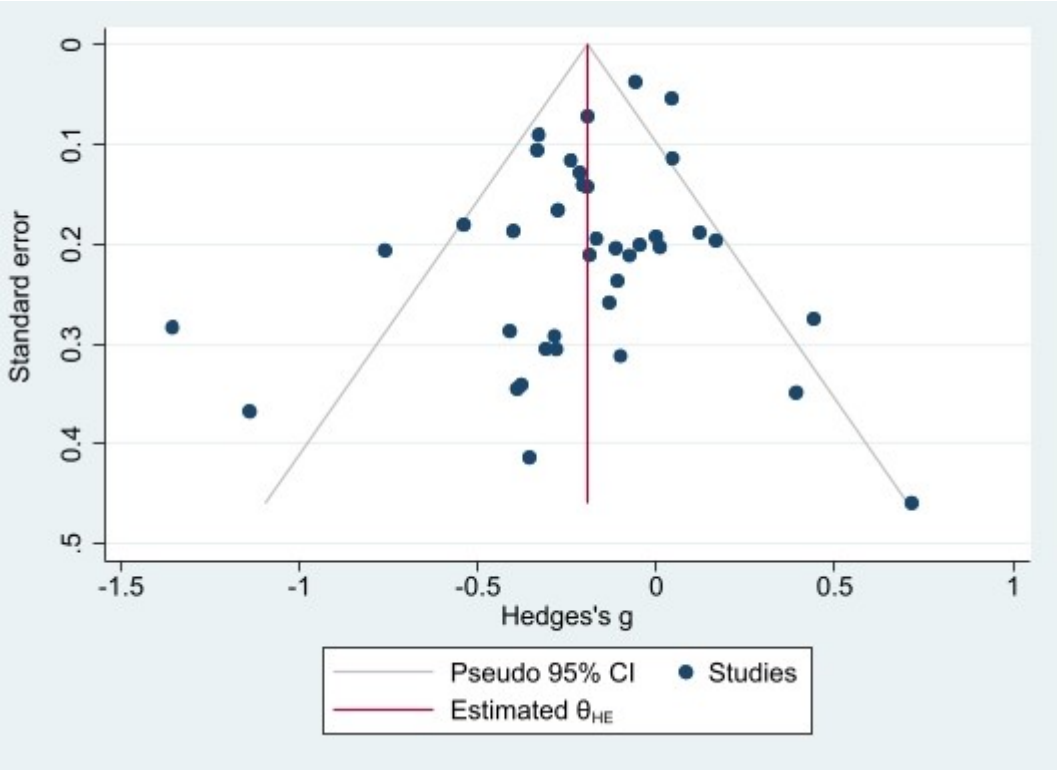
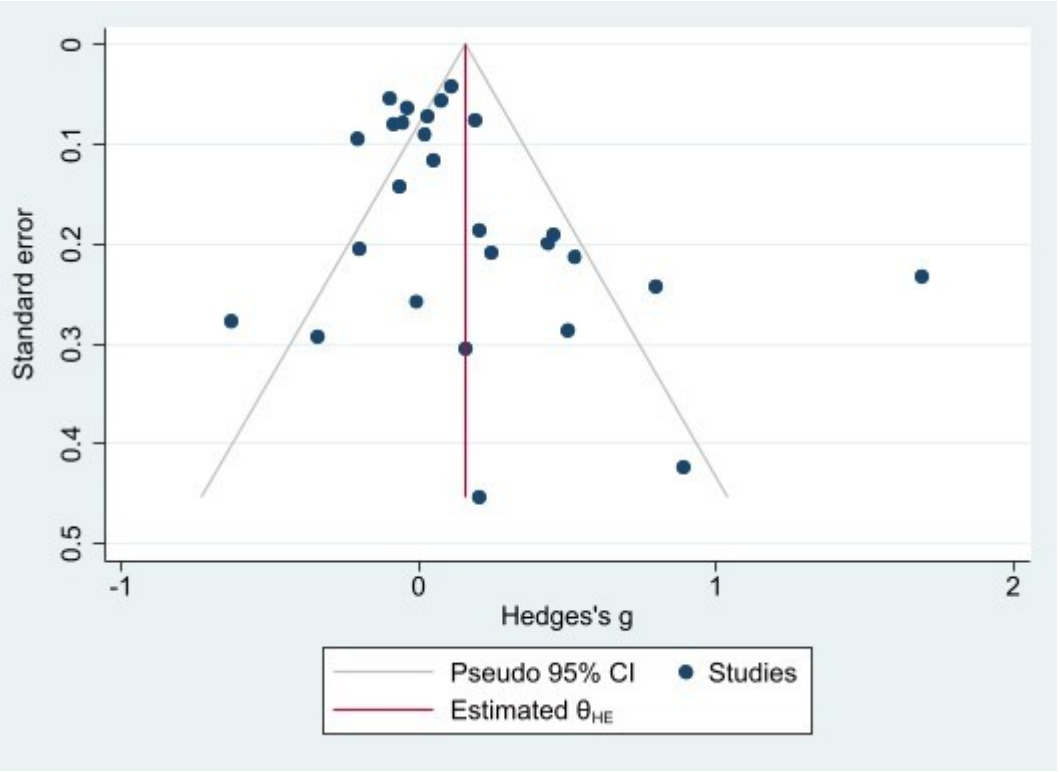
Holen 2012 640 0.88 0.16 631 0.87 0.19 0.07 [-0.04, 0.18]
Johnstone 2020 123 18.85 4.03 17 18.88 4.14 -0.01 [-0.51, 0.50]
Johnstone 2020 59 16.16 4.31 17 18.88 4.14 -0.63 [-1.17, -0.09]
Katz 2020 61 -3.28 0.44 52 -2.49 0.50 -1.67 [-2.10, -1.25]
Khalsa 2012 66 2.08 12.80 34 -4.69 12.80 0.52 [0.11, 0.94]
Kraag 2009 652 54.91 13.67 732 56.24 14.12 -0.10 [-0.20, 0.01]
Lang 2016 56 8.06 2.63 56 6.86 2.63 0.45 [0.08, 0.83]
Mendelson 2010 48 -0.75 0.05 44 -1.05 0.05 5.95 [5.00, 6.90]
Noggle 2012 35 131.80 24.50 15 127.90 23.40 0.16 [-0.44, 0.75]
Puolakanaho 2019 123 3.69 0.75 82 3.74 0.82 -0.06 [-0.34, 0.21]
Rawlett 2019 10 0.20 0.06 8 0.19 0.02 0.20 [-0.68, 1.09]
Ruttledge 2016 333 22.18 3.84 376 21.44 3.97 0.19 [0.04, 0.34]
Sibinga 2016 159 32.35 10.14 141 31.85 9.90 0.05 [-0.18, 0.28]
Singhal 2018 51 104.50 8.70 49 87.90 10.70 1.69 [1.24, 2.15]
Volanen 2020 1,175 76.86 12.15 323 77.35 13.10 -0.04 [-0.16, 0.08]
Volanen 2020 1,175 76.86 12.15 1,114 75.51 12.62 0.11 [0.03, 0.19]
Heterogeneity: τ^2 = 1.14, I^2 = 99.05%, H^2 = 104.89
Test of $\theta_i = \theta_j$: Q(28) = 328.60, p = 0.00
-2
0
2
4
6

Figure(s)


Standard error
0
.1
.2
.3
.4
.5
-1.5
-1
-0.5
0
0.5
1
Hedges's g
Pseudo 95% CI
Studies
Estimated θHE

Figure(s)


Standard error
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0.1
0.2
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0.4
0.5
-1
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1
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Hedges's g
Pseudo 95% CI
Studies
Estimated θHE

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Professor Craig Albers PhD
Editor-in-Chief
Journal of School Psychology

Subject: Res*ubmission of a previously reviewed manuscript*

May 28, 2023

Dear Professor Albers,

We would like to resubmit the attached manuscript titled 'We Need Better Ways to Help Students Avoid the Harms of Stress: Results of a Meta-analysis on the Effectiveness of School-Based Stress Management Interventions' after review for publication in the *Journal of School Psychology*.

The manuscript number of the previous submission is: 23-CJ050523-099

Attached to this cover letter we included a response to reviewers that details all of the changes we made to the manuscript in response to the previous editorial review process.

The resubmission to your journal has been approved by all of the authors as well as the indicated authorship order.

We hope you will find this revised manuscript of significant interest to merit publication in the *Journal of School Psychology*.

Sincerely yours,

Ágnes Juhász

Corresponding author

Title page

Title: We Need Better Ways to Help Students Avoid the Harms of Stress: Results of a Meta-analysis on the Effectiveness of School-Based Stress Management Interventions

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* Ágnes Juhász and Nóra Sebestyén contributed equally to this manuscript

** Zoltán Vokó and Zsuzsa-Rákosy contributed equally to this manuscript

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Funding

The work was supported by the Scientific Foundations of Education Research Program of the Hungarian Academy of Sciences (SZKF-12/2021).

Declaration of interest

The authors declare no competing interests.

Editor

Abstract

* The authors note that effect sizes doubled with inclusion of outliers, but did not present the actual overall effect size estimate for coping/resilience (likely since the effect was not statistically significant). Please provide this estimate (and appropriate p-value) so readers can process the finding that the effect doubled. Please also provide the statistical significance of the effects when outliers were included.

Authors: thank you very much for the review, and for drawing our attention to this omission. The estimate and the p values were added. Lines: 10-12

Introduction

* The authors did a nice job contextualizing their study in the first two paragraphs of the paper. Please consider whether in addition to data from Europe and Canada, recent data from the United States can be presented to help contextualize the study for the readership of JSP, many of whom reside in the U.S.

Authors: Thank you for the suggestion. We presented the US-specific information in lines: 26-30

* I encourage the authors to better introduce their study and its purpose in the first section (i.e., before discussing constructs and measurement) of their paper by discussing stress/coping/resilience intervention, briefly noting prior meta-analyses (and their limitations), and explicitly stating the purpose of the current study.

Authors: Thank you for this comment, we have inserted a paragraph introducing the purpose of our study before discussing the constructs. Lines: 41-52

* The authors did a nice job introducing the disparate constructs of stress, coping, and resilience in the initial section of the manuscript. Yet, as Reviewer 1 noted, more can be done in this section to empirically differentiate these constructs and describe their content, measurement, etc. This is especially important because this is one of the key features of the current study differentiating it from other recent meta-analyses that have been conducted on similar topics.

Authors: Thank you for making us aware of the need for a more detailed and theoretically underpinned discussion of the relationship between the constructs. The introduction has been reframed in line with your suggestions. The sections introducing the concepts of stress, coping and resilience have been revised and supplemented by referring to their differences, the causal relationship between them, and in the case of stress, the challenges of the measurement. Lines: 66-76, 103-127

* Relatedly, one of the major justifications for this study has to do with specific limitations noted for other meta-analyses including: a) the publication of more recent studies; b) a narrow focus on stress in prior studies; c) limited age groups analyzed. Considering this rationale, I suggest expanding and reframing the "School-Based Intervention" section to more explicitly highlight these limitations of prior research. To be clear, I think the authors should retain the initial portions of this section focused on the broad rationale for school-based stress intervention (although some expansion to discuss applied practice related to stress [e.g., applied assessment] as recommended by Reviewer 1 is warranted), but the portion focused on prior meta-analyses should be expanded and elaborated.

<u>Authors:</u> We expanded the first part of this section, focusing on the general justification for stress management interventions in schools by referring to the different types of evidence-based practices. Lines: 145-154.

We expanded and elaborated in more detail the description and shortcomings of the prior meta-analyses in the "School-Based Intervention" section. Lines: 165-185.

* I agree with Reviewer 3 that the authors inclusion of only RCTs could have been handled differently in a manner that would have preserved the rigor of the current study and rendered it more comprehensive. Specifically, the authors could have included other designs (QEDs) and included study design as a moderator in their analyses (van loon, 2020 actually did this and found that this aspect of the study did not moderate results). I will stop short of requiring the authors to do this, but I do believe that re-analysis with the 62 excluded QEDs included would render their meta-analysis much stronger and I encourage the authors to strongly consider it. Regardless of whether they make this change, the authors should be more careful about how they characterize this aspect of their study because it could be viewed less positively than the authors describe. Relatedly, I encourage the authors to remove discussion of generalizability of QED vs. RCTs since this is not an inherent distinguishing factor between the two designs (internal validity is, but RCTs can have low generalizability just as QEDs can as Reviewer 3 pointed out).

<u>Authors:</u> Thank you for the critique. Including other designs (QEDs) and investigating their moderator effect would undoubtedly make our analysis more comprehensive. Although this is no longer possible in the current research, we have removed the discussion of the generalizability of QED vs. RCTs from the text. Moreover, we added this issue to the Limitation section. Lines: 582-587.

Related to the main contributions of the paper stated above, I encourage the authors to more clearly articulate the purpose of the study in the final section of the Introduction.

<u>Authors:</u> The final section of the Introduction, the Aim of the Present Study has been revised and completed in line with the amendments made in the previous sections. Lines: 188-204

* Minor/APA Comments
  - No "Introduction" heading is needed.

Authors: **The heading was deleted.**

- The final sentence on page 6 is not a full paragraph.

Authors: **The sentence was incorporated into the previous paragraph. Lines: 182-185.**

Methods/Results
* Please clarify why the grade range of 1-12 was chosen and why the approach to splitting age groups was employed.

Authors: **Explanation for creating the age groups was added in the text. Lines: 244-249. Further explanation on why the grade range of 1-12 was chosen can be found in lines: 174-179**

* The authors describe their literature search process well, but I consider it a substantial limitation that they did not seek to find grey literature on this topic. The authors did note this as a limitation, but I suggest they expand on this in the Discussion section because of the importance of grey literature for meta-analyses.

Authors: **We expanded the discussion of not including grey literature in our analysis as a limitation in lines: 563-568.**

* Reviewer 3 noted some specific and important considerations for the authors' chosen methodology. Specific points to address include:

- Clarifying "change from baseline data"

Authors: **We have clarified the text as: "When the outcome data were not reported after the intervention and only the change from the baseline data was provided, we used the standardized mean difference of the change in the analysis." Lines: 282-284**

- Integrating multiple effect sizes from each study. The authors used an approach that should be able to include multiple effect sizes from each study and it is unclear why they did not use this approach, which would have been more justifiable. At the very least, better justification is needed, but fully integrating all data would be preferable.

Authors: **Whenever these multiple effect sizes corresponded to different effects (i.e., stress and coping), then we used both. On the other hand, using multiple estimates of the same effect from a study would have increased the influence of these studies. It is not justifiable from a statistical perspective. In this case, these studies would have been counted twice, although they did not provide double-size evidence, but measured the same thing with different instruments. Unfortunately, in many instances these measurements could not be combined, but we had to select the one measurement, which in our view was the most appropriate. We have added this notion to the Methods section. Lines: 290-294.**

- Citing and justifying decomposition approach.

Authors: **We wanted to ensure consistency between studies (i.e., using one overall estimate corresponding to each outcome from all studies), therefore we combined the subgroups when the results were reported by them. We clarified this in the updated text. Now we have provided the reference to the formulas used and corrected typos in them. Lines: 299-303**

- Providing more details on employed analyses, especially for moderation analyses (e.g., describing and justifying approach; clarifying utilized p-values, etc.). This will be a very important aspect of revision to allow better evaluation of your methods.

Authors: **First each potential effect modifier was independently tested in the model. We used $p<0.25$ in these models to decide on the inclusion of the covariates in the multiple regression model. This way we preserved efficiency, i.e., we did not include covariates in the multiple regression model which were very much unlikely to modify the effect of the intervention but were sensitive to including covariates which might not have been significant in the univariate analysis because of their correlation with other important modifiers. We have updated the Methods and Discussion section accordingly. Lines: 317-321, 533-539.**

* Please clarify the statement on page 14 regarding the Terjestam et al study and whether the included samples were completely independent or were included in some other manner.

Authors: **The above-mentioned statement was clarified: the included samples were completely independent, belonging to different grades. Lines: 347-350**

* Like Reviewer 3, I was confused by Table 3. I encourage the authors to revise it for clarity. Relatedly, I assume the authors did not have a Table focused on moderation for the stress outcome because nothing was statistically significant as noted in the text. I encourage the authors to include estimates and specific p-values in a separate Table regardless so that readers can better follow that these analyses were conducted for both outcomes and compare results across construct domains.

Authors: **Thank you for drawing our attention to this mistake in Table 3 related to the age groups that we have corrected: The correct age categories which were used are 10-14 years and >14 years. A separate table (Table 4) focusing on the moderation effects of the stress outcome was added. Lines: 421,426**

* As Reviewer 1 noted, measurement and construct related issues are particularly important for this meta-analysis. I encourage the authors to be more explicit in how they describe results across different outcomes and measures. I also encourage them to address Reviewer 1's suggestion to include measurement/precision as a moderator in the current analysis.

Authors: **We used Hedges's g as effect measure to be able to compare measurements on different scales. The precision in any meta-analysis is considered by weighing the study-specific evidence by the size of the study.**

In response to the reviewers' request, we conducted an investigation to determine whether the measurement quality of the studies had any moderating impact. We performed a distinct analysis wherein only studies characterized by a robust data collection method, as assessed by the Quality Assessment Tool, were included (specifically those that received high scores in the data collection method component of the Quality Assessment Tool). Notably, the overall effect estimates remained largely unchanged compared to the original analysis:

stress: -0.20 95% CI: (-0.27;-0.12), p<0.001
coping: 0.08 95% CI (-.032; 0.19), p=0.16

* More detail is needed for the publication bias section as well to clarify what was done and guide readers of the manuscript.

Authors: We used a standard graphical method and hypothesis testing to study the publication bias. In the Results section, we describe the detection of publication bias by the graphical method and explain how it occurred and present the results of the Egger-test. We have extended the description of this method in the Methods section. Lines: 323-324

* Minor/APA Comments
- APA format does not allow for back-to-back parentheses (p. 8)

Authors: Thank you for this critique, we corrected this in line 207

Discussion
* As Reviewer 1 noted, a greater emphasis on measurement related issues could also be included in the Discussion.

Authors: We have added the discussion of the limitations of the Quality Assessment Tool with regard to how the outcome measurements have been evaluated to the Limitations section. Lines: 577-581

* Along with Reviewers 1 and 3, I believe the manuscript is clear, and the Discussion in particular is well-written. That said, more detail is needed in the practical implications section, especially regarding practical implications for practicing school psychologists.

Authors: Practical implications for school psychologists were added to the section of Conclusions and Practical Implications. Lines: 624-630.

* Minor/APA Comments
- Please be mindful of single sentences constituting paragraphs (e.g., p. 33). This is not APA format.

Authors: We corrected these paragraphs.

Reviewer #1:

First, the authors examined intervention studies targeting stress management (actually reduction) and coping and resilience. These are clearly related constructs, but other than saying so and noting a few correlational students, the authors did little to provide details about any causal models that represent their relationships. Work in this vein has been advanced by the Center on the Developing Child at Harvard and involves both psychological and physiological modeling and an array of environmental factors in homes, schools, and communities.

Authors: Thank you for making us aware of the need for a more detailed and theoretically underpinned discussion of the relationship between the constructs, and also for suggesting the work of the Center on the Developing Child for further study. The introduction has been reframed in line with your suggestions. The sections introducing the concepts of stress, coping and resilience have been revised and supplemented by referring to their differences and the causal relationship between them. Lines: 66-76, 103-127.

Second, the authors assert (on page 6) that "children and adolescents spend a significant amount of their time in school" and that "schools are able to detect problems at relatively early stage." I believe these are both substantial overstatements. The facts are that most students spend less than 13% of their life in a given year breathing school air and most schools do not have valid assessments in use to screen students for stress and resilience. I suggest these statements be refined or much better empirically defended.

Authors: We refined the indicated statements: the ability of schools to detect problems is now mentioned only as a possibility, and we added some more arguments related to the time children spend in schools and the importance of having schools as the location for the intervention programs in general. Lines: 134-145.

Third, the authors employed excellent procedures to select studies and have documented them well. Yes, indeed, the authors followed the PRISMA Guidelines of Page and colleagues (2021)!

Authors: Thank you!

Fourth, the authors also embraced Thomas et al. (2004) Quality Assessment Tool for Quantitative Studies. I do not know much about this tool, but given the dimensions reported in Table 2 (page 22) it ironically does not consider the quality of the assessment tools used to measure the outcome variables - stress and coping/resilience - of primary interest for the meta-analysis at hand.

Authors: We discussed the components of the Quality Assessment Tool for Quantitative Studies in more detail. In the previous version, it was unclear what the dimensions covered. In the present version we provided a short description for each of them. Lines: 268-277. The "Data collection method" dimension refers to the reliability and validity of the measurement. Studies scored the highest (2) if they reported and used reliable tools, scored moderate (1) if they reported the measurement but it was self-developed and/or not reliable and scored weak (0) if the tool was not reported. We agree with the reviewer that we could have used a more deliberate qualitative assessment regarding the reliability of measurements, but we also intended to use the same tool as van Loon et al. (2020) for the purpose of comparison. Nevertheless, we also think that it is an important issue, therefore, we discuss it in the 'Limitation' section. Lines: 577-583.

Therefore, before I got to the Results section, I had concerns about this manuscript because of the lack of concern expressed about the measurement of the outcome variables. I do not know several of the Outcome Measures listed in Table 1 (pages 16-21). However, it appears that the Perceived Stress Scale (PSS-10) is one of the frequently used assessments and one that I do know well. Unfortunately, it is a dated tool (Cohen et al., 1983) perhaps not obsolete, but normed on mostly individuals 25 years or older. The authors of the PSS-10 reported "Cronbach's alpha of >.70 in all 12 studies… The test-retest reliability …in four studies met the criterion of >.70 in all cases."

Authors: Thank you for drawing our attention to the methodological concerns with the Perceived Stress Scale. Indeed, this was one of the two most frequently used questionnaires (along with the Depression Anxiety Stress Scale DASS-S) in the investigated studies. We mentioned the problem of validation on adult samples and the application of various versions in the intervention studies, thus making it difficult to compare the results in the Limitation section of our article. Lines: 572-583.

Unfortunately, their focus is too narrow by not showing appropriated concern for the precision and validity with which the outcome variables of stress and coping/resilience are measured. The quality/validity of the assessments of outcomes is not even listed in an otherwise comprehensive Limitations subsection (pages 33-34). Some consideration is imperative of intervention/treatment sensitivity of each stress and coping/resilience measure in the collective Quality Assessment Considerations tool.

Authors: Thank you for drawing our attention to the concern with the precision and validity of the measurement tools used in the investigated studies. The Quality Assessment Tool that we applied in our analysis was focusing on Cronbach alpha as the primary indicator of the reliability of the measurement tools and disregards treatment sensitivity as an equally (if not more) important characteristic of questionnaires. We mentioned this as a limitation of our study in lines: 577-583.

Thus, in my opinion, they could revise and improve this manuscript by focusing on stress alone, its measurement, and the inclusion of an analysis of a subset of studies that demonstrated highly reliable measurement of stress. Studies with better measures aligned with the intervention target behaviors should provide a stronger test of the effects of the intervention. Something we all care about and are eager to learn more about soon!

<u>Authors:</u> thank you very much for the review, and for raising this possible methodological solution, which could help us reaching even more sound conclusions about the efficiency of the interventions. Although this is no longer possible in the current research, the need for studies using better measures aligned with the intervention target behaviors and for their analysis is now mentioned in the Limitations and future directions section. Lines: 581-583.

In response to the reviewers' request, we conducted an investigation to determine whether the measurement quality of the studies had any moderating impact. We performed a distinct analysis wherein only studies characterized by a robust data collection method, as assessed by the Quality Assessment Tool, were included (specifically those that received high scores in the data collection method component of the Quality Assessment Tool). Notably, the overall effect estimates remained largely unchanged compared to the original analysis:

stress: -0.20 95% CI: (-0.27;-0.12), p<0.001
coping: 0.08 95% CI (-.032; 0.19), p=0.16

Reviewer #3:

On page 7, the authors make an argument that their meta-analysis is more rigorous than previous meta-analyses because they only included RCTs. They then go on to describe all the limitations of group-based QEDs, including baseline equivalence and generalizability. I would argue that both of those can be an issue in RCT as well. Regardless, yes, RCT are "more" internally valid, but QED can also provide rigorous evidence if well executed. The What Works Clearinghouse includes QED, but notes that the evidence is not as strong. I feel like the authors could have included QED and then estimated subgroup or meta-regression models to determine if the effect sizes were different. I'm not suggesting that the authors redo their study, but that perhaps the section on page seven could be slightly reduced/toned down.

Authors: Thank you for the critique. Including other designs (QEDs) and investigating their moderator effect would undoubtedly make our analysis more comprehensive. Although this is no longer possible in the current research, we have removed the discussion of the generalizability of QED vs. RCTs from the text.

On page 11, the authors indicate that they used Hedges' g using immediate post-test results. Then, the authors indicate that they calculated standardized mean difference effect sizes for pre-post change "[W]hen only the change from the baseline data was provided". This is unclear. Do the authors mean that they calculated g (a standardized mean difference effect size with a small sample size bias adjustment) from pre-post change for each group or within groups? Further, what standard deviation was used (pre or post). This is important as within group change is not the same as between group. Further, it is unclear if the posttest effect sizes controlled for pre-test when pre-test data was available.

Authors: We clarified the text. When the outcome measurements were not reported after the intervention, just only the change from the baseline data was provided, we used the standardized mean difference of the change in the analysis. We used the within-group SDs of the group-specific changes for calculating the Hedges' g. The post-test effect sizes were not controlled for the pretest values, as the randomized design ensured baseline comparability. Lines: 282-284

Page 11- selecting only one effect size from each study is fine, but modern meta-analysis techniques allow for aggregating multiple measures and effect sizes within a single study accounting for the nesting, such as robust variance estimation. The authors use a multilevel approach which could potentially handle this issue as well. Regardless, how did the authors choose which measure to include if more than one measure?

Authors: Whenever these multiple effect sizes corresponded to different effects (i.e., stress and coping), then we used both. On the other hand, using multiple estimates of the

same effect from a study would have increased the influence of these studies. It is not justifiable from a statistical perspective. In this case, these studies would have been counted twice, although they did not provide double-size evidence, but measured the same thing with different instruments. Unfortunately, in many instances these measurements could not be combined, but we had to select the one measurement, which in our view was the most appropriate. We have added this notion to the Methods section. Lines: 290-294.

Page 11- provide citation for the decomposition approach

Authors: Now we have provided the reference to the formulas used and corrected typos in them. Lines: 302-303

Page 12- the authors need to be clear about how they estimated the omnibus effect sizes and the moderator analyses using the multilevel random-effects meta-regression model. Was an empty model used for the main effect? Were separate models run for each moderator (that seems to be from Table 3). Overall, more clarity is needed.

Page 12- can the authors clarify the p in the statement, "Covariates were tested independently by outcome, and those with p < .25 were included in the multiple regression model"

Authors: We have updated this part of the Method section to clarify this issue: " The overall effect was estimated by an intercept only multilevel random-effects meta-regression model. Besides estimating the overall effects, we analyzed whether the specific modifier variables of the interventions, detailed above, had modified the effect size of the interventions. First, we added each covariate separately into the model. Covariates were tested independently by outcome, and next those with p < .25 in these models were included in the multiple regression model jointly." Lines: 317-321

Page 13- there is a type (should be protocol paper?) in the Prisma Flowchart

Authors: Thank you for drawing our attention to this mistake, we corrected it.

Page 26- should "level of p-value< 0.25" be 0.05?

Authors: The original number was correct, it is p<.25.

Page 26- in Table 3, the authors indicate that the model for age compared 14-18 and >18. However, after a review of the studies in Table 1, no studies only included samples >18 years. All studies appear to have been in K-12 settings. It is unclear how the authors coded the studies for the moderator analysis.

Authors: Thank you for noting this error. The correct age categories used were 10-14 years and >14 years. We have corrected the table. Line: 421.

Page 26- what was the reference group for the intervention types in Table 3? (e.g, Yoga, SEL)

Authors: The reference category was an intervention not containing the specific component.

Abstract

The level of psychological stress in children and adolescents has increased rapidly over the past decade. The aim of the present meta-analysis was to evaluate the effectiveness of school-based intervention programs targeting stress management and coping/resilience in school-aged children. The present study used more rigorous selection criteria than previous meta-analyses: Only randomized controlled trials were analyzed to increase the validity of the meta-analysis. A total of 55 studies were selected for the analysis, and a multi-level random-effect meta-regression model was used. Effects were calculated as standardized mean difference (Hedges's *g*) between interventions and control conditions at post-test. The results obtained highlighted important methodological issues and the influence of outliers. Without

Footnote 1: List of abbreviations:

AC: active control condition

CBT: cognitive Behavior Therapy

CI: confidence interval

DIFFITS: difference in fits

HBSC: Health Behaviour in School-aged Children

M: mean

NI: not indicated

OECD: Organization for Economic Co-operation and Development

p. page

PC: passive control condition

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

RCT: randomized controlled trial

SD: standard deviation

SEL: social-emotional learning

WHO: World Health Organization

WL: wait-list control

outliers, the results indicate a small significant overall effect of stress (g = −0.19**, p < .001)** and no significant effect of coping/resilience **(g = 0.11; p = .15)**. When outliers are included, the effect sizes are doubled in both cases **(g_{stress} = -0.44, p = .001; $g_{coping/resilience}$ = 0.25 p = .11).** Although we did not find any significant effect modifiers in relation to stress, the coping/resilience interventions were significantly more effective in older age groups, in selective samples, and in programs including yoga and elements of cognitive behavioral therapy (CBT). The present meta-analysis suggests a conflicting view of the effectiveness of school-based interventions targeting stress and coping. The present paper contains an explanation of the results and a detailed discussion of the limitations of the study and its implications in practice.

Keywords: stress management, school-based intervention, school mental health programs, meta-analysis, resilience, coping

The proportion of children and adolescents suffering from mental health conditions has increased in the last decade. One-fourth of adolescents in Europe and Canada reported feeling nervous and irritable or having difficulties getting to sleep every week according to the Health Behaviour in School-aged Children (HBSC) survey in 2017–18. There was an increase in several health complaints between 2014 and 2017 across all age and gender groups (WHO, n.d.). **One-fifth (20.9%) of US adolescents aged 12-17 had experienced a major depressive episode (Bitsko, 2022). The national prevalence of at least one mental health disorder was 16.5%, ranging from 7.6% in Hawaii to 27.2% in Maine (Whitney & Peterson, 2019)**. **The prevalence of mental disorders differed by race, ethnicity, sociodemographic characteristics and age (Bitsko, 2022)**. In an article based on systematic reviews, meta-analyses, and controlled trials, Schulte-Körne (2016) concluded that 4%–5% of children and adolescents suffer from depression. The prevalence of all types of mental health problems affecting children and young people may even be as high as 10%–20% worldwide (Kieling et al., 2011). The prevalence of such problems can be expected to increase over time, as suggested by the results of the HBSC study and a systematic review showing that internalizing problems among recent cohorts of adolescent girls are increasing compared to previous cohorts (Bor et al., 2014).

The recent COVID-19 pandemic has exacerbated the situation. In a recent systematic review by Viner et al. (2021) summarizing the results of 27 studies from around the world, 18%–60% of children and young people (aged between 0 and 20 years) scored above risk thresholds for distress, anxiety, and depressive symptoms.

Given the high percentage of children and youth suffering from milder or more serious mental health issues, prevention should be of high priority. Interventions can aim at preventing and decreasing mental health problems, such as depression, or, as a primary prevention, at reducing chronic stress that precedes mental health symptoms, facilitating coping, and increasing resilience. Our study evaluated the effectiveness of school-based intervention programs targeting stress

management, coping or resilience through a meta-analysis. It is important to note that previous research was limited in its scope. Prior meta-analyses were either outdated (Kraag et al., 2006), approached the topic differently (Feiss et al., 2019; Zenner et al., 2014), or focused on a narrower age group than our analysis (van Loon et al., 2020). Our research considers the entire school age group and provides a more complete picture of the subject. By extending the age group studied, the focus and the intervention methods, we sought to answer not only whether school interventions are effective but also the question of under what circumstances they are most powerful.

Stress

Stress is defined by Lazarus and Folkman (1984) as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 19). Stress is a major risk factor for mental health problems such as anxiety and depression (Businelle et al., 2014; Koechlin et al., 2018; Reiss et al., 2019). The prevalence of feeling very stressed often to very often has been found to be as high as 25% among children and adolescents (Anda et al., 2000). There are various sources of stress in school-aged children, and the school itself may be an important factor. In a survey carried out by the Organization for Economic Co-operation and Development among students aged 15–16 from 72 countries, 66% of the students reported feeling stressed about poor grades (OECD, 2016). School stressors predict mental health problems, together with other sources of stress (Wiklund et al., 2012) such as concerns about personal goals, emotional/interpersonal issues, violence (Anda et al., 2000), not having sufficient time (Brobeck et al., 2007), being alone, family conflicts, and having too many things to do (Ryan-Wenger et al., 2005).

Over the past 50 years, new perspectives on stress have emerged in parallel with the development of neuroscience. Stress can also be seen as an adaptive process of coping with the environment, preparing the individual for future challenges (McEwen & Akil, 2020). Based on its effects on the body, we can distinguish toxic, tolerable and positive stress (Shonkoff, Slopen, et al.,

2021). Although toxic stress can damage the brain, this organ is capable of adaptive plasticity and resilience, especially in the critical period of early life and adolescence (McEwen & Akil, 2020), thus giving this stage of life its primary importance in preventive interventions. When it comes to the measurement of stress, in addition to the existence of different types of stressors, the diverse elements of the complex stress process, such as stressors, physiological and psychological strain, also pose their challenges, and it has resulted in a multitude of very different and often hardly comparable methods.

Coping

Lazarus and Folkman (1984) defined coping as constantly changing cognitive and behavioral efforts to manage specific external and/or internal situations that are thought to exceed or overwhelm the individual's resources. The authors originally distinguished between two categories of coping strategies: emotional-focused coping and problem-focused coping (Lazarus & Folkman, 1984). Problem-focused coping refers to efforts to modify the problem, while emotional-focused coping is defined as efforts to manage the emotional distress within the situation. Research on the mental health effects of emotional-focused coping has yielded inconsistent results (Aldwin & Revenson, 1987), which may be due partly to the predominantly cross-sectional design of the studies, and partly to the fact that items measuring emotional-focused coping are often confounded by approaching and avoidant strategies, and also by coping with the emotional distress itself (Baker & Berenbaum, 2007). Consequently, researchers have recommended other, more precise coping strategy categories, such as adaptive and maladaptive coping, or proactive and reactive coping (Greenglass & Fiksenbaum, 2009).

Looking at the correlations between coping and mental health, we see that adaptive coping can be a protective factor against stress-induced symptoms and problems (Skinner & Saxton, 2019; Zhang et al., 2020), whereas maladaptive coping strategies may correlate with health risks such as externalizing and internalizing problems (Liu et al., 2004), and with alcohol and marihuana consumption (Eftekhari et

al., 2004). Proactive coping, on the other hand, is a process that takes place before stress occurs. Proactive and adaptive coping can predict positive mental health and well-being (Greenglass & Fiksenbaum, 2009). When assessing children's coping strategies, Anda et al. (2000) found that the frequency with which adolescents employed any kind of coping strategies was quite low, and that students experiencing higher levels of stress employed maladaptive coping strategies more frequently than students experiencing lower levels of stress. Skinner and Saxton (2019) found that adaptive coping declined and maladaptive coping increased in early adolescence, which makes this age cohort a particularly important target group for stress management interventions.

Resilience

The term resilience is used in different disciplines and approaches in different ways: as a process, an outcome, or an individual characteristic. The common element between the different definitions is the positive, adaptive response in the face of significant adversity (National Scientific Council on the Developing Child, 2015). Resilience can be defined as the ability to adjust to adverse or potentially traumatic events in such a way that one emerges from them even stronger, with improved coping strategies and adaptation (Luthar & Cicchetti, 2000; Luthar et al., 2000). **It is closely linked to the concepts of stress and coping. During childhood, resilience ensures healthy brain development by transforming potentially toxic stress into tolerable stress (Shonkoff, Boyce, et al., 2021). The resilient brain adapts to comparable types of stressors by developing coping skills, and consequently, effective coping skills (responses to stress) are one of the major building blocks of resilience (McEwen, 1998; National Scientific Council on the Developing Child, 2015).**

The fact that the concepts of stress, coping and resilience are closely intertwined is also reflected by the Allostatic Load Model of Stress (McEwen & Stellar, 1993). Coping and resilience take the form of individual differences in susceptibility to stress and the related behavioral responses to the environmental challenges in this model. It is proposed that they closely link to the physiological

and pathophysiological responses of the body, thus determining the long-term consequences of stress (McEwen & Akil, 2020). Empirical research has demonstrated a close theoretical connection between resilience and coping, especially in the case of problem-focused coping. For instance, Mayordomo et al.(2016) have shown how closely the two are related. Additionally, stress, especially academic stress, can have adverse effects on students' physical and mental health (Pascoe et al., 2020)**. Given** the burden and suffering these health problems can cause to the children, their families, and the system, and the frequently inadequate and limited efficacy of students' coping strategies, supporting students to learn and make use of good stress management skills can benefit them throughout their lives. **All the more so, empirical research has found evidence that** experiences (stressors) in childhood and physiological effects of stress in adulthood **are associated (Guidi et al., 2020).**

School-Based Interventions

School-aged children may be an important target population for stress management interventions, given the relatively high and ever-increasing proportion of them suffering from mild or more serious mental health problems. Different aspects of school, such as the physical environment and social climate of the institution and the socioeconomic profile of the school area, have a direct impact on children's mental health.

Schools can be a powerful setting for the delivery of interventions for effective stress management and coping, given their potential to reach a high number of students simultaneously. According to a time diary study investigating children aged 6 to 12, excluding sleep, children spend more time in school than in any other activity during a workday (Hofferth, 2009). Furthermore, stress and mental health problems can increase the risk of school-related problems, including dropout, misbehavior, and poor performance (Dupéré et al., 2015; Hoffman et al., 1992; Pascoe et al., 2020). On the one hand, this means that schools **could** detect problems at a relatively early **stage from decline in performance and school attendance.** On the other hand, they are also motivated to cooperate in

preventing mental health issues and supporting vulnerable students since evidence-based school programs **have the potential to** reduce the risk of students developing internalizing or externalizing mental health problems (Schulte-Körne, 2016), **and they can also be effective in enhancing student functioning (Bradshaw et al., 2010) and academic attainment (Needham, 2009). Evidence-based school mental health promotion programs can take many forms: they can be targeted, address high-risk students, or universal, involving all students. With regard to their content, they mainly aim at promoting social and emotional learning (SEL) and resilience or preventing social, emotional, and behavioral difficulties, including risk behaviors (Cavioni et al., 2020). School-based stress management programs constitute a subset of these interventions, focusing on supporting students in better coping with stress. Here the outcomes investigated are selected from the psychological and physiological symptoms of stress, coping, social behavior and self-efficacy (Kraag et al., 2006). The most frequently used methods and approaches in stress reduction interventions are mindfulness, relaxation exercises and life skills training, which includes various cognitive-behavioral techniques (Rew et al., 2014).**

Several studies and meta-analyses have found school-based stress management programs to be effective in reducing health risks and stress symptoms and improving coping capacities (Hampel et al., 2008; Kraag et al., 2006, 2009; van Loon et al., 2020). However, other studies and meta-analyses have found no effect on stress or coping, or have identified a significant positive effect only for selective, targeted samples of students (see, e.g., Bluth et al., 2016; Feiss et al., 2019; Hains & Ellmann, 1994). The effect sizes of school-based prevention and intervention programs for reducing psychological pressures/stress, among other things, are low to moderate statistically but significant in terms of real-world impacts (Weare & Nind, 2011). The most frequent school-based intervention programs include mindfulness, relaxation and yoga, social-emotional learning (SEL), and cognitive behavioral therapy (Rew et al., 2014; van Loon et al., 2020).

Although there are a few meta-analyses investigating the effects of stress-management programs, they are not free of limitations. Kraag et al. (2006) investigated the effectiveness of universal school-based stress-management programs targeting stress and coping in children and adolescents, altough the quality of the included studies was low, and they conducted their meta-analysis more than 15 years ago. There is a consensus that meta-analyses should be updated whenever a significant number of new studies appear (Chalmers & Haynes, 1994; Clark et al., 2006; Higgins et al., 2022). Van Loon et al. (2020) carried out a more recent meta-analysis, but they only targeted stress, and focused on adolescents aged 10-18 years old. Feiss et al. (2019) also carried out a more recent meta-analysis, they only targeted adolescents in the United States, and their scope was broader with less emphasis on stress (only four studies related to stress). Numerous researchers have argued that interventions aimed at prevention should begin as early as possible (e.g., Hester et al., 2004; Luby, 2010; Nelson, 2000; Rapee, 2013; Webster-Stratton, 1993). Following this line, the transition from kindergarten to primary school and adjusting to a new system can be very stressful for the pupils (Wong, 2013), so it is important to investigate the effectiveness of stress-management programs targeting children under the age of 10. Other meta-analyses have focused exclusively on one type of intervention (e.g., mindfulness-based stress reduction, Zenner et al., 2014); or have involved studies for the prevention of depression and anxiety, the potential consequences of stress, rather than stress itself (Werner-Seidler et al., 2017). To sum up, previous meta-analyses were either outdated or focused on a narrower aspect regarding age or stress outcome. There is no recent meta-analysis that is updated, involves also younger age group, and investigates stress and coping at the same time.

Aim of the Present Study

Our goal was to assess the effectiveness of school-based intervention programs by means of a meta-analysis. **Considering the shortcomings of prior meta-analyses we focused also on the younger**

age group, involving children right from the start of primary school to the end of secondary school. Moreover, our meta-analysis targeted stress management and coping as well, as it has been more than 15 years since the last meta-analysis on this subject (Kraag et al., 2006). We included different types of intervention in our analysis, both selective and universal, making it possible to compare the effectiveness of the various intervention types. Our meta-analysis was methodologically more rigorous than most earlier analyses,, which have also included quasi-experimental studies (e.g., Feiss et al., 2019; Kraag et al., 2006; van Loon et al., 2020). Quasi-experimental study designs lack randomization and as such have various methodological shortcomings: performance at baseline in the experimental group and the control group often differs, thereby precluding direct comparisons between the study group and the control group (Eccles et al., 2003)**. To** increase the validity of our meta-analysis, we therefore aimed to focus exclusively on randomized controlled studies (Stanley, 2007).

In sum, the goal of our research was to analyze the effectiveness of school-based programs on stress and coping or resilience targeting school-aged children from grades 1-12, thus allowing the effectiveness of both early prevention and prevention targeting adolescents to be examined as these are critical age groups for the development of resilience. Our more general goal was to contribute to the development of school-based mental health interventions.

Methods

The present study adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA**)** guidelines (Page et al., 2021).

Eligibility Criteria

Articles were selected by means of a systematic literature search. Sample, setting, research design, and outcomes were used to define the eligibility criteria. Studies were included if (a) the sample consisted of school-aged children from grades 1 to 12; (b) implementation was in a school setting; (c) the research design was a randomized controlled trial (RCT); (d) the intervention targeted stress

management and/or coping/resilience building; and (e) the outcomes were quantitative measurements of stress and coping/resilience. Quasi-experimental studies, interventions focusing on post-traumatic stress disorder or the effects of war, and studies involving clinical samples were excluded. Furthermore, reviews, study protocols, and case studies without quantitative data were also removed from the meta-analysis.

Information Sources and Search Strategy

The systematic literature search was performed in eight databases: ProQuest, ERIC, Cochrane Library, PubMed, Web of Science, Science Direct, PsycArticle, and Educational Research Complete. The search period ran up to April 2021. Additional manual searches were conducted in the literature references of relevant meta-analyses (Kraag et al., 2006; van Loon et al., 2020) and articles. The search terms were (intervention OR program OR training OR prevention) AND ("randomized controlled trial" OR RCT OR "quasi experiment" OR experiment OR "randomized control") AND (stress OR cortisol OR "psychosocial risk" OR distress OR anxiety OR well-being OR resilience OR psychosomatic) AND (school OR classroom OR student OR school-based).

Selection and Data Collection Process

The literature search and the selection of studies were performed by five independent researchers. Search results were stored using reference management software (Zotero, Version 6.0.8). Data on study characteristics and intervention outcomes were extracted by five independent researchers. A consensus discussion took place at the end of the selection and data extraction process. A third researcher (the first or second author) was consulted so that consensus could be reached in the event of disagreements and ambiguities.

The following data were extracted from the studies: author(s) and year of publication, country, age of study participants, sample characteristics, elements of the intervention, length of the intervention and follow-up, type of outcome, agent of delivery, and type of control condition, as well as the data

required to calculate effect sizes. In the case of studies where important information was missing, the study authors were contacted by the researchers.

To allow for comparison, the analyzed effect modifiers described below were mostly based on van Loon et al. (2020):

1. Target population: (a) universal intervention involving the general population without selection; or (b) selective intervention targeting a narrower sample, typically applying a screening process (e.g., cut-off points).

2. Age of the sample. **Since in most interventions, the age range of the sample covered was larger than 1-2 years, to allow a more valid comparison of the studies, instead of using the mean age, three** age groups were defined: (a) children below the age of 10; (b) students aged 10–14; and (c) students over the age of 14. **The age groups are based on the structure of the education system; they are defined according to the transition points when pupils move from one type of school/grade to another in most school systems.**

3. Type of control condition: (a) in the wait-list control condition (WL), participants received the intervention after the intervention group; (b) in the passive control condition (PC), participants did not receive any intervention or did regular school activities; and (c) in the active control condition (AC), participants received specific treatment or took part in a structured whole-class activity.

4. Type of delivery. Interventions were delivered by: (a) the authors, researchers, or experts; (b) the school staff; or (c) via other platforms (e.g., online).

5. Intervention length was calculated using the session duration multiplied by the frequency of the sessions. If the session duration was not specified and was reported as a standard lesson, it was calculated as 45 minutes. If a range was given for the length of the intervention, we used the value in the middle of the range.

6. Intervention elements. Following van Loon et al. (2020), we focused on intervention elements and assessed the most frequently used stress management techniques, such as mindfulness, relaxation, yoga, CBT, SEL, exercises, psychoeducation, and counselling. Studies were characterized by the main techniques included in the intervention.

Quality Assessment

Following van Loon et al. (2020), research quality was assessed by the Quality Assessment Tool for Quantitative Studies (Thomas et al., 2004), a scale that is frequently used for health promotion interventions. The scale consists of six methodological quality components: 'Selection bias' refers to the representativeness of the target population and the participation rate. **'Study Design' refers to the design of the study, 'Confounders' indicates the rate of confounders that were controlled for, 'Blinding' indicates who was aware of the research question, 'Data collection methods' refers to the validity and reliability of the measurements, and 'Withdrawals/dropouts' indicates the follow-up rate of the participants.** Quality assessment was performed by six independent coders. Each component was rated on a three-point scale with the scores 0 (*weak*), 1 (*moderate*), or 2 (*strong*). The maximum quality score was 12. **Those studies scored the highest that were RCTs, used reliable and popular measurements, worked with balanced samples (e.g., by gender), had an 80% participation rate and less than a 20% drop-out rate, and participants and coders were blind for the research questions.**

Statistical Methods

Effect Size

The different studies used different scales to measure stress level and/or coping/resilience. We used Hedges's *g* standardized mean difference in the first measurement after the intervention, corrected for small samples (Murad et al., 2019). Generally, 0.20, 0.50, and 0.80 are considered the cut-off points for small, moderate, and large effects. When **the outcome data were not reported after the intervention and** only the change from the baseline data was provided, we used the standardized mean

difference **of the change in the analysis**. As all the studies involved were RCTs, the difference in the change from the baseline was inevitably very close to the difference in the measurement after the intervention.

Where several measurement tools were used to measure the same outcome, only one of them was selected. If the measurement tool was composed of subscales, and no summary measure was available for that tool, then only one subscale was selected corresponding to each outcome to avoid having more than one effect estimate for the same outcome from the same study. **Using multiple estimates of the same effect from a study would have increased the influence of these studies. This is not justifiable from a statistical perspective. In this case, these studies would have been counted twice, although they did not provide double-size evidence but measured the same thing with different instruments.** Regarding the different measurement tools, the following decisions were made. If a well-known and accepted tool was used together with a tool that was less well known and less utilized, we used the former. With respect to multifaceted coping scales, we selected the problem-focused coping scale if available; if not, we selected the scale measuring adaptive coping strategies.

In some instances, the results were presented by subgroups only (e.g., by sex and grade). In these cases**, to ensure consistency between studies (i.e., using one overall estimate corresponding to each outcome from all studies),** we combined the group-specific estimates using the following decomposition rules for means and standard deviations **(Agarwal, 2006)**:

$$\bar{X}_c = \frac{n_1 \cdot \bar{X}_1 + n_0 \cdot \bar{X}_0}{n_1 + n_0}$$

$$S_c = \sqrt{\frac{n_1 \cdot [S_1^2 + (\bar{X}_1 - \bar{X}_c)^2] + n_1 \cdot [S_0^2 + (\bar{X}_0 - \bar{X}_c)^2]}{n_1 + n_0}}$$

where n_1 and n_0 are the numbers of subjects in group 1 and group 0, $\bar{X}_1$ and $\bar{X}_0$ are the mean values of the outcome measure, and S_1 and S_0 are the standard deviations in the two groups. $\bar{X}_c$ stands for the mean value of the outcome in the combined group, and S_c stands for the combined standard deviation.

We estimated the overall effect size by the multilevel random-effects meta-regression modelling of the two outcomes (stress and resilience/coping) jointly, using the meta mvregress module of the software package StataMP 17. The analysis accounted for the dependency of multiple effect sizes from the same study due to multiple arms and/or outcomes. The two outcomes, stress and coping/resilience, were analyzed jointly.

Outliers were defined based on the difference in fits (DFFITS) values (Belsley et al., 1980). An observation was deemed to be an outlier if the absolute value of its DFFITS value was greater than

$$\sqrt{\frac{k+2}{n-k-2}}$$

where *k* is the number of predictors and *n* is the sample size. Outliers were excluded from the analysis.

Effect Modifiers

The overall effect was estimated by an INTERCEPT ONLY multilevel random-effects meta-regression model. Besides estimating the overall effects, we analyzed whether the specific modifier variables of the interventions, detailed above, had modified the effect size of the interventions**. First, we added each covariate separately into the model.** Covariates were tested independently by outcome, and **next** those with p **< .25 in these models** were included in the multiple regression model **jointly.**

Publication Bias

First, the funnel plot was visually inspected to detect asymmetry, which is an indication for publication bias. Next, publication bias was assessed by Egger's asymmetry test (Egger et al., 1997).

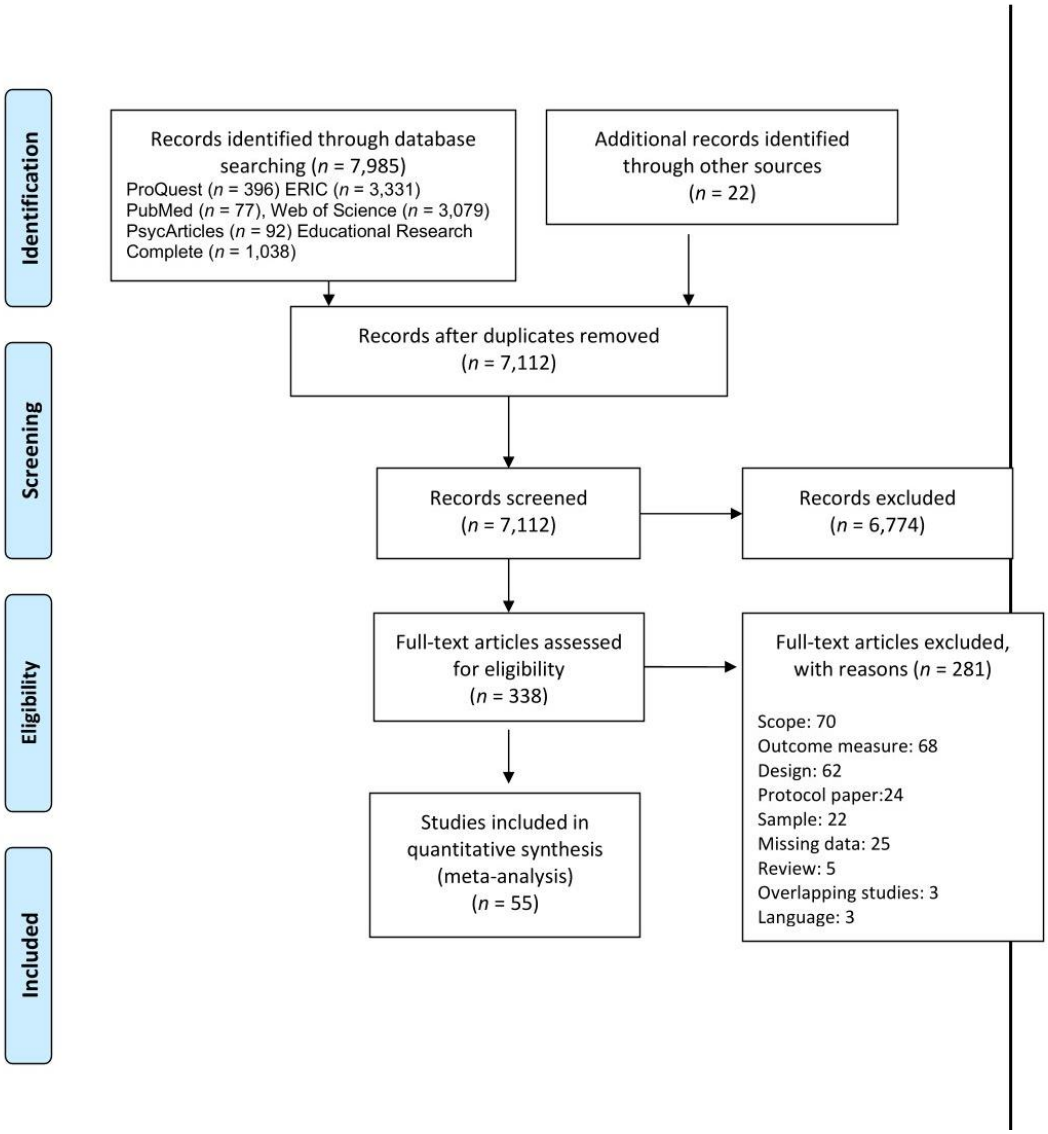
Results

Study Selection

The study selection process is visualized in a PRISMA flow diagram in Figure 1 (Moher et al., 2009). The initial database search resulted in 7,985 articles, and 22 further articles were identified through additional manual searches. After duplicates were removed, abstract and title screening was performed on 7,112 items. Full text examination was conducted on 338 articles, and after the exclusion of 281 articles, 55 studies were included in the final meta-analysis. The main reasons for exclusion were related to the scope of the study (i.e., no stress/coping focus); the type of outcome measure (e.g., qualitative data); and the design (e.g., quasi-experimental study). Several studies were removed because they were earlier versions of included studies or study protocols.

Figure 1

Flowchart of Article Selection



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341

342 **Characteristics of the Studies**

343 Fifty-five studies were included in the analysis. All the studies had been published. Most of them
344 had been conducted in North America (n_{US} = 19, n_{CAN} = 2) or Europe (*n* = 17), followed by Asia (*n* = 9) and
345 Australia (*n* = 7), while only one study came from South America. There were no interventions from
346 Africa. Regarding outcomes, 28 studies focused on stress, 17 studies measured coping/resilience, and 10
347 studies targeted both stress and coping. In one of the studies (Terjestam et al., 2016), **data were broken**

down by grade, three interventions were compared to three separate controls **from the same grade level**, and these were considered in the analysis as three separate studies**, as the control groups and the intervention groups were independent of one another**. Most of the interventions were universal (*n* = 38), and only 17 studies worked with a selective sample. Regarding the type of delivery, 34 interventions were delivered by mental health professionals or researchers, 16 interventions were implemented by teachers or school counsellors, and five interventions also included another form of delivery (e.g., online). With respect to control conditions, most of the studies used AC (*n* = 28), 12 studies involved PC, and 15 studies had a research design with a WL control group. Regarding the content of the interventions, the most frequently used element was SEL (*n* =29), followed by psychoeducation (*n* = 25), relaxation (*n* = 24), and mindfulness (*n* = 21). Only a few interventions included cognitive behavioral techniques (*n* = 14), exercises (*n* = 6), and counselling (*n* = 4). The average length of the interventions was 737 minutes.

Out of the 55 studies, 27 involved older adolescents (> 14 years of age), 22 involved early adolescents (10–14 years of age), five worked with mixed age groups but included older adolescents as well, and only one study focused on children below the age of 10. In most studies (*n* = 31), the participants were followed for a maximum of 6 months; in 15 studies, participants were followed for 6.1–12 months; and in nine studies they were followed for over a year. We used the first measurement during the follow-up as the outcome to ensure comparability in this respect.

Details of the selected studies are presented in Table 1. The results of the quality assessment are presented in Table 2, where a higher score indicates stronger methodological quality. Study quality ranged from 4 to 11, with an average value of 7.1 out of 12.

Table 1

Details of the Selected Studies

First author (year)	Country	N	Age range/mean age/grade	Control group	Intervention type	Program name /main component	Outcome measure	Intervention target
AbGhaffar (2019)	Malaysia	461	age: 10-11	WL	universal	school-based anxiety prevention program	Child Worry Management Scale (CWMS)	coping
Babic (2016)	Australia	322	M = 14.4 ± 0.6	WL	selective	„Switch-off 4 Healthy Minds" (S4HM	Psychological Distress	stress
Bauer (2019)	US	33	6th grade	AC	universal	mindfulness	Perceived Stress Scale (PSS)	stress
Bernal-Manrique (2020)	Colombia	42	age: 11-17 M=14.52 ± 1.67	WL	selective	acceptance and commitment therapy (ACT) focused on repetitive negative thinking	Depression Anxiety and Stress Scales (DASS-S)	stress
Bluth (2015)	US	27	M =17±1.3, 9-12th grade	AC	universal	Learning to BREATHE (mindfulness)	Perceived Stress Scale (PSS-10)	stress
Bouchard (2013)	Canada	46	age: 9-12, 5-6th grade M(intervention)=10.7 M(control)=10.1	WL	universal	Dominique's Handy Tricks (CBT)	The Coping Scale for Children and Youth	coping
Bradley (2019)	US	136	10th grade, M=15.3±0.45	WL	universal	TestEdge for students, Resilient Educator program for teachers (biofeedback)	Student Opinion Survey (SOS)	coping
Burckhard (2016)	Australia	267	age: 15-18 M=16.43 ±0.64 10-11th grade	AC	universal	Strong Minds (ACT)	Depression Anxiety and Stress Scales (DASS-S)	stress

Burckhard (2017)	Australia	48	age: 14-16, M=15.64 10th grade	AC	universal	Strong Minds II (ACT)	Depression Anxiety and Stress Scales (DASS-S)	stress
Butzer (2016)	US	209	M=12.640.33 7th grade	AC	universal	Kripalu Yoga in the Schools (KYIS) curriculum	Perceived Stress Scale (PSS-10)	stress
Castro-Olivo (2014)	US	102	M=13.91±1.86	WL	selective	culturally adapted Jovenes Fuertes (Strong Teens) Social-Emotional Learning (SEL) program	Behavior Emotional Rating Scale (BERS-2)	coping
Chisholm (2016)	UK	657	age: 12-13 years, M=12.21±0.58 8th grade,	AC	universal	contact and education about living with mental illness	Resilience Scale	coping
Cross (2018)	Australia	2945	M=13.00 8-9th grade	AC	universal	Friendly Schools Project	Depression Anxiety Stress Scale (DASS-S)	stress
Doumas (2019)	US	65	M=16.29± 0.95	PC	universal	STAC bystander bullying program	Depression and Anxiety Scale of the Behavioral Assessment Scale-3 Self Report of Personality-Adolescent Form (BASC-3 SRP-A)	coping
Dowling (2019)	Ireland	675	age: 15-18	AC	universal	MindOut	Coping Strategy Indicator (CSI-15) Depression Anxiety Stress Scale (DASS-S)	coping, stress
Eslami (2016)	Iran	126	M=16.33±7.0	AC	universal	assertiveness training program	Depression Anxiety Stress Scale (DASS-S)	stress

Essau (2012)	Germany	638	age: 9-12 years M=10.91 ±0.86	WL	universal	FRIENDS (CBT)	Coping Scale for Children and Youth	coping
Felver (2018)	US	29	9-12th grade	AC	universal	Learning to BREATHE (L2B)	Social-Emotional Assets and ResilienceScales (SEARS-SF)	coping
Fridrici (2009)	Germany	904	age:12-18 M=14.83±0.81 8-9th grade	PC	universal	stress-prevention program	Questionnaire for the measurement of stress and coping in children and adolescents	stress, coping
Fung (2018)	US	145	age:13-15 M=13.99±0.36 9th grade	WL	selective	Learning to Breathe (L2B)	Perceived Stress Scale (PSS-9), Emotional Approach Coping Scale	stress, coping
Goodman (2014)	US	60	9th and 12th grade	AC	universal	Digital storytelling	Adolescent Stress Questionnaire	stress
Greco (2019)	Italy	50	age: 14-16 M=14.6 ± 0.7	WL	universal	build resilience to bullying	Child and Youth Resilience Measure (CYRM-28)	coping
Gregoski (2011)	US	166	9 grade	AC	selective	breathing awareness meditation (BAM), Botvin LifeSkills Training (LST)	Perceived Stress Scale (PSS-4)	stress
Hagins (2016)	USA	112	9,10,11th grade	AC	universal	The yoga curriculum (Sonima Foundation, n.d.)	Response to Stress Questionnaire (RSQ)	coping
Harris (2003)	US	86	age:14-19 M=17	AC	selective	"Taking charge" (CBT)	Adolescent Coping Orientation for Problem Experiences (A-COPE)	coping

Holen (2012)	Norway	1483	age:7-8 M=7.3± 0.32	PC	universal	Zippy's Friends	Kidscope questionnaire	coping
Jamali (2016)	Iran	100	age:13–14 M= 13.50±1.01	PC	universal	Life skills training	stress (based on Kettle Personality Scale)	stress
Johnstone (2020)	Australia	295	age:8–13 M=11.04 ± 1.40	AC	universal	Emotion Regulation (ER) and Behavioral Activation (BA)	The child and youth resilience measure—short version (CYRM-12	coping
Katz (2020)	Canada	995	3-12th grade	PC	universal	Combined Mental Health Literacy and Dialectical Behavior Therapy Skills Program	Resilience Inventory	coping
Khalsa (2012)	US	100	age: 15-19, M=16.8±0.6, 11-12th grade	AC	universal	Yoga Ed (mindful)	Resilience Scale, Perceived Stress Scale (PSS-10)	stress, coping
Kiselica (1994)	US	48	9th grade	AC	universal	stress inoculation training	Symptoms of Stress Inventory (SOSI)	stress
Köroğlu (2016)	Turkey	60	age: 11 - 13	PC	universal	swimming training	Stress Level Scale II	stress
Kraag (2009)	Netherlands	1467	M=10.3±0.64 5-6th grade	WL	universal	Learn young, learn fair	Maastrich University Stress Instrument for Children (MUSIC), Social Problem Solving Instrument	stress, coping
Lam & Seiden (2019)	China	115	age:11-15 M=12.4 6th grade	AC	universal	learning to BREATHE	Perceived Stress Scale (PSS-1)	stress

Lang (2016)	Switzerland	122	M = 16.22 ± 1.12	AC	universal	EPHECT coping training program	Coping Questionnaire for Children and Adolescents; Adolescents Stress Questionnaire (ASQ)	stress, coping
Livheim (2015)	Sweden	32	age: 14-15	AC	selective	Australian Acceptance and Commitment Therapy protocol	Perceived Stress Scale (PSS-10), Depression Anxiety Stress Scale (DASS-S)	stress
Lowe & Wurthrich (2021)	Australia	56	age: 17-18 12th grade	AC	universal	Study without Stress (CBT)	Depression Anxiety and Stress Scale 21 (DASS-S)	stress
McArthur (2013)	UK	33	age: 13-16 M=14.12±0.93	WL	selective	school based humanistic counselling	Young Person's CORE (YP-CORE)	stress
Mendelson (2010)	USA	97	4-5th grade	WL	universal	school-based mindfulness and yoga intervention - Holistic Life Foundation (HLF)	The Responses to Stress Questionnaire (RSQ)	coping
Michelson (2020)	India	251	age: 12-20 9-12th grade	AC	selective	problem solving	Perceived Stress Scale (PSS-4)	stress
Noggle (2012)	USA	51	M=17.20±0.70 11-12th grade	AC	universal	Kripalu-based yoga program	Perceived Stress Scale (PSS-10); Resilience Scale (RS)	stress, coping
Puolakanaho (2019)	Finland	205	M=15.27 ± 0.39 9th grade	PC	universal	Youth COMPASS (ACT)	Academic Buoyancy Scale, 1-item overall stress scale; School Stress- 4 item scale form HBSC 2012	stress, coping
Pybis (2014)	UK	49	age: 13+ years, M=14.5±1.35	WL	selective	humanistic counselling	Young Person's CORE (YP-CORE)	stress

Quach (2016)	USA	149	age:12-15 M=13.18±0.72 7–9th grade	AC	universal	mindfulness meditation and hatha yoga	Perceived Stress Scale (PSS-10)	stress
Raes (2013)	Belgium	408	age: 13-20 M=15.4±1.2	PC	universal	mindfulness	Depression Anxiety Stress Scale (DASS-S)	stress
Rawlett (2019)	USA	22	age:11–13 M = 11±0.696 6th grade	AC	selective	Learning 2 Breath Mindfulness Curriculum	Response to Stress Questionnaire (RSQ)	coping
Rentala (2019)	India	60	age: 16-19 M=17.13	PC	selective	holistic group health promotion	Depression Anxiety Stress Scale (DASS-S); Education Stress Scale for Adolescents (ESSA)	stress
Ruiz-Aranda (2012)	Spain	147	age: 13-16, M= 14.18±0.64	PC	universal	Emotional intelligence education program (INTEMO)	social stress scale of Behavior Assessment System for Children and Adolescents (BASC)	stress
Ruttledge (2016)	Ireland	709	age:9-13 M=10.83±0.7	WL	universal	Friends for Life (CBT)	Coping Efficacy Scale (CES)	coping
Sibinga (2016)	USA	300	M=12.00 5-8th grade	AC	universal	Mindfulness-based stress reduction	Perceived Stress Scale (PSS-6), Children's Response Style Questionnaire (CRSQ), The Brief COPE, The Coping Self Efficacy Scale (CSE)	stress, coping

Singhal (2018)	India	120	age: 13-18 8,9, and 11th grade	AC	selective	Coping Skills Program	Academic stress (SAAS)Social Problem Solving Inventory (SPSI), Adolescent Coping Orientation to Problems Experienced Inventory (ACOPE)	stress,coping
Stapleton (2016)	Australia	44	age: 14-15	WL	universal	Emotional Freedom Technique	Depression Anxiety Stress Scale (DASS-S	stress
Terjestam (2016)	Sweden	307	5,7 and 8th grade	AC	universal	Compassion and Attention in the Schools (Compas)	Psychological distress (PD) General Stress Scale (GSS)	stress
Volanen (2020)	Finland	3519	age: 12–15 6th-8th grade	AC	universal	Stop and Breathe/Be (mindfulness-based)	Resilience scale (RS14)	coping
Zafar & Khalily (2015)	Pakistan	100	age:12- 18 M = 15.14±1.98	AC	selective	Didactic therapy	Depression Anxiety Stress Scale (DASS-S)	stress

Table 2

Quality Ratings of the Studies

Author (year)	Selection bias	Design	Confounders	Blinding	Data collection method	Withdrawals, dropouts	Total
Ab Ghaffar et al. (2019)	2	2	1	1	2	2	10
(Babic et al., 2016)	0	2	2	0	1	2	7
(Bauer et al., 2019)	0	2	2	1	2	1	8
(Bernal-Manrique et al., 2020)	1	2	1	0	2	2	8
Bluth et al. (2016)	2	2	1	0	2	1	8
(Bouchard et al., 2013)	0	2	0	0	2	1	5
(Bradley et al., 2010)	1	2	1	0	2	2	8
(Burckhardt et al., 2016)	2	2	1	0	1	2	8
(Burckhardt et al., 2017)	0	2	1	0	2	0	5
(Butzer et al., 2017)	0	2	1	0	1	2	6
(Castro-Olivo, 2014)	0	2	1	0	2	0	5
(Chisholm et al., 2016)	1	2	0	0	1	2	6
(Cross et al., 2018)	1	2	2	0	2	2	9
(Doumas et al., 2019)	0	2	1	0	2	2	7
(Dowling et al., 2019)	1	2	2	0	2	2	9
(Eslami et al., 2016)	2	2	1	0	1	2	8
(Essau et al., 2012)	1	2	1	0	2	0	6
(Felver et al., 2019)	0	2	1	0	2	2	7
(Fridrici & Lohaus, 2009)	2	2	0	0	1	2	7
(Fung et al., 2019)	1	2	1	0	2	2	8
(Goodman & Newman, 2014)	0	2	0	0	1	1	4
(Greco et al., 2019)	0	2	2	1	2	2	9
(Gregoski et al., 2011)	2	2	1	0	2	2	9
(Hagins & Rundle, 2016)	0	2	1	0	1	2	6
(Harris & Franklin, 2003)	0	2	1	0	2	1	6
(Holen et al., 2012)	2	2	1	0	2	2	9
(Jamali et al., 2016)	0	2	0	0	0	1	3
(Johnstone et al., 2020)	1	2	0	0	2	0	5
Katz et al. (2020)	2	2	2	1	2	1	10
(Khalsa et al., 2012)	2	2	1	0	1	2	8
(Kiselica et al., 1994)	0	2	2	1	2	2	9
(Köroğlu & Yiğiter, 2016)	0	2	0	0	1	2	5
Kraag et al. (2009)	0	2	1	1	1	2	7
(Lam & Seiden, 2020)	1	2	2	1	2	1	9

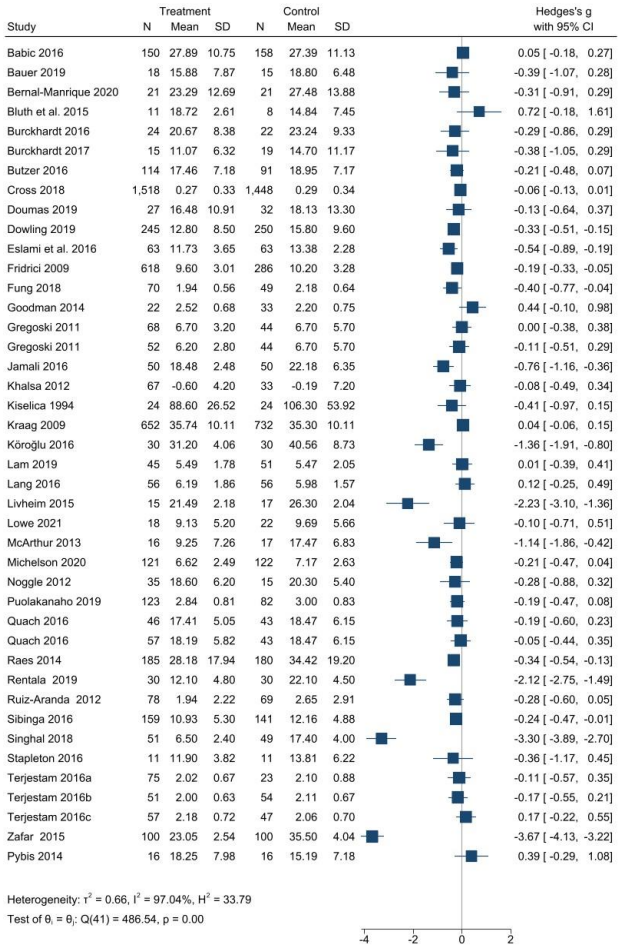
(Lang et al., 2017)	2	2	1	1	2	2	10
(Livheim et al., 2015)	0	2	1	0	2	1	6
(Lowe & Wuthrich, 2021)	2	2	2	1	2	2	11
(McArthur et al., 2013)	0	2	1	1	2	2	8
(Mendelson et al., 2010)	1	2	1	0	2	2	8
(Michelson et al., 2020)	2	2	1	1	0	2	8
(Noggle et al., 2012)	0	2	1	0	2	2	7
(Puolakanaho et al., 2019)	2	2	2	0	2	2	10
(Pybis et al., 2014)	0	2	1	1	2	0	6
(Quach et al., 2016)	0	2	1	0	2	2	7
(Raes et al., 2014)	0	2	2	0	2	2	8
(Rawlett et al., 2019)	0	2	1	0	2	2	7
Rentala et al. (2019)	0	2	1	0	2	2	7
(Ruiz et al., 2012)	0	2	0	0	2	0	4
(Ruttledge et al., 2016)	0	2	0	0	2	1	5
(Sibinga et al., 2016)	0	2	1	1	2	0	6
Singhal et al. (2018)	1	2	0	0	1	1	5
(Stapleton et al., 2016)	0	2	0	0	1	2	5
(Terjestam et al., 2016)	2	2	0	0	2	2	8
(Volanen et al., 2020)	2	2	1	0	2	1	8
(Zafar & Khalily, 2015)	0	2	1	0	2	2	7

Overall Effect

Regarding the stress outcome, the study-specific effect was heterogeneous (I^2: 97%, homogeneity test *p*: < .01); it had a range from –3.67, 95% CI: (−4.13; −3.22) to 0.72, 95% CI: (0.18; 1.61) (Figure 2). Negative numbers indicate a positive effect in relation to stress. Three studies (Rentala et al., 2019; Singhal et al., 2018; Zafar & Khalily, 2015) were deemed to be outliers based on their DFFITS values and were excluded from the analysis of the stress outcome.

Figure 2

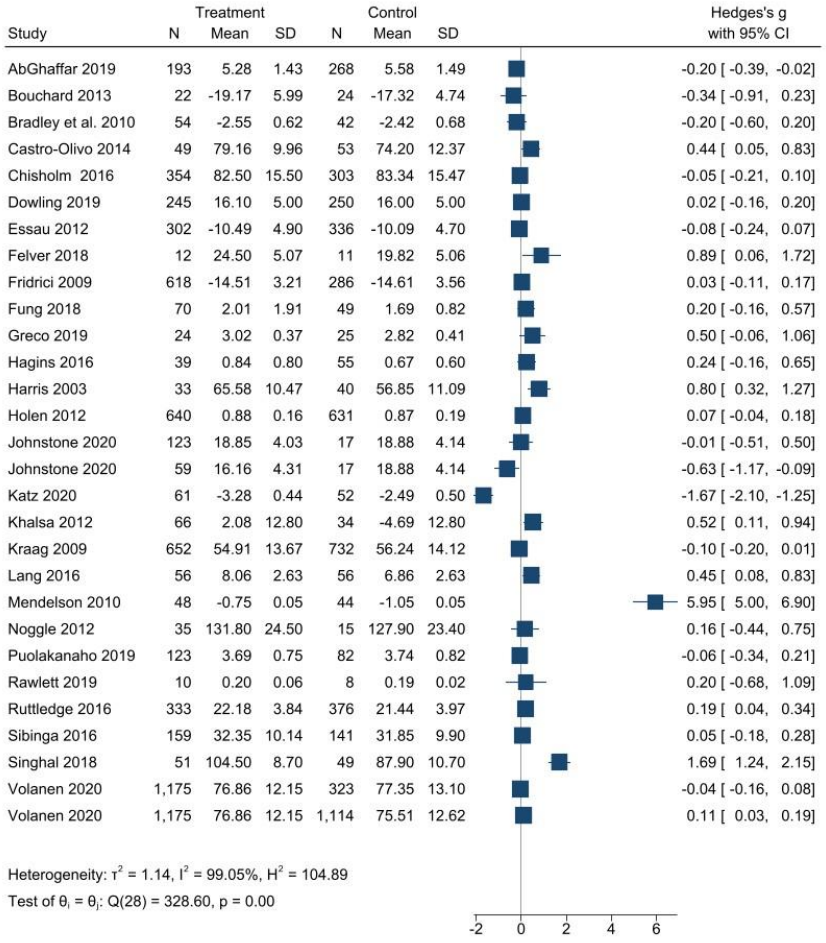
Study-Specific Effects Estimate and Heterogeneity Statistics Corresponding to the Stress Outcome



Similarly, the study-specific estimates were heterogeneous regarding the coping/resilience outcome (I^2: 99%, homogeneity test $p < .01$); they had a range from −1.67, 95% CI: (−2.10; −1.25) to 5.95, 95% CI: (5.00; 6.90) (Figure 3). Positive values indicate a positive effect in the case of this outcome. Two studies (Katz et al., 2020; Mendelson et al., 2010) were deemed to be outliers based on their DFFITS values and were excluded from the analysis of the coping/resilience outcome.

Figure 3

Study-Specific Effects Estimate and Heterogeneity Statistics Corresponding to the Coping/Resilience Outcome



Finally, 56 intervention arms were included in the analysis, nine of them with both outcomes. The combined effect for stress was small and significant: −0.19, 95% CI: (−0.27; −0.11), *p*: < .001. The coping/resilience outcome was also small but not significant: 0.11, 95% CI: (−0.04; 0.27), *p*: .15. When the outliers were also included in the analysis, the results changed to −0.44, 95% CI: (−0.70; −0.17), *p*: .001 for stress, and 0.25, 95% CI (−0.06; 0.56), *p*: .11 for coping/resilience.

Effect Modifiers

When an intervention was delivered by both teachers/school counsellors and mental health professionals/researchers, we included it in the latter category. When an intervention was delivered not only by teachers or mental health professionals but also by other means (e.g., online), it was categorized as "other." Four studies were excluded from the effect modifier analysis because one included only children younger than 10 and three involved both younger and older adolescents.

In the univariate analysis, age, target population, length of the intervention, and inclusion of CBT, SEL, and yoga were associated with both outcomes at the level of $p < .25$. These covariates were included in the final multivariate model (Table 3 **and 4**). None of them were significant effect modifiers in relation to stress **(Table 4).** Although we were unable to detect a combined effect of all the interventions pooled on coping/resilience, the interventions were significantly more effective in older adolescents and in selective samples. Furthermore, interventions that contained CBT and yoga were significantly more effective than those that did not. The covariates included in the model explained 40% of the heterogeneity of the effect sizes **(Table 3).**

Table 3

Effect Modification by Intervention and Study Population Characteristics in Relation to Coping/Resilience

Effect modifier	Regression coefficient (95% CI)	p-value
age		
10-14 year	reference	
> 14 years	0.38 (0.19; 0.56)	< .001
length of intervention (day)	-0.00019 (-0.00042; 0.000036)	.098
sample		
universal	reference	
selected	0.47 (0.26; 0.69)	< .001
CBT	0.26 (0.019; 0.51)	.035
yoga	0.32 (0.014; 0.63)	.040
SEL	-0.026 (-0.41; 0.019)	.075

Table 4

Effect Modification by Intervention and Study Population Characteristics in Relation to Stress

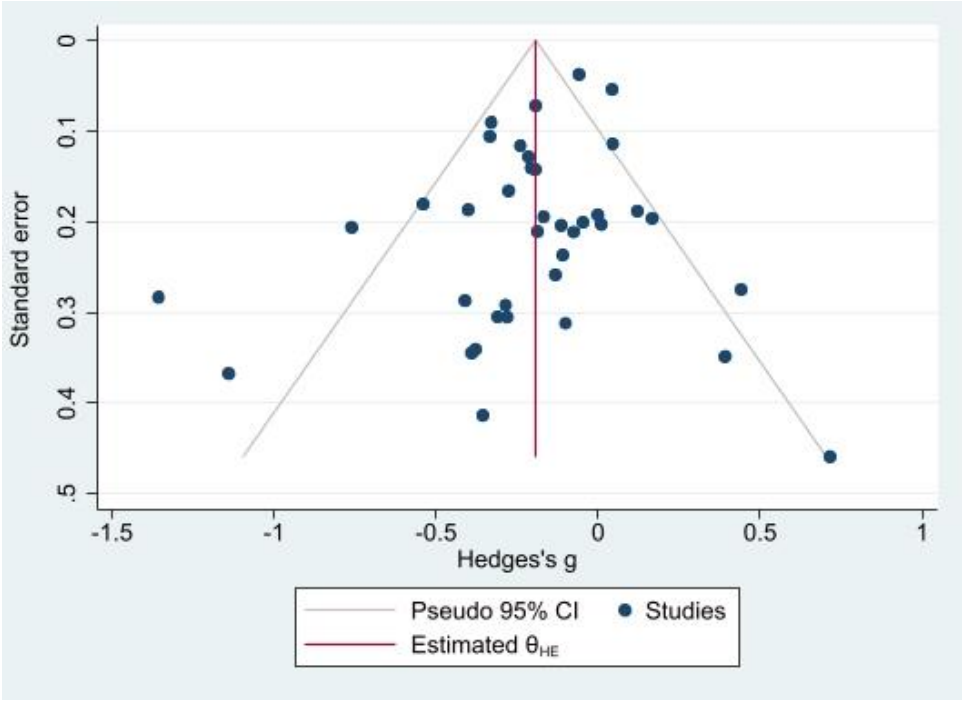
Effect modifier	Regression coefficient (95% CI)	p-value
age		
10-14 year	reference	
> 14 years	-0.050 (-0.23; 0.13)	.59
length of intervention (day)	-0.00018 (-0.00040; 0.000038)	.11
sample		
universal	reference	
selected	0.061 (-0.14; 0.26)	.55
CBT	0.13 (-0.21; 0.46)	.45
yoga	0.078 (-0.18; 0.34)	.55
SEL	-0.047 (-0.23; 0.13)	.61

Publication Bias

The funnel plots indicate publication bias in the case of both outcomes (Figures 4 and 5). There are disproportionately fewer small studies with no or inverse effects (e.g., positive standardized mean difference in the case of stress; negative standardized mean difference in the case of coping/resilience) in both figures than small studies with a positive effect. However, Egger's test was not significant in either case, with *p*-values of .58 and .10 for stress and coping/resilience respectively.

Figure 4

Funnel Plot of Studies Investigating Stress



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444 *Note:* CI = Confidence interval

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446 **Figure 5**

447 *Funnel Plot of Studies Investigating Coping/Resilience*

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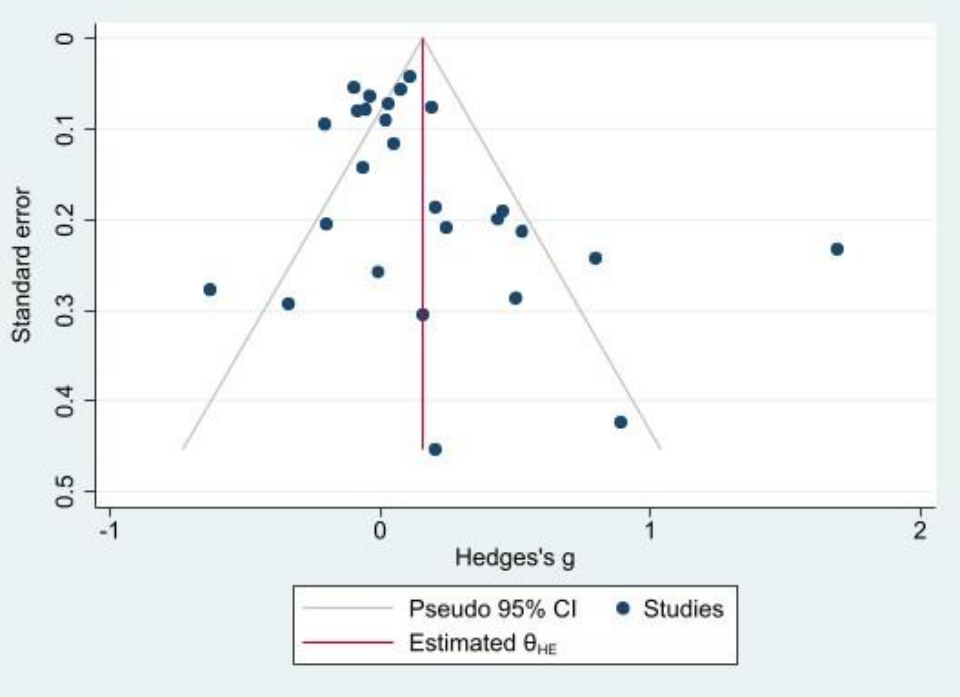

Note: CI = Confidence interval

Discussion

The aim of the present meta-analysis was to investigate the effect of school-based stress-management interventions targeting both perceived stress and coping/resilience. While many meta-analyses have focused on school programs targeting stress symptoms (e.g., van Loon et al., 2020, 2022), there has been no recent meta-analysis investigating stress-related factors such as coping and resilience. Although Kraag et al. (2006) focused on stress management with the inclusion of coping, their meta-analysis was performed more than 15 years ago, since when a large number of studies have been carried out covering this scope. Zenner et al. (2014) also focused on stress and resilience in addition to other psychological factors, although they investigated mindfulness programs only. In their meta-analysis (Zenner et al., 2014), the effect sizes of mindfulness programs were small but still significant (*g* = 0.36) in the case of resilience measures. Kraag et al. (2006) investigated various types of stress management interventions and found that they had a large effect size on coping as the outcome. Unlike previous studies, we did not find a significant effect on the coping/resilience outcome in the present

meta-analysis. In relation to the stress outcome, while many earlier meta-analyses found moderate effects of school-based mental health programs on stress (Kraag et al., 2006; van Loon et al., 2020; Zenner et al., 2014), our meta-analysis showed a significant but very small effect (g = 0.19), which did not even reach the cut-off point of 0.20 for small effect size (Lakens, 2013).

One possible reason for the absence of a significant effect of coping/resilience and the very small effect size for stress may be that our selection criteria were more rigorous, since they focused exclusively on RCTs, while previous meta-analyses also selected quasi-experimental studies (e.g., van Loon et al., 2020). The overlap between the studies of van Loon et al. (2020) and our meta-analysis is only 24 articles (44%), which can be attributed mainly to the difference in study selection. In the meta-analysis of van Loon et al. (2020), 30% of the selected studies were quasi-experimental studies. The quality ratings also reflect this difference; the overall quality score is one point higher in our case compared to van Loon et al. (2020). According to our reasoning, previous studies showed that removing observational and/or low-quality studies can modify the effect size (Tejada-Gallardo et al., 2020). Applying rigorous inclusion criteria tends to diminish the statistical significance of effect sizes (Neitzel et al., 2022). In the meta-analysis by Tejada-Gallardo et al. (2020), there was a slight decrease in the effect size for subjective well-being and a considerable increase for depression symptoms after removing the low-quality studies. Recently, Zhang et al. (2023) argued the need to employ more rigorous selection methods to provide evidence-based results and increase the credibility of meta-analyses related to school-based mental health programs.

Another possible explanation for our findings may be related to outliers. Meta-analyses reporting larger effect sizes (e.g., van Loon et al., 2020) have typically included outliers, while outliers were excluded in the present meta-analysis. In the meta-analysis by van Loon et al. (2020), for example, although the effect size with outliers was moderate (d = 0.543), the effect size without outliers was reduced to small (d = 0.276). This means that the results of meta-analyses should be considered with

caution: If there are only a few studies with extreme effect sizes, the overall effect sizes may be doubled. We detected the same phenomenon in our analysis: With the inclusion of outliers, the effect sizes were 0.44 and 0.25 for stress and coping respectively. In our meta-analysis, there were two outliers in relation to coping (Katz et al., 2020; Mendelson et al., 2010) and three outliers in relation to stress (Rentala et al., 2019; Singhal et al., 2018; Zafar & Khalily, 2015). All of them were also included in the meta-analysis by van Loon et al. (2020). Regarding their common characteristics, the interventions in relation to stress were selective interventions and were conducted in Asia; and the interventions in relation to coping were universal interventions and were conducted in North America.

In the case of coping, another potential confounding factor may be the heterogeneity of the outcome measures. Coping is not a unidimensional factor. Items in the coping questionnaire usually belong to multiple factors, and inter-factor correlations can range from −0.4 to 0.44 for the Coping Scale for Children and Youth (Brodzinsky et al., 1992), and from 0.00 to 0.20 for the Coping Strategy Indicator (Amirkhan, 1990), to mention just two of the most frequently used questionnaires. As most of the coping inventories and questionnaires consist of several scales, to avoid having more than one effect estimate for the same outcome from the same study we had to select one scale for the meta-analysis. We selected problem-focused coping scales where available, since several studies have found problem-focused coping to be an adaptive coping strategy and, as such, to be associated with positive mental health indicators (Budimir et al., 2021; Felton & Revenson, 1984; Rodríguez-Rey et al., 2019). However, one scale may not fully represent the complex phenomenon of coping. It is also possible that some interventions did not affect problem-focused coping but did have an effect on assistance seeking or other adaptive forms of emotional-focused coping, such as emotional approach coping, for example (Baker & Berenbaum, 2007). The heterogeneity of coping questionnaires may add to this complexity: In the studies included in our meta-analysis, many different coping and resilience questionnaires were used, making it difficult to compare the results of the different interventions.

The results suggest that school-based programs targeting stress and coping may not be unequivocally effective. Some earlier studies have yielded similar results. Feiss et al. (2019) found that school-based stress management programs did not significantly reduce stress in adolescents (although only four studies were investigated). Similarly, Sanchez et al. (2018) showed that school-based mental health programs were more effective in the case of externalizing problems than internalizing problems. These results are in line with meta-analyses focusing on depression and anxiety, which present a more conflicting view of the effectiveness of school-based interventions (Zhang et al., 2023).

While the present meta-analysis did not find a significant overall effect of the interventions for the coping/resilience outcome, moderator variables such as the age of the participants, the target population, and the content of the interventions significantly influenced the effects. On the other hand, when considering stress as the outcome of the interventions, unlike earlier meta-analyses (Kraag et al., 2006; van Loon et al., 2020) we did not find any factors significantly modifying the effect. Specifically, in the case of coping and resilience as the study outcome, we found that the interventions were significantly more effective in older adolescents (above 14 years of age) than in younger adolescents (10–14 years old), and in selective versus universal samples. Furthermore, interventions that contained CBT and/or yoga were significantly more effective than those that did not. The greater effectiveness of selective, targeted interventions compared to universal ones is not a new finding in the literature: Earlier meta-analyses, such as those by Feiss et al. (2019) and van Loon et al. (2020), found similar results. The superiority of this type of intervention may be due to the difference in baseline stress symptoms between the students in the targeted sample and the students in the universal sample, and also to the greater motivation among the selected students to participate in the intervention (van Loon et al, 2020). **We utilized an efficient and sensitive method to analyze potential effect modifiers in our analysis. First, we tested each potential effect modifier independently in the model. We used p< .25 in these models to decide on the inclusion of the covariates in the multiple regression model. Using this**

approach, we preserved efficiency, i.e., we did not include those covariates in the multiple regression model which were unlikely to modify the effect of the intervention and sensitivity at the same time by including those covariates which might not have been significant in the univariate analysis because of their correlation with other important modifiers.

Nevertheless, we expected to obtain the opposite result regarding the modifying effect of age. Based on the numerous arguments in the literature for starting interventions as early as possible (Hester et al., 2004; Luby, 2010; Nelson, 2000; Rapee, 2013; Webster-Stratton, 1993), we expected interventions targeting younger children to be more effective than those targeting older students. However, in our meta-analysis there was only one study that focused on children below the age of 10 years, which meant we were unable to analyze the effectiveness of programs targeting children in the youngest age group. With regard to interventions targeting adolescents, results similar to ours—that is, the greater effectiveness of programs for older students—were found by Pacillo et al. (2022) and Zhang et al. (2023), whereas the study by Barrett et al. (2005), for example, demonstrated that in a school-based program targeting anxiety, effectiveness was lower among secondary school students compared to primary school students. These contradictory findings may be explained by differences in methodology, since a meta-analysis of academic interventions found that significant differences between the age groups disappeared when the inclusion criteria were restricted to randomized and quasi-experimental designs (Cheung & Slavin, 2013).

With respect to the content of the interventions, the greater effectiveness of cognitive behavioral techniques and therapeutic methods compared to other methods has also been demonstrated elsewhere (see, e.g., Caldwell et al., 2019; Collins et al., 2014; Zhang et al., 2023). The superiority of yoga in terms of its effectiveness on the coping outcome, on the other hand, has not been found in other meta-analyses of school interventions targeting stress and coping, although its significant

effects on physical and mental health outcomes have been proven in systematic reviews with a wider focus (Khalsa & Butzer, 2016; Serwacki & Cook-Cottone, 2012).

Limitations and Future Directions

As in most meta-analyses, publication bias may also be present in our case. In the future, it would be important to publish studies with negative results as well**. One possible reason for publication bias might be that our meta-analysis did not include** grey literature (e.g., congress proceedings, unpublished dissertations). **Including grey literature in meta-analyses ensures that all studies on the subject are fully represented, including those with negative or non-significant results. Meta-analyses that do not include grey literature might over-represent studies with significant findings, which can lead to biased conclusions (Conn et al., 2003).**

The heterogeneity of outcome measurement, especially in the case of coping, may be another limitation, as discussed earlier. To reduce this heterogeneity and improve the comparability of the various interventions, we recommend that future programs use more standardized and common outcome measures. **Another difficulty is that one of the most frequently used questionnaires, the Perceived Stress Scale, has several different versions based on the number of items; studies vary on which one they use, making the comparison even more problematic. Moreover, most of the questionnaires were validated in adult samples, not for younger age groups. Given the ongoing issue with the reliability and heterogeneity of the available measurements, quality assessment in meta-analyses became more important. In our meta-analyses, we applied the Thomas et al. (2004) Quality Assessment Tool for Quantitative Studies which was also used in the meta-analysis of van Loon et al. (2020). That tool measures quality less sensitively and elaborately, considering only Cronbach alpha, which, as recent studies show, is not the best predictor of intervention responsiveness (Puhan et al., 2005). For assessing changes among participants over time, researchers suggest using measures that ask directly about change (Fok & Henry, 2015). The future meta-analysis should measure study and**

measurement quality more sensitively. That way even QEDs would be an asset because they can provide rigorous evidence if carried out professionally. Including only RCTs in the meta-analysis was considered a positive factor. However, the exclusion of QEDs might have diminished the strength of the present meta-analysis. Involving more designs would have made it possible to create subgroups and determine whether significant differences existed among the conditions.

Another limitation is that our analysis included only one eligible study on interventions with children younger than 10 years of age, precluding an appropriate evaluation of the moderator effects of age. The relative lack of high-quality school-based interventions targeting younger children seems to be a general shortcoming in the intervention literature. We would thus highly recommend that more school-based interventions be conducted among younger age groups. **Recently, a growing number of studies have been measuring stress on the physiological level (e.g., heart-rate variability, breath frequency), even in the younger age groups (Aranberri-Ruiz et al., 2022). Therefore, further meta-analysis should also involve biological/physiological markers as stress indicators.**

Given that many of the interventions included several different approaches and methods, we followed the protocol of van Loon et al (2020) and, rather than classifying the interventions according to type (e.g., CBT, mindfulness, etc.), we focused on intervention elements. While this presumably increased the validity of our meta-analysis, at the same time it made it more difficult to attribute the differences in the effects of the various interventions to the methods and approaches assessed.

The length of the follow-up in intervention studies may be another important factor affecting the effect size. In our analysis, we selected the first measurement during the follow-up as the outcome to ensure comparability, since the existence and length of the follow-up period varied significantly in the studies involved. Most of the studies had only one post-intervention measurement; 23% of the studies had a short follow-up (0–6 months); and 18% had a medium-term follow-up (6–12 months). The length of the follow-up was found to have a significant moderator effect in the meta-analysis carried out by van

Loon et al. (2020), where larger effects were found during the follow-up compared to post-intervention. Thus, our focus on the results of the post-intervention measurements may also have contributed to the lower effect sizes in the case of our meta-analysis. This leads to a further suggestion for future direction: Intervention studies should use several follow-up measurements, with a good extension over time, to allow for the so-called sleeper effect (Spence & Shortt, 2007).

Last but not least, we should mention the challenges of implementing RCTs in schools, where it is difficult to find appropriate control groups, given the inevitable transfer of information between classes and students. However, if a control group is chosen from another school, questions concerning the comparability of the different groups may well arise.

Conclusions and Practical implications

Our results underline the need for methodologically rigorous school-based intervention studies on stress management. While the low effect sizes found in our meta-analysis may appear discouraging, the results of the moderator analysis indicate how interventions might be made more effective: older adolescents and selective, targeted populations seem to obtain greater benefits from interventions, while including elements of CBT and/or yoga can further add to their effectiveness. **Regarding yoga, trauma studies also draw attention to the importance of body-awareness techniques in self-regulation (Van der Kolk, 2014). Given that stress management in targeted samples seems to be more effective, it would be important to screen the students first to identify those who may profit the most from the coping interventions. Besides targeted interventions, school psychologists should include CBT and body awareness elements in their individual and group sessions and educate teachers about their importance, especially in adolescence, since this is a critical age group for developing resilience.**

It may also be important to invent new intervention methods, since the effectiveness of the methods currently in use appears to be limited. As stressors in children's lives are changing constantly, and new stressors, such as the climate change (Martin et al., 2022), the COVID-19 pandemic, being

alone, family conflicts, tests, too many demands, and boyfriend/girlfriend issues emerge (Ryan-Wenger et al., 2005), it is important to come up with new forms of intervention to support children effectively.

Finally, the limited effectiveness of stress management interventions should direct our attention towards the importance of primary prevention strategies aimed at decreasing the level of stress that children face in and outside school, rather than teaching them how to cope with these stressors. Such school-based prevention programs might focus on areas such as transforming the school curriculum and teaching practice to focus on nurturing students' well-being and happiness, fostering optimal youth functioning, teaching social skills, supporting students' self-image, and equipping students with a higher level of cognitive skill. These interventions are also cost-effective, since existing resources and personnel can be used (Chodkiewicz & Boyle, 2017). Interventions in which a whole-school approach is employed, such as the Geelong Grammar School Project (Seligman et al., 2009), are prime examples of ambitious yet time- and energy-consuming approaches that engage the wider community of students.

Acknowledgements

The authors would like to thank Diana Darwish and Szilárd Pokoraczki for their contribution to the article selection process.

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Response to reviewers

Response to Reviewer 1

Introduction:
Overall the introduction is very simplistic. It lacks flow and the link to a research question and hypotheses is far too implicit. It is hard to see how the research question comes from the literature cited. I would encourage a much more comprehensive literature review and an clearer link to the hypotheses stated.

Thank you very much for the review, and for drawing our attention to this omission. We have revised the Introduction as proposed and extended it to make its flow more comprehensive and to provide a more detailed background to our research questions. We start with the importance of addiction prevention among school-aged children underlined with epidemiologic data on nicotine, alcohol, cannabis and problematic technology use by adolescents and their potential risks (Lines 49-80). We continue with the risk and protective factors of addiction development (revised and extended also according to a later comment) (Lines 81-103). Then we discuss the role of school in addiction prevention and intervention methods shown to be effective in this setting. This paragraph has been extended by a section discussing EU and US level strategies on school-based health promotion activities in relation to addictions (Lines 104-125). This is followed by a new section detailing the institutional factors that can influence the implementation and effectiveness of addiction prevention, for example, the training of teachers and the cooperation with other actors (Lines 126-135). We then introduce the context of our study in which we aim to examine the role of the abovementioned factors. We include details on the policy environment of school-based health promotion in Hungary and point to the lack of data on the implementation of universal addiction prevention programs and the factors influencing it in the country (Lines 136-164). We close this section with the aims of our study (that was revised also according to a later comment) (Lines 165-175).

An example would be the authors are not clear what they mean by long terms and "immediate" effect of addiction on health? Does Immediate refer to acute administration?

We did not mean the acute effect of addiction, we meant the acute effect of the substance on health, like acute alcohol intoxication. Thank you for your comment, this has been clarified in the updated version of the manuscript (Line 50).

They are not clear which drugs are included in substance use.

Thank you for the comment. We specified it in Lines 56-58.

These are just some examples of where there needs to be a more comprehensive review of the literature and where the authors need to be clearer on their terminology and definitions of those terms.

We sincerely appreciate your valuable comments. Through the revisions that have been discussed above, we hope that the text has now achieved a good level of clarity.

Does Immediate refer to acute administration?

We have responded to this comment together with the comment above on the same topic.

The preferred term for "marijuana" is cannabis. The authors need to be consistent in the use of this term. Marijuana is a pejorative word with no scientific value.

We agree that consistency is important and replaced the term 'marijuana' to 'cannabis' throughout the text as proposed. However, marijuana is used in the report on Adolescent Behaviors and Experiences Survey and also in the reports of the Monitoring the Futures project.

What does "mainly due to vaping…" (line56) mean?

According to the Adolescent Behaviors and Experiences Survey (January–June 2021), the one-month prevalence of the use of any type of tobacco product (including cigarette, cigar, smokeless tobacco, or electronic vapor product [EVP]) was 15.6%. The one-month prevalence of electronic vapor product use was 15.4%, whereas other tobacco products were consumed less frequently (cigarette smoking was 3.3%, cigar smoking and smokeless tobacco use were 2%). We revised and clarified the text by specifying the meaning of any type of tobacco product use and the rate of EVP use (Lines 57-60).

There needs to be more clarity on the comparison to other countries. I am surprised to see no mention of the "monitoring the futures" survey data? This also needs to be evaluated in the context of drug and alcohol policy in other countries. For example many states in the USA have stricter alcohol and tobacco laws and have legalised cannabis for medical and recreational use.

We thank the Reviewer for calling our attention to this valuable data source on young people living in the US. We included the latest survey results and updated the text with a reference to this project in Lines 62-63.

We agree that regulations limiting the accessibility of substances are important measures in preventing substance use. We also included accessibility as a risk factor when extending the paragraph on addiction development as proposed in a later comment. Making a comparison of epidemiologic data between countries and states and linking those to the relevant legislation could be the focus of a very valuable policy review. However, in our paper, we aim to shed light on the institutional factors that may influence the implementation of universal addiction prevention in schools. We use epidemiological data to illustrate that substance use is present among school-aged children regardless of strict regulations on access and that data from Hungary is really concerning. Regarding policies, we restrict ourselves to the introduction of EU and US-level guidelines on school-based health promotion and addiction prevention to show how the Hungarian policy relates to these.

Line 73. This section is a very cursory description of the issue of addiction.

We thank for the comment, we have extended the section according to the proposal of the Reviewer to provide a more detailed overview of the topic in the Lines 81-103.

Why have the authors chosen elementary school children to target? This would be considered a crucial factor to describe and embody in the literature regarding the effectiveness of interventions at this stage of development.

Thank you for addressing this point. The situation in Hungary, where elementary schools are accountable for the foundational 8 years of the mandatory ten-year education beginning at the age of 6 (encompassing primary and lower secondary education in a unified structure), might indeed raise some confusion, therefore this educational structure is clarified in the main text (Lines 136-137).

Our choice of focusing on this specific age group stems from the evidence within literature reviews and meta-analyses. These studies have consistently highlighted that universal program characterized by interactivity, a concentration on skill development, and extended implementation periods can significantly reduce instances of smoking, alcohol consumption, and other substance use among young individuals. Furthermore, research has conclusively shown that elementary school students reap the most substantial benefits from these programs. We included this information in the main text, in Lines 124-125.

Does Frontiers require the use of numerical citation coding?

According to the Author guidelines the expected reference style is indeed numbered for manuscripts submitted to Frontiers in Public Health, namely Vancouver (Numbered). Frontiers even provides a reference style file for reference management software, that we used to make sure that our manuscript complies with the formatting standards of the journal.

Methods:

Why were only 14 questions used in the study? What is the justification for this?

The survey-based study was part of an overarching evaluation of the implementation of Holistic Health Promotion (HHP, prescribed by the Ministry of Human Capacities Decree of 2012) in Hungarian elementary schools. HHP activities need to cover a wide spectrum of health-related tasks, structured under four main pillars, namely: “I) Healthy diet; II) Daily physical education fulfilling health promotion criteria and other forms of physical activity; III.) Appropriate pedagogic methods (including also the use of arts) to enhance mental health [to improve learning outcomes, and social competence and to prevent early school leaving, violence, bullying, and the development of behavioral and chemical addictions]; IV.) Improving health literacy and health competencies of children” (see p. 5, Somhegyi, 2019). The original survey targeted to evaluate the implementation of HHP activities related to all four pillars. In our survey-based study, we used only those questions that related to the implementation of universal addiction prevention activities, this is why we used only 14 questions of the 32. We extended the Introduction section with a short list of HHP topics and also the Materials and Methods section to clarify this for the readers (Lines 142-145 and 194-195).

What was the attrition rate? Did all 3601 principals respond fully?

3601 schools were invited to participate in our survey-based study, from which 2892 completed the survey, meaning that the participation rate in this cross-sectional study reached 80.3%. We provided the number of participants in the Results section in accordance with the STROBE guidelines on the dissemination of observational studies (Line 288).

The focus group questions seem to be somewhat limited?

In Hungary, the National Core Curriculum does not encompass the requisites for implementing school-based universal addiction prevention programs, nor does it outline the skills, competencies, and knowledge standards/outcomes categorized according to different grade levels. Furthermore, educational institutions lack resources like the Health Education Curriculum Analysis Tool, a development of the CDC in the United States (https://www.cdc.gov/healthyyouth/hecat/index.htm). By utilizing the inquiries presented during the focus group our intent was twofold: firstly, to assess to what extent teachers consider skill cultivation linked to addiction prevention and fostering mental well-being as integral to their roles; and secondly, to glean practical insights from their perspectives on enhancing such initiatives within the Hungarian context. We applied non-directive, open-ended questions in semistructured focus group discussions. The advantage of semistructured discussions is that the moderator has the opportunity to ask additional questions to facilitate the conversation and to help the group elaborate on topics that arise during the discussion and that seem important. We think that the questions we posed not only shed light on these aspects but also provided substantive answers and served our aims appropriately.

Results:

I am really struggling to see the rationale for the analysis in relation to the hypotheses. Whilst the analysis itself is not problematic I am not sure how the data relates to the research question or literature underlying that research question? This needs to be clarified and made more explicit.

We clarified the description of our aims to more explicitly express the rationale for our analysis. The logistic regression analysis in which we used the quality implementation as an outcome and the institutional conditions as determinants is in line with our aim of examining "how institutional characteristics of schools (regional location, funding, and size along with the support of teachers and the diversity of program implementers) influence the quality implementation of addiction prevention programs". Moreover, the chosen analysis could estimate the independent effects of these characteristics. Also, as a response to the first comment of the Reviewer, we extended the Introduction section with a paragraph to provide an appropriate literature background for the importance of institutional characteristics that can influence the implementation of policies on school-based health promotion activities such as addiction prevention. The results of this analysis help identify potential targets for improving universal school-based addiction prevention at institutional and staff levels. These findings can be used to inform stakeholders and policy development.

Did you conduct a thematic analysis of your qualitative data? The citation (56) refers to a methods text book.

For the analysis of data from the focus groups, we applied the *classic analysis strategy* according to Krueger & Casey's methodological guide. This type of analysis has roots in grounded theory and is different from thematic analysis, although it also results in themes identified in the qualitative data. It starts with creating a pool of answers per interview questions from all of the focus group sessions. Then similar answers are grouped together applying the constant comparative method. This is a systematic, inductive approach where answers are compared to the ones reviewed before. If there were similar answers, this occurrence is grouped together with those, if there were no such answers before, a new group is made. This is how groups are formulated. Groups of similar answers then receive the same code. When the coding is complete, a descriptive summary is compiled for each question based on the coded responses and their relationships to each other. For the final report,

findings can be structured not only around the focus group questions but also around themes emerging repeatedly in the descriptive summaries. We applied this latter strategy in our analysis. Krueger & Casey's methodological guide provides an overview of how to conduct focus group research from planning, through data collection to the analytic process and reporting.

Discussion:

So are the authors saying that intervention for the potential for substance use is linked to the community and teacher support and engagement in a given school? Its not clear to me. Apologies if I have missed the point but it is hard to follow the logic of your argument in relation to the data and the research question.

The literature in the introduction speaks to specific trends in drug use, to interventions and to the effects on mental health. The discussion speaks to the environments and implementation of strategies to cope with these issues but the two are not well linked if that makes sense. I would suggest restructuring the introduction to align more with the analysis and discussion of the data collected.

We acknowledge that the extension of the Introduction (proposed in earlier comments as well) was necessary to give a solid background to the focus of our study, namely the relevance of institutional factors in the implementation and effectiveness of addiction prevention. We thank the Reviewer for the comments, and we hope that with the proposed changes, and revisions made, the coherence and logic of our paper improved significantly.

Along with our findings, we argue in the discussion - as the Reviewer understood that correctly - that investing in teacher support by training and involving more actors in the implementation are potential targets to improve the implementation of universal addiction prevention. These results may be of international relevance. So is the association that more frequent community-building events between teachers are related to safer and more friendly school atmosphere and facilities.

Response to Reviewer 1

Independent Review Report, Reviewer 2

Lines 113-114, you mention teachers, but only principal interviews were presented in this study. As such, this was confusing.

We agree with Reviewer 2 that it is important to clearly distinguish early in the paper that we used two sources of data: quantitative data on schools - collected with the help of school principals, and qualitative data on teachers' perspectives. The lines mentioned in this comment referred to the latter, namely the qualitative data collected in the focus group-based study which was conducted with the participation of teachers. We have clarified the paragraph on the aims of the study in Lines 165-175. We hope that the revised version removes any confusion.

Were there follow-up emails to principals? I would benefit from more detail on the procedures of this study.

The Ministry of Human Capacities, the state institution responsible for education matters, emailed an invitation letter for the survey to all principals of Hungarian elementary schools. No follow-up emails were sent. The participation rate reached 80.3% within 2 weeks.

Focus group interviews. I am not clear on this research method? Was it a group interview or focus groups? Please clarify this. Please, discuss the procedures for this method (depending on which you used) as well.

We conducted focus groups, sorry for the misnomer, we corrected it, and we are now referring to this study of our project as the *focus group-based study* in the main text. We also provided additional details on the procedures in the relevant section of the manuscript in Lines 265-270.

Line 378 49 – I don't believe the reference is presented correctly

We thank the Reviewer for noticing this and have revised and corrected the reference.

In the limitations --- please add more limitations or think through other limitations such as the cross-sectional nature of this study. I believe the scales (dichotomous, Likert) could have limited findings and interviews might yield more comprehensive data for interventions, for example.

We agree that the cross-sectional nature of our project is an important limitation. We acknowledge that the survey method did not allow schools to provide a detailed description of their health-promoting activities, but a relatively short, easy-to-complete questionnaire seemed to be the best method to gather comparable data on the state of implementation at a national level. Nevertheless, we thank the reviewer for this very interesting suggestion for a more detailed mapping of the universal addiction prevention activities of schools, which would allow the specificities of each school as an individual community to be considered. We have revised and extended the Limitations section as it was proposed (Lines: 558-562).

Please review the paper for APA style and editing.

According to the Author guidelines available for the authors, Frontiers in Public Health does not require APA style. We worked in the Word template provided by Frontiers, we followed

the structure prescribed for original articles (1) Abstract, 2) Introduction, 3) Materials and Methods, 4) Results, 5) Discussion) and we used the expected reference style (Frontiers Vancouver (Numbered)), so we believe that our manuscript complies with the formatting and editing standards of the journal.

Please review the discussion and work to qualify statements as needed, because this is based on principal report and there are many other stakeholders. In fact, this could be an additional study limitation to present.

We fully agree that collecting data through school principals is a limitation, and as such it is represented in the relevant section. To elaborate on this subject considering other stakeholders, we extended the limitation section by naming other potentially valuable information sources (e.g., teachers, school health service professionals, etc.). We clarified the sources of information in the first paragraph of the discussion (Line 429) as recommended and extended the Limitations section (Lines: 565-568). We believe that with these revisions and the detailed description provided in the Materials and Methods section, readers will be able to evaluate our findings correctly.

The Influence of Institutional Characteristics on Implementing School-based Universal Addiction Prevention: A Hungarian Mixed-Methods Nationwide Study on the State of Implementation, Barriers, and Facilitators

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Keywords: universal addiction prevention, mental health, school-based health promotion, implementation, teachers, policy

Number of words: 5975

Number of Figures: 1

Number of Tables: 4

Abstract

Background: In Hungary, as in other European countries, substance and behavioral addictions are an increasing problem among children and adolescents. Schools play a vital role in providing the knowledge and skills needed to prevent addictions. However, various factors influence the overall effectiveness of such efforts. To design more effective preventive interventions, it is necessary to evaluate existing programs and identify possible points to intervene. Our aim was to assess the current state of addiction prevention in Hungarian schools, identify barriers, and explore facilitators that contribute to the successful implementation of addiction prevention.

Methods: A nationwide cross-sectional survey-based quantitative study was performed to investigate the implementation of addiction prevention in Hungarian elementary schools (N=2892). With the participation of 37 teachers from 21 elementary schools, a~~n~~ focus group~~interview~~-based qualitative study was conducted to investigate teachers' perspectives on such programs and ways to improve them.

Results: Among the addiction topics, alcohol (62%), smoking (74%), and drug use (71%) were the most covered themes. Problematic use of the internet and electronic devices was addressed in 61% of the schools, while gaming and gambling were addressed in only 19%. Of schools, 55% reported having regular programs to support pupils' mental health, and this differed significantly by school type and size. Logistic regression analysis revealed that the type of school, the support for teachers' work, and the diversity of implementers were significantly associated with the quality of implementation of addiction prevention. The qualitative study showed that commitment, competences, and cooperation are required to improve prevention. According to the teachers, they can do the most for the health of children at school, but they need support for effective implementation.

Conclusion: Our results indicate the importance of school characteristics in addiction prevention implementation and call for the support and empowerment of teachers and greater organizational capacity to ensure the effectiveness of school-based addiction prevention activities. By understanding these barriers and facilitators, policymakers and educators can develop evidence-based strategies to improve the effectiveness of prevention programs.

1 Introduction

Substance use ~~behaviors~~ such as smoking, drinking alcohol and cannabis use often begin during adolescence (1, 2) and ~~are~~ can be associated with ~~immediate~~ acute and/or long-term health problems (3) and with premature mortality (4, 5). It can have detrimental effects on school performance, contribute to aggressive behavior, increase the likelihood of engaging in risky sexual behavior and contribute to the development of mental health disorders, including depression, anxiety or psychosis and self-harm (6-10). In the United States (US), the latest Adolescent Behaviors and Experiences Survey (2021) revealed concerning trends in substance use among high school students: one in three 9-12th graders was characterized by some form of substance use: alcohol, the use of any type of tobacco products (ea., cigarette, cigar, smokeless tobacco or electronic vapor product) or cannabis or the misuse of opioid prescription drugs (2). The one-month prevalence of a~~A~~lcohol consumption was recorded most commonly (20%), followed by tobacco use of any type (16%). The use of electronic vapor products (15%) accounted mainly for the latter~~The latter was mainly due to the use of electronic vaping products~~. Students reported using ~~marijuana~~ cannabis (13%) and prescription opioid misuse (4%) less frequently. Similar rates have been recorded in the Monitoring the Future

project for 2022 (11). ~~and also for~~ A parallel pattern is evident in Europe and Canada, as indicated by the latest findings from the Health Behaviour in School-aged Children (HBSC 2018) study: ~~Europe and Canada in the most recent report of the Health Behaviour in School-aged Children (HBSC 2018) study~~ (1): 37% of children aged 15 drank alcohol ~~in the last 30 days~~, while 15% smoked cigarettes and 7% ~~were~~ used ~~current marijuana users~~cannabis in 30 days prior the survey. Moreover, fourteen percent of 15- to 16-year-olds in Europe reported ~~current~~ useing ~~of~~ e-cigarette~~s~~ ~~during the last month~~ (12).

Other behaviors with addictive potential, such as internet, smartphone and social media use; online communication; playing digital games and gambling, also begin or become widespread during adolescence (1, 12, 13). These behavioral addictions are also associated with various health harms and mental health problems (13-19). Problematic use of technology and games that bear the risk of addiction was also detectable in this age group, although fortunately in lower proportions. Generally, fewer than one in ten teenagers was reported to be affected in Europe (1.5–8.2% for problematic internet use (20, 21), 7% for social media use (1), 1.4% for problem gambling (12) and approximately 2% for gaming problems (22)), and rates of similar magnitude were detected in the US (23, 24), although estimates can show significant differences depending on the measures used. Notably, however, rates of both internet-based activities and problematic use increased during the COVID-19 pandemic (25).

~~Addiction development is a complex process with numerous risk factors~~~~S~~Several factors represent risks for substance use and abuse and the development of the above-detailed behavioural addictions. Examples of individual risk factors are the presence of mental health issues (behaviour or conduct problems, attention deficit and hyperactivity, depressive symptoms, anxiety and aggressive behaviour (6, 13, 16, 21, 26-31)), specific personality traits (impulsivity and novelty-seeking (16, 29, 30)) or poorer social and personal skills (e.g., social competence, problem-solving, decision-making, self-control, impulse control, emotion regulation and self-esteem (20, 22, 26, 27, 30, 32-34)). There exist family-related risks such as the experience of maltreatment, attachment problems, substance use in the family, absence of a parent and low parental education or control (6, 13, 21, 22, 30, 31). School and social environment of children also play an important role: low school connectedness, poor academic performance (6, 13, 30, 31) along with high perceived drug accessibility and substance use among friends and peers (6, 30) also represent a higher risk.

On the other hand, there are factors that protect against substance use and addiction. On the individual level these include enhanced psychosocial competencies such as assertiveness (31, 35), effective coping (29, 36, 37) and resilience (13, 38, 39). Family cohesion and secure attachment can also decrease the risk of addictions (6, 13). In relation to the school and social context, the protective factors are academic motivation, successful adjustment to school, ~~, like mental health issues (6, 13, 16, 28-31), specific personality traits (16, 29, 30), poorer social and personal skills (20, 22, 26, 27, 30, 32-34), family-related problems (6, 13, 21, 22, 30, 31), and school-related factors (6, 13, 30, 31). While enhanced psychosocial competences (31, 35), effective coping (29, 36, 37) and resilience (13, 38, 39), family cohesion (6, 13), academic motivation,~~ school engagement ~~and~~ and positive school climate (6, 13, 29, 31, 36, 40) along with anti-substance policy (6). ~~were found to be protective against the development of both substance and behavioral addictions.~~

Schools play a pivotal role in curbing addictive behaviors. The implementation of prevention programs within the school environment can serve to bolster individual protective factors while mitigating the influence of risk factors associated with school and family. Furthermore, this contributes to the reduction of health disparities ~~Schools have a key role to prevent addictive~~

~~behaviors. Implementing prevention programs within the school setting can mitigate the impact of family-related risk factors and can reduce health inequalities too~~ (41, 42). Both the European Union (EU) and the United States have adopted a comprehensive strategy for health promotion in schools to address substance and behavioral addictions (43, 44). These strategies typically encompass a multifaceted combination of health education, counseling and support services, prevention campaigns, awareness initiatives, and regulations. Universal school-based interventions designed for addiction prevention, targeting all students irrespective of their risk profiles, have shown promise in averting addictive behaviors. Effective interventions focus on enriching knowledge and fostering protective factors, such as students' psychosocial skills and mental well-being ~~School-based universal interventions for addiction prevention, targeted to all students, regardless of their risk level, have demonstrated the potential to prevent addictive behaviors. Effective interventions focused on enhancing knowledge and promoting shared protective factors, such as students' psychosocial skills and mental health~~ (36, 37, 42). Creating a positive school atmosphere and establishing safe school areas have proven to be effective intervention points as well ~~Promoting a positive school ethos or climate and safe school areas represented additional effective intervention points~~ (36, 45). These forms of school-based interventions ~~are recommended in~~align with the United Nations International Standards on Drug Use Prevention (46) and have been particularly beneficial for elementary school students~~and they were proven to be the most beneficial for elementary school students~~ (47, 48).

Nonetheless, the implementation of the aforementioned interventions can be influenced by various school characteristics including teacher competencies, school and class size, institutional resources, and organizational structures (41). The United Nations International Standards on Drug Use Prevention offer expert insights into factors that could ensure the effectiveness of universal school-based substance use prevention (46). Notably, the support of teachers through training in fostering social competencies via interactive classroom activities or engaging students in discussions about substance use risks is emphasized. Collaborative efforts with mental health professionals and healthcare facilities are also highlighted as advantageous. To examine the importance of these institutional characteristics in the implementation of addiction prevention programs we applied national data from Hungary.

In Hungary, elementary schools are responsible for the first 8 years of the ten-year compulsory school education starting from age 6 (primary and lower secondary education in a single structure (49, 50)). ~~In Hungary, school health promotion is stipulated by law~~ (51, 52)~~.~~ The regulation of school health promotion establishes that all children must be involved in Holistic Health Promotion (HHP) in schools (signifying both state, church and private schools) accounting for health promotion activities ~~– including addiction prevention –~~ adapted to their biological, social and age-specific characteristics (51-53). These activities are aimed at promoting healthy diet, health promoting physical activity, improvement of health literacy and health competencies above the enhancement of mental health to prevent the development of behavioral addictions and substance use among others (e.g. early school leaving, violence) (53). The elements of HHP are in accordance with the WHO health-promoting school approach (54, 55). This regulation prescribes the evidence-based and recommended methods of universal addiction prevention that were listed above. However, the incorporation of these regulations into the Hungarian National Core Curriculum (NCC) (56)~~)~~ is only partial, as health promotion is treated merely as an adjunct to physical education (57)~~ (56)~~. There are no selective nor indicated addiction programs in the current NCC, ~~offered for students~~ and it is unclear how universal school programs address the risk and the protective factors of addiction (58). The number of school hours dedicated to health promotion is minimal, and the curricula do not include outcome requirements related to addictions. This is particularly significant considering that the rates of both individuals who had ever smoked (53%) and ~~current~~ the one-month prevalence of

cigarette smok~~ers~~ing (28%) among 15- to 16-year-old Hungarian adolescents exceeded the European rates by 30–40% in 2019 (12). The proportion of individuals who had ever tried alcohol was found to be one of the highest (over 90%) in Europe (12). Moreover, the proportion of Hungarian 15-year-olds who had been drunk at least twice ~~only three countries in the case of boys and five in the case of girls showed a higher proportion of~~was also among the highest compared to other -European countries ~~15-year-olds who had already been drunk at least twice~~ (1). Developing skills and fostering positive attitudes toward healthy lifestyle choices from an early age is of utmost importance to address these unfavorable national epidemiological indicators. However, to successfully accomplish this goal, it is crucial to gain a comprehensive understanding of the addiction prevention currently being implemented in schools and the factors influencing its implementation.

Our aim was to examine the state of the art of health promotion programs targeting universal addiction prevention in Hungarian elementary schools. Additionally, we aimed to identify potential areas for improvement at institutional and staff levels to inform stakeholders and policy development. Furthermore, we ~~te aimed to ex~~investigated ~~plore~~ how institutional characteristics of schools (regional location, funding, and size along with the support of teachers and the diversity of program implementers) influence the quality implementation of addiction prevention programs in a nationwide quantitative study. We also ~~examined~~ explored teachers' opinions and perspectives on possible ways to facilitate the implementation and to improve the effectiveness of school-based addiction prevention activities in Hungary through qualitative data ~~to identify potential target areas for improvement at institutional and staff levels~~. This niche study provides the first national data on the subject while offering lessons of international relevance.

2 Materials and Methods

This was a mixed-methods research project run from October 2019 to February 2020. The project consisted of a survey-based quantitative study providing data on the implementation of universal addiction prevention ~~and related mental health promotion~~ in Hungarian elementary schools (providing primary [International Standard Classification of Education (ISCED) 1: grades 1–4] and lower secondary education [ISCED 2: grades 5–8] in a single structure (49, 50)) and a~~n interview~~focus group-based qualitative study examining teachers' views on such programs and on ways to improve them.

2.1 Survey-based Study

2.1.1 Participants and Procedure

The survey-based study was part of an overarching evaluation of the implementation of HHP (prescribed by the Ministry of Human Capacities Decree of 2012 (53)) in Hungarian elementary schools. The Ministry of Human Capacities emailed an invitation to participate in the evaluation to the principals of all Hungarian elementary schools (N=3601). The email contained basic information on the study and the link to the online survey, which was open between 7 and 21 February 2020. Participation by schools was voluntary and anonymous, and respondents were asked to provide data on their institution only with no personal data included.

2.1.2 Instrument

The original survey evaluating the implementation of the whole spectrum of HHP activities in schools consisted of 32 questions. According to the purpose of our research, we used data from 14 of these questions. The questions can be divided into three blocks according to their focus.

The first block of questions focused on the basic characteristics of schools, measuring three parameters. The type of school by funding was measured with a single-choice question *(state/private/church).* The school size was given by the number of pupils enrolled. Three categories were then created for the analyses: small: ≤ 150 children, medium: 151–450 children, and large: ≥ 451 children (59, 60). Finally, the regional location of the school was determined by using data from its county of operation. The official administrative regional structure was used except for merging Pest county and Budapest into one region called Central Hungary (61).

The second block of questions focused on the institutional conditions and support for HHP implementation. A dichotomous question evaluated whether a school health promotion program was integrated into the school's pedagogical program. It was followed by a multiple-choice question that listed the developers of the school health promotion program *(teacher/school physician/school health-visitor/school psychologist/parents' working group/pupil)*. For the analysis, answers were grouped into three categories: 1) only teacher was selected, 2) other developer(s) in addition to teacher(s) were selected and 3) no developer from the list was selected.

The diversity of program implementers was measured with the number of different types of program implementers chosen in a multiple-choice question listing five potential partners involved in the implementation of the school health promotion program *(school personnel/persons working for the school on a contract [e.g., school health-visitors and physicians]/parents with an educational background in medicine or health sciences/external expert speakers/organizations or associations providing programs approved by experts)*.

The ways in which the schools supported teachers in their health promotional activities were examined by 3 questions. One multiple-choice question targeted the available support for teachers through training opportunities. Several options were listed from which three groups relevant for the analysis were created: 1) available training only provided health-related information, 2) both training providing health-related information and programs to help build teachers' resilience, coping strategies and mental well-being were available, and 3) any other answer. Another question examined the types of support for teachers' work with pupils in need of help for mental health *(~~e.g.,~~ individual counseling for pupils with a mental health professional/consultation about pupils with a mental health professional/both/none*). Finally, a question examined the frequency of community-building and recreational events for teachers *(more than once a year/once a year/never)*.

The third block of questions monitored the presence of effective school-based universal addiction prevention methods. The topics covered by the school health promotion program were evaluated with a multiple-choice question *(smoking/alcohol/drug/internet gaming disorder and problem gambling/problematic use of internet and electronic devices/online and offline bullying)*, as well as the methods of building social competence *(cooperative teaching method/interactive teaching method/assertive communication techniques*). A 10-point Likert scale *(from fully disagree to fully agree)* measured whether regular programs supporting students' mental health were provided in schools and whether pupils' environment, such as the school atmosphere and facilities (e.g., classrooms, corridors, schoolyard) were friendly and safe. Answers to these three questions were then grouped into three categories: 1) disagree: 1–5 points, 2) moderately agree: 6–8 points, and 3) fully agree: 9–10 points.

2.1.3 Statistical Analyses

Pearson's chi-squared tests were used in univariate analyses to test the associations of the elementary school characteristics with the institutional conditions of HHP implementation, as well as the

addiction prevention programs provided. In some cases, the associations between institutional conditions and the provided programs were also tested by Pearson's chi-squared test and Pearson's correlation.

In addition, we used a multiple logistic regression model to investigate factors that predict schools' performance in implementing universal addiction prevention. The participating schools were divided into two groups for this analysis based on the quality of their program implementation (good or low quality). Schools with a school health promotion program included in the pedagogical program were considered *good-quality performers* if:

1) their program covered at least three of the above-listed topics related to addiction prevention and

2) they used at least one of the above-listed methods of building social competence and

fully agreed that

3) the school provided regular programs supporting students' mental health, and

4) the school atmosphere and

5) school facilities were friendly and safe and

6) they provided at least one type of support for teachers who worked with pupils needing help for mental health.

The model investigated the relationship between basic characteristics (school type by funding, school size, and regional location) and institutional conditions (support for teachers through training, number of types of program implementers) with implementation quality. The likelihood ratio test (LR test) was used to determine whether the model fit better by representing the number of types of program implementers as a categorical or a continuous variable. The statistical analyses were performed with STATA/SE 16.1 software.

2.2 ~~Interview~~Focus Group-based Study

2.2.1 Participants and Procedure

A total of 37 teachers (8 primary school teachers, and 29 lower secondary school teachers; 34 women, and 3 men) from a convenience sample of 21 schools participated in this study. Participation was voluntary and subject to written consent. We conducted four 75-120 minute semistructured focus group discussions with the participation of 7, ~~-~~8, 8 and 14 ~~participants~~teachers. Each focus group ~~interview~~ was held in person outside the school grounds in a community space (e.g., in a municipal community center), and was led by a trainer who specialized in communication skill-building. ~~Participation was voluntary and subject to written consent.~~ The Ethical Review Board of the National Korányi Institute of Pulmonology (Reg. No. 14/2019) granted approval for the study.

2.2.2 Instrumentation

Answers to the following questions of the focus group ~~interview~~ guide were analyzed:

- What are your thoughts on improving addiction prevention and communicating the importance of related mental health promotion in your own work?
- What are the most significant barriers to these programs in your school?
- How can such a program be implemented in schools?
- What message could be used to persuade the teaching staff to support the program?

2.2.3 Data analysis

The ~~interviews~~ discussions were audio recorded and transcribed verbatim, and the classic analysis strategy (with ~~routes~~ roots in grounded theory) was then applied to the transcripts according to Krueger & Casey's methodological guide (62). In this inductive approach, the constant comparative method is used to code responses to questions. For the final report, findings were structured around repeatedly emerging themes, which are illustrated with quotes (both typed in ~~cursive~~italic).

3 Results

3.1 Results of the Survey-Based Study

Of the 3601 elementary schools in Hungary, 2892 completed the national survey. According to their size 805 were small, 1297 were medium, and 790 were large schools (small: ≤ 150 children, medium: 151–450 children, large: ≥ 451 children), and regarding their type by funding: 2330 were state, 158 were private and 404 were church schools.

3.1.1 Institutional conditions and support

The school health promotion program was included in the pedagogical program in more than two-thirds (69%) of schools. Table 1 summarizes the remaining institutional conditions and support for the implementation of school health programs. The number and diversity of participants involved in the program development were significantly associated with the school size ($p < 0.001$). Two-thirds of the schools supported teachers with health-related information and skill development training. The type of training differed by school size ($p = 0.004$). The majority (74%) of institutions supported teachers by providing both individual counseling for pupils and consultations for teachers when a pupil was in need of help for mental health. The level of this support related significantly to both school type and school size ($p = 0.002$ and $p < 0.001$, respectively). Almost two-thirds (63%) of the schools organized community-building and recreational events for the teachers more than once a year (Table 1).

3.1.2 Universal addiction prevention in Hungarian schools

Table 2 shows the associations between the different school types and the implementation of universal addiction prevention. Among the addiction topics, alcohol (62%), smoking (74%), and drug use (71%) were the most common themes in the schools. State schools were more likely to implement these programs than church or private schools. Problematic use of internet and electronic devices was addressed in 61% of the schools, while gaming and gambling were covered in only 19% of the participating institutions. Half (51%) of the institutions organized programs to prevent online and offline bullying. In the cases where the implementation was linked to the size of the school, larger schools implemented these prevention programs more frequently.

The abovementioned programs were mostly delivered by school personnel (65%), by someone in a legal relationship with the school (77%), or by external experts (67%) (data not shown in the tables). The number of addiction prevention topics covered was significantly correlated with the diversity of implementers ($p < 0.001$, Figure 1).

In addition to specific addiction prevention programs, the use of either cooperative or interactive teaching methods to develop social skills was common in most schools (78% and 71%, respectively), but state and large schools were most likely to do so.

Over half of the schools reported having regular programs to support pupils' mental health and having a safe and friendly school atmosphere and facilities. These differed significantly by school type and size, with the highest proportions of church and small schools (Table 2).

In the majority of the participating institutions, the environment for pupils was reported to be safe and friendly with private and small schools providing them the most frequently (Table 2). The presence of such a mental health-supporting environment was also significantly related to the frequency of dedicated opportunities for community building within the teaching staff ($p < 0.001$). Schools that organized community-building activities several times a year were more likely to have a safe and friendly school atmosphere and facilities (Table 3).

3.1.3 Institutional characteristics influencing the implementation quality of school-based universal addiction prevention

Among the participating schools, 20% were found to be good-quality performers and 80% low-quality performers with respect to universal addiction prevention. There was no evidence that the logistic regression model with the number of types of implementers represented by a categorical variable would fit better; therefore, it was included as a continuous variable (LR test $p = 0.8$).

The type of school by funding, support for teachers' work, and the number of types of implementers were significantly associated with the quality of implementation (Table 4). The odds of good-quality performance was twice as high in state schools than in private schools and it was 25% lower in large schools than in small schools, but the difference was not statistically significant. Compared to schools with support containing only health-related information, the odds was less than 0.5 for schools providing support that did not include health-related information. In schools where the support involved information provision complemented by skills training, the odds of good-quality performance was 14% higher than in the reference category, although the difference was not statistically significant. Each additional number of implementers increased the odds of good-quality performance by 11%.

3.2 Results of the Focus Group-based ~~Interviews~~Study

The systematic analysis resulted in six themes.

Development of addictions and mental health

Anxiety and the lack of emotional safety were identified as predictors of experimenting with addictive substances and devices. *"Emotional security is what these children lack."* According to teachers' observations, the likelihood of developing addictions is higher in cases where an imbalanced mental state is affected by impulses that can lead to addiction. Factors that may also play a role in the development and maintenance of addiction include the home environment, particularly the pattern set by parents and/or the child's environment, and the cognitive abilities of the student: *"Addiction prevention should start much earlier, during fetal development, e.g., if a pregnant mother smokes."* Teachers believed that not only the parents but also the schools and teachers were responsible for children developing appropriate health behavior.

Health education

Health education was also mentioned as essential for students and their parents to improve their knowledge of addictions and how to prevent them. It is important for students to be able to avoid

being manipulated: *"There is a very severe industry – one that reinforces addictions – and there is significant marketing going on for their attention, for their time."*

It is also necessary for parents to be able to provide better support to their children: *"Parents have good intentions but often they don't know what they are putting in the hands of their children."*

Role of teachers in addiction prevention: attention, commitment, and competence limits

According to teachers, the person in the classroom can do the most for the mental health of children in school. They confirmed that they are attentive to identifying when a pupil is experiencing a difficult situation in their social relationships that may require help. Teachers felt that it was part of their professional duty to address children's mental health, recognizing that children can only be expected to perform well in school if they are emotionally balanced, and committed to doing so: *"It is absolutely our job to deal with this. What's wrong with a child who performed well before and now isn't? What happened? There must be a psychological reason for that."*

Teachers expressed their conviction that they can provide meaningful help if they address students' problems with the right approach: *"It is important to have a trusting relationship with the children."* Sometimes they have to compensate for the lack of attention from parents, but there are also occasions when parents need to be advised on how to deal with their child. However, despite the teachers' sense of duty and attentiveness, they said that the tools and competences that they had acquired during their studies thus far with which they could support children's mental health and help them develop their coping strategies were limited.

Cooperation: difficulties and opportunities

Teachers need support from other professionals in schools, such as psychologists and teaching assistants. However, it seemed difficult for them to share responsibility for supporting children's mental health, as they considered the less intense presence of these other professionals as an important limitation in their ability to do so. Teachers' relevant statements included, *"In many cases, there is no time to wait for support from other professionals to take action, something must be done immediately to restore the student's mental balance."* and *"The children do not approach the psychologist with the same trust as the one they see every day."*

The difficulty of cooperating with parents was mentioned as a major constraint. It was deemed important and very helpful to establish a dialogue with parents, such as through joint programs; in this way, addressing children's mental health could become a common goal. The same applied to children's discipline and compliance, which were seen as two crucial factors of effective work at school. These factors were influenced most by the patterns that students bring from home, as well as consistent and clear school rules. However, in some cases, parents consider school to be a knowledge-only institution rather than an educational institution: *"They will educate [their child], you teach. But I can't, because there are such discipline problems."*

Collaboration with other teachers at school was also important and would facilitate preventive work: *"Together we can make a much more powerful difference in shaping the mental health of pupils."*

Factors hindering addiction prevention in schools

Many factors can obstruct the implementation of addiction prevention in schools. Pupils' workloads are increasing: *"Kids today can't be kids."* Children, parents and teachers are overworked. The

expectations towards teachers are too high, these expectations change at a rapid pace, and some teachers do not agree that they should be involved in addiction prevention: *"There should be a change of attitude, also on the part of the teachers, so that they feel it is their problem as well."* The classrooms are overcrowded, which makes health promotion activities very challenging. Among the hindering factors, teachers' lack of material and methodological tools, inappropriate family or teacher models, divisive behavior by the teaching staff, and the lack of cooperation between teachers and parents were also highlighted: *"A teacher who wants to convince children of anything as a smoker is not an authentic teacher."*

Factors supporting addiction prevention and its implementation in schools

Based on the teachers' perspectives, introducing an addiction prevention program requires the school leadership to be committed to supporting children's mental health and to coordinate, manage and monitor activities in this area and provide feedback on effectiveness: Sample comments were, *"the school management should be committed because this is a joint task"* and *"the result must also be advertised."* A cooperative attitude and mutual support from the teaching staff are also essential. Additional help is needed in the form of good practices to build cooperation with fellow teachers and with parents as well. Participants believed that teachers' work is facilitated when pupils know and follow the school rules. The maintenance of teachers' mental well-being was also emphasized: *"A basic requirement for the development of children's mental health is the mental health balance of the teacher."* This can be supported, among other things (e.g., skills training), by social recognition/acknowledgment of the teacher.

The engagement of fellow teachers in the program was also mentioned as crucial. This can be facilitated and strengthened if teachers become personally involved in the program: if they understand that the methods used to develop children's mental health also support their own health and burnout prevention or if the new methods are also introduced and tried out among the staff: *"bringing the games into the staff-room".* Additionally, creating programs that involve the children of fellow teachers also seemed useful for teachers so they become emotionally involved.

4 Discussion

This was a mixed-methods research project that examined the implementation of addiction prevention and its influencing factors in elementary schools on a national level for the first time in Hungary. We have demonstrated based on data provided by school principals that the quality implementation of the aforementioned school program is closely linked to institutional characteristics of schools, namely to the nature of support and training provided to teachers in this domain, to the diversity of program implementers, and to the type of schools by funding. Furthermore, our ~~interview~~focus group-based study provided insights into the challenges associated with program implementation, particularly from the perspective of teachers who serve as vital stakeholders. By analyzing their perspectives, we were able to corroborate our survey-based findings regarding the significance of institutional factors, including the presence of committed leadership that not only provides comprehensive training but also actively engages and supports teachers both individually and as a community.

In addition to the family, the school serves as a vital institutional setting for young individuals, exerting a significant influence on their physical, psychological, and social development. Empowering children and adolescents to avoid harmful substances, such as alcohol and tobacco, and maladaptive technology use requires multidisciplinary efforts and knowledge[49](55). Our findings

have also shown that collaborating with a greater variety of partners enhances the quality of addiction prevention implementation. Furthermore, we found that schools with a higher number of program implementers can address a wider, more diverse range of addiction-related topics in their curricula. This result reinforces the standards provided in the International Standards on Drug Use Prevention (46). Cooperation among teachers, parents, and other professionals was also mentioned in the ~~interviews~~ focus-groups as an important supporting factor of effective implementation. This collaborative approach aligns with the endorsed framework for establishing health-promoting schools, as advocated by both WHO and UN (55) and it has been demonstrated to be effective in practice (36).

School size can influence the implementation of school health programs, but its effect is contradictory and depends on the nature of the programs and the type of school (63). In our model, school size was not shown to be associated with the quality of program implementation. However, our univariate analysis detected differences in terms of institutional support of implementation by school size in favor of large schools. This may be explained by the Hungarian regulatory frameworks, which determine the number of health professionals who can be employed by the schools. For example, schools with fewer than 800 pupils can only employ one school health-visitor (a specialist with similar tasks to a school nurse (64)) and one school physician on a part-time basis (65), and one part-time school psychologist is allowed per 500 pupils (66). In this respect, larger schools are in a better position, as the presence of a full-time school health-visitor and psychologist creates opportunities for their involvement in both program design and implementation. The study by McIsaac et al. also highlighted the importance of enhancing organizational capacity for effective implementation of health promotion activities (67).

Different school types by funding also have different resources, which, as our quantitative data showed, can influence the implementation quality and the provision of addiction prevention. State and church schools were found to perform better than private schools in quality implementation according to our model. Church schools may be in a better position in the context of mental health promotion. These institutions are obliged by their church to maintain contact with the local parish and its pastors and/or to employ an institutional pastor who is responsible for the support of the whole school: pupils, staff and parents (68-70). This regulatory framework may be reflected in our results, which showed the highest proportion in the provision of regular programs supporting pupils' mental health in church schools (68% vs. 53% and 54% in state and private schools, respectively).

Our results did not show regional differences in the quality of implementation of addiction prevention. However, it is important to acknowledge that implementation differences may still exist at the level of smaller administrative units. Previous studies from other countries have shown that different regions may have varying levels of investment and commitment to school health promotion, which can impact the effectiveness and quality of implementation. Additionally, regional variations in socioeconomic conditions and support from the Regional Education Authority can also influence the quality of implementation of school health promotion initiatives (71, 72).

Support of teachers with health-related information was shown to be an important facilitator of the implementation quality. Parallel with this, in our ~~interviews~~ focus groups the enhancement of children's health literacy was mentioned as an important task, which requires adequate health-related information. These are in line with previous studies showing that competent and trained teachers are the keys to promoting and supporting young people's health by facilitating social and emotional skill building (73). Our survey results indicated that teachers still lack sufficient, complex health education and skill development training and support in one-third of schools. These issues were also

reflected in the outcomes of our ~~interview~~focus group-based study underlining the importance of skill development. Similar hindering factors of the effectiveness of school-based addiction prevention programs than those, mentioned in our ~~interviews~~focus-groups, were already detected in Hungary (74). It was found that although the number of these programs has been increasing since the early 2000s, most programs are short, mainly restricted to health education without social–emotional skill learning, and are often led by external presenters with frontal-type education (74). The frontal type of education does not meet the new methodological needs of the Z and Alpha generations, and its motivational approaches are not or only partially effective (75).

~~Our a~~Additional results from our project further underscored the significance ~~of~~~~also support the importance~~ of school characteristics ~~and are in line with numerous previous studies~~. Consistent with multiple prior studies (67, 76-79), it has been demonstrated in our focus-groups that ensuring effective implementation relies on dedicated leadership~~Effective implementation was shown to be ensured by committed leadership~~ (78, 79), ~~by~~ along with the provision of support for the school staff acting as implementers and by greater organizational capacity (good communication and willingness to cooperate) (67, 76, 77). ~~These requirements were also reflected in our interviews with teachers.~~ Additionally, our survey-based study showed that educational institutions that invest in the well-being of the teaching community more than once a year have significantly greater success in creating a school environment that supports mental health, which is also an important school-based protective factor (80). The focus group discussions provided a possible explanation for this association, as teachers emphasized that they can generally do the most for children's mental health based on the trust between them and the children, and the maintenance of their own mental health was mentioned as key for effective work. The latter is in line with previous findings on the importance of teachers' mental health (81). It was also mentioned as beneficial for these processes if school leaders prioritize the mental health of pupils and teachers and provide the necessary training and supportive environment for teachers. This further underlines the need for teachers' skills training, as this could not only help them facilitate pupils' skill building (as mentioned above) but also provide them with help maintaining their own mental well-being. Community building can also have this two-sided beneficial effect by facilitating cooperation in the implementation tasks and improving mental health.

4.1 Implications of the Results for School Health Policy, Practice

Our study underlines the importance of institutional characteristics in implementing school-based universal addiction prevention. The training and mental health support of teachers and their collectives are important intervention points that should be invested in by local and national policymakers to increase the effectiveness of addiction prevention and to empower teachers. In addition, strengthening staff cohesion, teacher–teacher and parent–teacher dialogue and cooperation is essential not only during the introduction of new programs and methods but also to ensure their sustainability (63).

Hungary has the second-highest rate of preventable deaths among the 36 OECD Member States (82). The leading causes of avoidable mortality are cardiovascular diseases and cancer (82), for which the main risk factors are alcohol consumption and smoking. It is particularly significant in this regard that the rate of alcohol and cigarette use among Hungarian adolescents is high and above the European average (12). ~~The training and mental health support of teachers and their collectives are important intervention points that should be invested in by local and national policymakers to increase the effectiveness of addiction prevention and to empower teachers. In addition, strengthening staff cohesion, teacher–teacher and parent–teacher dialogue and cooperation is essential not only during the introduction of new programs and methods but also to ensure their~~

~~sustainability (63).~~ However, there are several challenges to ~~these~~ implementing effective school-based universal addiction prevention interventions in this country. One is to ensure that teachers are properly encouraged to do the difficult work of introducing these pedagogical methods and programs that promote pupils' mental health outside the different projects and supported in doing so. Effective implementation is further hampered by the aging of the Hungarian teacher population and high rates of turnover, stress, and burnout among teachers (83-86), which were further aggravated by the COVID-19 pandemic. The worsening trend in children's mental health, the significant increase in children's psychiatric illnesses (87) and the steep rise in the number of children with severe learning disabilities over the past 20 years (88) are also aggravating factors. Among these conditions, it is of crucial importance to enhance the attractiveness of the teaching profession, to motivate talented individuals able to cope with these difficulties. Part of this task for the coming years is to modify teachers' training curricula in order to ensure that newly qualified teachers are equipped with the knowledge and pedagogical methods in health promotion that facilitate the development of skills and that are adapted to the learning needs of new generations.

In addition to the above-described factors, school-based local planning and involvement in decisions about implementation can further enhance the success of school-based programs (89, 90) with program/method integration into school routines and school curricula (91, 92). Health Services, Counseling, Psychological Services specialists (e.g., school health-visitors, physicians, psychologists) are important partners in school health promotion (93). Capacity must be built in the current service so that its members can actively participate in designing and implementing school health promotion programs and support such activities of teachers, regardless of the schools' characteristics. Equal support for all schools, regardless of size and funding would ensure that every student has access to quality health promotion which can significantly enhance the chances of students achieving health-promoting behavior.

4.2 Limitations

Notably, our results have limitations. Due to the cross-sectional nature of the project, it can only provide a detailed description of universal addiction prevention in Hungarian elementary schools at a given point in time. The survey method did not allow schools to provide a detailed description of their health promoting activities, however a relatively short, easy-to-complete questionnaire seemed the best methods to gather comparable data at national level. ~~The~~ An additional ~~main~~ limitation is that the survey was completed by principals of schools, which may result in some distortions in the data provided compared to the actual implementation of the programs in schools and classrooms. More accurate data on implementation could be obtained if the questionnaire was also completed by teachers, school health service professionals, psychologists and by students as well (in older age groups) above principals in schools. This method would also make it possible to examine the consistency of data from different sources of information and to identify possible discrepancies. Another limitation is the lack of information on the actual number of school health services specialists and psychologists working in the institutions at the time of the survey. We could only infer their number from the school sizes and the related regulations; however, there may have been vacancies.

~~Although we applied purposeful sampling~~As participation in ~~for~~ the focus group ~~interview~~s was voluntary, sampling bias cannot be excluded in our qualitative data. ~~t~~The opinions and perceptions of teachers' who were willing to discuss the issues of addiction prevention in school ~~opinions and perceptions~~ are not generalizable on a national level.

5 Conclusion

The use of alcohol, tobacco, and illicit substances typically first occurs in adolescence, while maladaptive technology use or technology addiction can arise from early childhood, as children today are born and grow up in environments in which digital technologies are widely available (94). Both substance and behavioral addictions can lead to significant impairment in personal, family, social, educational or other important life domains and represent high mental and physical health burdens. We have demonstrated that good-quality implementation of the aforementioned school programs is closely linked to the provision of training for teachers that includes health education and social skills training, to greater diversity of program implementers and to schools being run by the state or a church. Additionally, from our ~~interview~~focus group-based study, we could reinforce our results on the importance of institutional factors, such as committed leadership, providing training, and engaging and supporting teachers individually and as a community. These results may inform policymakers, schools, teachers, adolescents, and their parents about which factors to invest in to improve the school-based universal addiction prevention.

It is essential to prioritize actions that involve input from multiple stakeholders for the nationwide improvement of addiction prevention in schools. This involves, in addition to address those factors mentioned above, to revise the training curricula for teachers. Furthermore, integrating a comprehensive health education program into the National Core Curricula that adheres to standards is essential. This will enable students to gain the knowledge, attitudes, skills, and experiences needed to lead a healthy lifestyle which will not only benefit them personally but also contribute to the overall well-being of society.

6 Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

7 Author Contributions

DÁ: Validation, data curation, writing the original draft, and visualization.

ZV: Formal analysis and validation of outputs.

MS: Review & editing of the original draft.

ZsCs: Methodology, formal analysis and review & editing.

ZsR: Conceptualization, methodology and investigation along with writing the original draft and review & editing it, supervision.

8 Funding

This work was supported by the Scientific Foundations of Education Research Program of the Hungarian Academy of Sciences (SZKF-12/2021), WHO-BCA 2019-2020 (2019/881133-0), Central Budget of Hungary for 2019 (according to Act L of 2018, Annex 1, Chapter XX. Ministry of Human Capacities, Title No. 20.22.28. “Tasks related to the National Public Health Strategy”). The contributions of the first author (DÁ) were supported by the ÚNKP-22-3-I-SE-11 New National

Excellence Program of the Ministry for Culture and Innovation from the source of the National Research, Development and Innovation Fund.

9 Acknowledgments

Thank you to Annamária Somhegyi for her help in designing the questionnaire and conducting the survey. We greatly appreciate the efforts of the colleges of the Ministry of Human Capacities in helping send the questionnaire to the schools. We give special thanks to school principals and teachers for giving their time to participate in this research.

10 Data Availability Statement

The data analyzed in this study was obtained from the Ministry of Human Capacities, Hungary. This authority disposes all rights upon providing access to these datasets.

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12 Figure legends

Figure 1. Box- and whisker plot showing the association between the number of topics covered by universal addiction prevention programs in Hungarian elementary schools and the diversity of implementers

*from the seven topics of addiction prevention and mental health programs listed in the questionnaire: smoking/alcohol/drug/internet gaming disorder and problem gambling/problematic use of internet and electronic devices/body image disorders/online and offline bullying.

†from the five partners listed in the questionnaire: school personnel/persons working for the school on a contract (e.g., school health-visitors and physicians)/parents with an educational background in medicine or health sciences/external expert speakers/organizations or associations providing programs approved by experts.

The bottom of the boxes indicates the lower quartile, the top the upper quartile, and the line within it is the median. Whiskers are at lower/upper quartile ± interquartile range or minimum/maximum value, whatever is more extreme.

13 Tables

Table 1. Institutional conditions and support for the implementation of school health promotion programs in Hungarian elementary schools (N = 2892)

	Total	Type of school[a]			*p*-value[b]	School size[c]			*p*-value[b]
		State	Private	Church		Small	Medium	Large	
Developers of school health promotion program (%)									
Teachers only	1.4	1.4	1.3	1.3		1.8	1.4	1.0	
Teachers and others[d]	13.3	13.2	16.4	12.6	0.803	9.9	12.0	18.9	**<0.001**
Not specified	85.3	85.4	82.3	86.1		88.3	86.6	80.1	
Support for teachers through training (%)									
Only health-related information	25.6	26.4	20.3	23.0		29.0	26.0	21.7	
Health-related information and skills training[e]	66.3	65.3	71.5	70.3	0.162	61.9	66.2	71.0	**0.004**
Other	8.1	8.3	8.2	6.7		9.1	7.8	7.3	
Support for teachers' work with pupils in need of help for mental health (%)									
Individual counseling for pupils with a mental health professional	13.5	13.4	13.3	14.4		15.0	10.8	16.3	
Consultation about pupils with a mental health professional	12.0	11.2	22.8	12.4	**0.002**	14.5	12.4	8.6	**<0.001**
Both	74.2	75.1	63.3	73.0		70.2	76.3	74.7	
None	0.3	0.3	0.6	0.2		0.3	0.5	0.4	
Community-building/ recreational events for teachers (%)									
More than once a year	63.2	61.4	69.6	70.8		52.0	65.8	70.4	
Once a year	34.8	36.6	26.0	28.7	**<0.001**	44.5	32.8	28.6	**<0.001**
Never	2.0	2.0	4.4	0.50		3.5	1.4	1.0	

[a] type of school by funding

[b] Pearson's chi-squared test, $p < 0.05$ highlighted in bold

[c] school size: small: ≤ 150 children; medium: 151-450 children; large: ≥ 451 children

[d] others: school physician; school health-visitor; school psychologist; parents' working group; pupil

[e] skills training: training to help build teachers' resilience, coping strategies and mental well-being

Table 2. Universal addiction prevention in Hungarian elementary schools (N = 2892)

	Total	Type of school[a]			*p*-value[b]	School size[c]			*p*-value[b]
		State	Private	Church		Small	Medium	Large	
Topics covered (%)									
Smoking	73.6	75.7	50.6	70.1	**<0.001**	72.1	73.1	75.8	0.205
Alcohol	61.9	63.8	44.9	57.2	**<0.001**	59.1	61.8	64.7	0.074
Drug	71.3	73.1	56.3	66.6	**<0.001**	63.6	71.9	77.9	**<0.001**
Internet gaming disorder and problem gambling	18.9	20.0	21.5	17.1	0.452	17.0	17.0	23.7	**<0.001**
Problematic use of internet and electronic devices	60.9	60.6	58.9	63.4	0.504	58.5	61.0	63.3	0.147
Online and offline bullying	50.9	52.2	39.9	47.7	**0.004**	41.1	52.3	58.6	**<0.001**
Methods of building social competence (%)									
Cooperative teaching method	78.0	78.63	67.1	78.7	**0.003**	71.6	80.0	81.4	**<0.001**
Interactive teaching method	70.9	72.49	56.3	67.6	**<0.001**	68.5	71.7	72.2	0.187
Assertive communication techniques	19.6	18.1	34.2	23.0	**<0.001**	17.4	19.6	22.0	0.066
Regular programs supporting students' mental health (%)									
Disagree	5.3	5.7	7.8	2.3		4.5	5.2	6.4	
Moderately agree	39.6	41.5	37.9	29.4	**<0.001**	38.0	38.4	43.2	**0.035**
Fully agree	55.1	52.8	54.3	68.3		57.5	56.4	50.4	
The school atmosphere is friendly and safe (%)									
Disagree	1.8	2.0	0.6	1.3		2.3	3.6	6.6	
Moderately agree	31.3	33.2	17.7	25.5	**<0.001**	28.9	32.6	39.9	0.066
Fully agree	66.9	64.8	81.7	73.2		68.8	63.8	53.5	
School facilities (e.g., classrooms, corridors) are friendly and safe (%)									
Disagree	4.0	4.4	2.0	2.6		2.3	3.6	6.5	
Moderately agree	33.6	35.1	22.2	29.4	**<0.001**	28.9	32.6	39.9	**<0.001**
Fully agree	62.4	60.5	75.8	68.0		68.8	63.8	53.6	

[a] type of school by funding

[b] Pearson's chi-squared test, $p < 0.05$ highlighted in bold

[c] school size: small: ≤ 150 children; medium: 151-450 children; large: ≥ 451 children

Table 3. Associations between the frequency of community-building/recreational events for teachers and the safety and friendliness of the school atmosphere and facilities in Hungarian elementary schools (N = 2892)

	Community building/recreational events for teachers			
	More than once a year	Once a year	Never	***p*-value**[a]
The school atmosphere is friendly and safe (%)				
Disagree	45.1	51.0	3.9	
Moderately agree	56.2	40.8	3.1	**<0.001**
Fully agree	67.8	31.0	1.2	
School facilities (e.g., classrooms, corridors) are friendly and safe (%)				
Disagree	59.3	36.3	4.4	
Moderately agree	59.8	37.7	2.5	**0.001**
Fully agree	66.1	32.6	1.3	

[a] Pearson's chi-squared test, $p < 0.05$ highlighted in bold

Table 4. Associations of good-quality implementation of universal addiction prevention in Hungarian elementary schools with the school's regional location, type by funding, and size, the support for teachers and the diversity of program implementers (N = 2892)

Determinant	Odds ratio[a] (95% CI)	***p*-value**[a]
Region		
Northern Hungary	reference	
Northern Great Plain	1.17 (0.85-1.61)	
Southern Great Plain	0.80 (0.56-1.15)	0.117
Central Hungary	0.80 (0.58-1.09)	
Central Transdanubia	0.75 (0.52-1.08)	
Western Transdanubia	0.95 (0.66-1.36)	
Southern Transdanubia	0.83 (0.57-1.21)	
Type of school[b]		
State	reference	**0.009**
Private	0.50 (0.30-0.84)	
Church	1.21 (0.93-1.57)	
School size[c]		
Small	reference	0.100
Medium	0.89 (0.71-1.12)	
Large	0.75 (0.57-0.97)	
Teacher support		**<0.001**

Only health-related information	reference	
Health-related information and skills training	1.14 (0.92-1.42)	
Other	0.46 (0.28-0.74)	
No. of types of program implementers[d]	1.11 (1.03-1.18)	**0.002**

[a] Odds ratios with 95% CI (confidence intervals) and *p*-values were derived from a multiple logistic regression analysis with the quality of implementation used as outcome (the odds of good-quality implementation were calculated in reference to the odds of low-quality implementation)
[b] type of school by funding
[c] school size: small: ≤ 150 children; medium: 151-450 children; large: ≥ 451 children
[d] number of types of program implementers was treated as a continuous variable