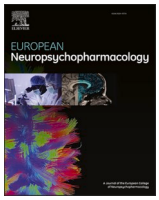
European Neuropsychopharmacology 104 (2026) 112741

Contents lists available at ScienceDirect

European Neuropsychopharmacology

journal homepage: www.sciencedirect.com/journal/european-neuropsychopharmacology



Mental health, coping and related risk factors during the first 2 years of the COVID-19 pandemic in children: Nationally representative, multi-wave, cross-sectional results from 12 countries from the global COH-FIT study

Agorastos Agorastos [1,#,*], Trevor Thompson [2,#], Marco Solmi [3,4,5,6,7,#], Samuele Cortese [8], Andrés Estradé [9,10], Joaquim Radua [11], Elena Dragioti [12,13], Davy Vancampfort [14], Lau Caspar Thygesen [15], Harald Aschauer [16], Monika Schlögelhofer [16], Elena Aschauer [17], Andres Schneeberger [18], Christian G. Huber [19], Gregor Hasler [20], Philippe Conus [21], Kim Q. Do Cuénod [21], Roland von Känel [22], Gonzalo Arrondo [23], Paolo Fusar-Poli [4,24,25], Philip Gorwood [26,27], Pierre-Michel Llorca [28], Marie-Odile Krebs [27,29], Elisabetta Scanferla [26], Taishiro Kishimoto [30], Golam Rabbani [31], Karolina Skonieczna-Żydecka [32], Paolo Brambilla [33,34], Angela Favaro [35], Akihiro Takamiya [30], Leonardo Zoccante [36], Marco Colizzi [37], Julie Bourgin [38], Karol Kamiński [39], Maryam Moghadasin [40], Soraya Seedat [41], Evan Matthews [42], John Wells [42], Emilia Vassilopoulou [43], Ary Gadelha [44], Kuan-Pin Su [45,46], Jun Soo Kwon [47], Minah Kim [48], Taeyoung Lee [49], Oleg Papsuev [50], Denisa Manková [51], Andrea Boscutti [52], Cristiano Gerunda [35], Diego Saccon [53], Elena Righi [54], Francesco Monaco [55,56], Giovanni Croatto [57], Guido Cereda [33], Jacopo Demurtas [58], Natascia Brondino [25], Nicola Veronese [59], Paolo Enrico [33], Pierluigi Politi [25], Valentina Ciappolino [60], Andrea Pfennig [61], Andreas Bechdolf [62], Andreas Meyer-Lindenberg [63], Kai G. Kahl [64], Katharina Domschke [65], Michael Bauer [61], Nikolaos Koutsouleris [66], Sibylle M. Winter [7,172], Stefan Borgwardt [67], Istvan Bitter [68], Judit Balazs [69,70], Pál Czobor [68], Zsolt Unoka [68], Dimitris Mavridis [71], Konstantinos Tsamakis [72], Vasilios P. Bozikas [1], Chavit Tunvirachaisakul [73], Michael Maes [73], Teerayuth Rungnirundorn [73], Thitiporn Supasitthumrong [73], Ariful Haque [31], Andre R. Brunoni [74], Carlos Gustavo Costardi [44], Felipe Barreto Schuch [75,76,77], Guilherme Polanczyk [74], Jhoanne Merlyn Luiz [78], Lais Fonseca [44], Luana V. Aparicio [74], Samira S. Valvassori [78], Merete Nordentoft [79], Per Vendsborg [80], Sofie Have Hoffmann [15], Jihed Sehli [81], Norman Sartorius [82], Sabina C. Heuss [83], Daniel Guinart [84,85], Jane Hamilton [86], John Kane [87,88], Jose Rubio [87,88], Michael Sand [89], Ai Koyanagi [90], Aleix Solanes [11], Alvaro Andreu-Bernabeu [91], Antonia San José Cáceres [91,92], Celso Arango [91], Covadonga M. Díaz-Caneja [91], Diego Hidalgo-Mazzei [93], Eduard Vieta [93], Javier Gonzalez-Peñas [91], Lydia Fortea [93], Mara Parellada [91], Miquel A. Fullana [93], Norma Verdolini [93,94], Eva Andrlíková [51], Karolina Janků [51], Mark J. Millan [95], Mihaela Honciuc [28], Anna Moniuszko-Malinowska [96], Igor Łoniewski [32,97], Jerzy Samochowiec [98], Łukasz Kiszkiel [99], Maria Marlicz [32], Paweł Sowa [39], Wojciech Marlicz [100,101], Georgina Spies [41], Brendon Stubbs [102], Joseph Firth [103], Sarah Sullivan [104], Asli Enez Darcin [105], Hatice Aksu [105], Nesrin Dilbaz [106], Onur Noyan [106], Momoko Kitazawa [30], Shunya Kurokawa [30], Yuki Tazawa [30],

* Corresponding author at: University Department of Psychiatry, School of Medicine, Aristotle University of Thessaloniki., Psychiatric Hospital of Thessaloniki, Lagkada 196, GR 56430, Thessaloniki, Greece.

E-mail address: aagorast@auth.gr (A. Agorastos).

https://doi.org/10.1016/j.euroneuro.2025.112741

Received 9 October 2025; Received in revised form 8 December 2025; Accepted 10 December 2025

Available online 18 December 2025

Alejandro Anselmi [10], Cecilia Cracco [10], Ana Inés Machado [10], Natalia Estrade [10], Diego De Leo [107], Jackie Curtis [108], Michael Berk [109], Andre F. Carvalho [109], Philip Ward [110], Scott Teasdale [110], Simon Rosenbaum [110], Wolfgang Marx [109], Adrian Vasile Horodnic [111], Liviu Oprea [111], Ovidiu Alexinschi [112], Petru Ifteni [113], Serban Turliuc [111], Tudor Ciuhodaru [114], Alexandra Bolos [111], Valentin Matei [115], Dorien H. Nieman [116], Iris Sommer [117], Jim van Os [118], Therese van Amelsvoort [119], Ching-Fang Sun [46,120], Ta-wei Guu [68,46,121], Can Jiao [122], Jieting Zhang [122], Jialin Fan [122], Liye Zou [122], Xin Yu [123], Xinli Chi [122], Philippe de Timary [124,125], Ruud van Winkel [126], Bernardo Ng [127], Edilberto Pena [127], Ramon Arellano [127], Raquel Roman [127], Thelma Sanchez [127], Larisa Movina [50], Pedro Morgado [128,129], Sofia Brissos [130], Oleg Aizberg [131], Anna Mosina [132], Damir Krinitski [133], James Mugisha [134], Dena Sadeghi-Bahmani [135,136], Farshad Sheybani [137], Masoud Sadeghi [138], Samira Hadi [139], Serge Brand [136,140,141,142,143,144], Antonia Errazuriz [145], Nicolas Crossley [145], Dragana Ignjatovic Ristic [146], Carlos López-Jaramillo [147], Dimitris Efthymiou [148], Praveenlal Kuttichira [149], Roy Abraham Kallivayalil [150], Afzal Javed [151], Muhammad Iqbal Afridi [152,153,154], Bawo James [155], Omonefe Joy Seb-Akahomen [156], Jess Fiedorowicz [3,4,5], Jeff Daskalakis [157], Lakshmi N. Yatham [158], Lin Yang [159,160], Tarek Okasha [161], Aïcha Dahdouh [162], Jari Tiihonen [163,164], Jae Il Shin [165], Jinhee Lee [166], Ahmed Mhalla [167], Lotfi Gaha [167], Takoua Brahim [167], Kuanysh Altynbekov [168], Nikolay Negay [168], Saltanat Nurmagambetova [168], Yasser Abu Jamei [169], Mark Weiser [170], Christoph U Correll [7,84,87,88,171,172,173,174]

[1] *Aristotle University of Thessaloniki, II. Dept. of Psychiatry, Medical School, Faculty of Health Sciences, Thessaloniki, Greece*
[2] *Centre for Chronic Illness and Ageing, University of Greenwich, London, United Kingdom*
[3] *University of Ottawa, Department of Psychiatry, Ontario, Canada*
[4] *The Ottawa Hospital, Department of Mental Health, Ontario, Canada*
[5] *Ottawa Hospital Research Institute (OHRI) Clinical Epidemiology Program, Ottawa Ontario, Canada*
[6] *Centre for Innovation in Mental Health-Developmental Lab, School of Psychology, University of Southampton, and NHS Trust, Southampton, United Kingdom*
[7] *Charité Universitätsmedizin Berlin, Department of Child and Adolescent Psychiatry, Berlin, Germany*
[8] *Developmental EPI (Evidence Synthesis, Prediction, Implementation) Lab, Centre for Innovation in Mental Health, School of Psychology, Faculty of Environmental and Life Sciences, University of Southampton, Southampton, UK*
[9] *Early Psychosis: Interventions and Clinical-detection (EPIC) Lab, Department of Psychosis Studies, Institute of Psychiatry, Psychology & Neuroscience, King's College London, London, United Kingdom*
[10] *Universidad Católica, Department of Psychology, Montevideo, Uruguay*
[11] *Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Imaging of Mood- and Anxiety-Related Disorders (IMARD), University of Barcelona, CIBERSAM, Instituto de Salud Carlos III, Barcelona, Spain*
[12] *Linköping University, Pain and Rehabilitation Centre and Department of Health, Medicine and Caring Sciences, Linköping, Sweden*
[13] *University of Ioannina, Research Laboratory Psychology of Patients, Families & Health Professionals, Department of Nursing, School of Health Sciences, Ioannina, Greece*
[14] *Katholieke Universiteit Leuven (KU Leuven), Department of Rehabilitation Sciences, Leuven, Belgium*
[15] *National Institute of Public Health, University of Southern Denmark, Denmark*
[16] *BioPsyC - Biopsychosocial Corporation, Non-profit association for Research Funding Ltd., Vienna, Austria*
[17] *Klinik Hietzing, Wiener Gesundheitsverbund, 3rd Psychiatry, Department of Psychiatry and Psychotherapeutic Medicine with Center for Psychosomatics, Vienna, Austria*
[18] *University of California San Diego, CA, United States*
[19] *University of Basel, Universitäre Psychiatrische Kliniken Basel (UPK), Basel, Switzerland*
[20] *University of Fribourg, Fribourg Network of Mental Health (RFSM), Fribourg, Switzerland*
[21] *University of Lausanne, Department of Psychiatry, Lausanne, Switzerland*
[22] *University of Zurich, University Hospital Zurich, Department of Consultation-Liaison Psychiatry and Psychosomatic Medicine, Switzerland*
[23] *University of Navarra, Mind-Brain Group, Institute for Culture and Society (ICS), Pamplona, Spain*
[24] *OASIS service, South London and Maudsley NHS Foundation Trust, London, United Kingdom*
[25] *University of Pavia, Department of Brain and Behavioral Sciences, Pavia, Italy*
[26] *Université Paris Cité, CMME, GHU Paris Psychiatrie et Neurosciences, Paris, France*
[27] *Institute de Psychiatrie et Neuroscience de Paris, INSERM U1266, F-75014, Paris, France*
[28] *Université Clermont Auvergne, CHU Clermont-Ferrand, Service de Psychiatrie B, Clermont-Ferrand, France*
[29] *Université de Paris, PEPIT, GHU Paris Psychiatrie et Neuroscience, Paris, France*
[30] *Keio University School of Medicine, Department of Neuropsychiatry, Tokyo, Japan*
[31] *The National Foundation of Mental Health of Bangladesh, Bangladesh*
[32] *Pomeranian Medical University in Szczecin, Department of Biochemical Sciences, Szczecin, Poland*
[33] *University of Milan, Department of Pathophysiology and Transplantation, Milan, Italy*
[34] *Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Department of Neurosciences and Mental Health, Milan, Italy*
[35] *University of Padua, Neurosciences Department, Padua, Italy*
[36] *UOC Infanzia, Adolescenza, Famiglia e Consultori, Districts 1 & 2 AULSS 9 Scaligera, Verona, Italy*
[37] *University of Udine, Department of Medicine (DAME), Unit of Psychiatry, Italy*
[38] *Service de Psychiatrie de l'enfant et de l'adolescent, GHNE, 91440 Bures Sur Yvette, France*
[39] *Medical University of Białystok, Department of Population Medicine and Lifestyle Diseases Prevention, Bialystok, Poland*
[40] *Kharazmi University, Department of Clinical Psychology, Faculty of Psychology and Education, Tehran, Iran*

[41] South African Medical Research Council Unit on the Genomics of Brain Disorders, Stellenbosch University, Department of Psychiatry, Faculty of Medicine and Health Sciences, South Africa
[42] South East Technological University, School of Health Science, Waterford, Ireland
[43] University of Nicosia, Department of Life and Health Sciences, Nicosia, Cyprus
[44] Universidade Federal de São Paulo, Department of Psychiatry, São Paulo, Brazil
[45] An-Nan Hospital, China Medical University, Department of Psychiatry, Tainan, Taiwan
[46] China Medical University Hospital, Mind-Body Interface Research Center, Taichung, Taiwan
[47] Seoul National University College of Medicine, Department of Psychiatry, Seoul, Republic of Korea
[48] Seoul National University Hospital, Department of Neuropsychiatry, Seoul, Republic of Korea
[49] Kyungpook National University School of Medicine, Department of Psychiatry, Daegu, Republic of Korea
[50] Moscow Research Institute of Psychiatry, Moscow, Russia
[51] National Institute of Mental Health, Klecany, Czechia
[52] UTHealth Houston, Department of Psychiatry, USA
[53] AULSS4 Veneto Orientale, Addictions Department, Italy
[54] University of Modena and Reggio Emilia, Department of Biomedical, Metabolic and Neural Sciences, Modena, Italy
[55] ASL Salerno, Department of Mental Health, Salerno, Italy
[56] European Biomedical Research Institute of Salerno (EBRIS), Salerno, Italy
[57] University of Padova, Padova, Italy
[58] University of Modena and Reggio Emilia, Clinical and Experimental Medicine PhD Program, Modena, Italy
[59] University of Palermo, Department of Internal Medicine, Geriatrics Section, Palermo, Italy
[60] Unit of Psychiatry, Azienda Ospedaliero-Universitaria Ss. Antonio e Biagio e Cesare Arrigo, Alessandria, Italy
[61] Technische Universität Dresden, University Hospital Carl Gustav Carus, Department of Psychiatry and Psychotherapy, Dresden, Germany
[62] Charité Universitätsmedizin Berlin, Department of Psychiatry and Psychotherapy, Berlin, Germany
[63] Heidelberg University, Central Institute of Mental Health, Medical Faculty Mannheim, Germany
[64] Hannover Medical School, Department of Psychiatry, Social Psychiatry and Psychotherapy, Germany
[65] University of Freiburg, Department of Psychiatry and Psychotherapy, Medical Center – University of Freiburg, Faculty of Medicine, Freiburg, Germany
[66] Ludwig-Maximilians-University of Munich, Munich, Germany
[67] Department of Psychiatry and Psychotherapy, University of Lübeck, Lübeck, Germany
[68] Semmelweis University, Department of Psychiatry and Psychotherapy, Budapest, Hungary
[69] Eotvos Lorand University, Institute of Psychology, Budapest, Hungary
[70] Bjørknes University College, Oslo, Norway
[71] University of Ioannina, Department of Primary Education, Ioannina, Greece
[72] King's College London, Institute of Psychiatry, Psychology and Neuroscience, London, United Kingdom
[73] Chulalongkorn University, Department of Psychiatry, Thailand
[74] Faculdade de Medicina da Universidade de São Paulo, Departments of Internal Medicine and Psychiatry, São Paulo, Brazil
[75] Universidade Federal de Santa Maria, Department of Sports Methods and Techniques, Santa Maria, RS, Brazil
[76] Faculty of Health Sciences, Universidad Autónoma de Chile, Providencia, Chile
[77] Institute of Psychiatry, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil
[78] Universidade do Extremo Sul Catarinense, Translational Psychiatry Laboratory, Graduate Program in Health Sciences, Criciúma, SC, Brazil
[79] University of Copenhagen, Copenhagen, Denmark
[80] Psykiatrifonden, Copenhagen, Denmark
[81] Le Jolimont Psychiatry and Psychotherapy, Fribourg, Switzerland
[82] Association for the Improvement of Mental Health Programmes (AMH), Switzerland
[83] FHNW University of Applied Sciences and Arts Northwestern Switzerland, Switzerland
[84] Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, NY, USA
[85] Institut de Salut Mental, Hospital del Mar, Hospital del Mar Research Institute, CIBERSAM, Barcelona, Spain
[86] University of Texas Health Science Center Houston, McGovern Medical School, Louis A. Faillace, MD, Department of Psychiatry and Behavioral Sciences, USA
[87] The Zucker Hillside Hospital, Northwell Health, NY, USA
[88] Feinstein Institutes for Medical Research, NY, USA
[89] S2 Consulting LLC, CA, USA
[90] Parc Sanitari Sant Joan de Deu, Research and Development Unit, CIBERSAM, ICREA, Barcelona, Spain
[91] Hospital General Universitario Gregorio Marañón, Department of Child and Adolescent Psychiatry, Institute of Psychiatry and Mental Health (IPS MARAÑÓN), IiSGM, CIBERSAM, Universidad Complutense, Madrid, Spain
[92] Universidad Internacional de la Rioja, Spain
[93] University of Barcelona, Hospital Clínic, IDIBAPS, CIBERSAM, Barcelona, Spain
[94] Local Health Unit 1, Department of Mental Health, Mental Health Center of Perugia, Italy
[95] Glasgow University, Institute of Neuroscience and Psychology, College of Medicine, Vet and Life Science, Glasgow, United Kingdom
[96] Medical University of Białystok, Department of Infectious Diseases and Neuroinfections, Poland
[97] Sanprobi Sp. z o.o. Sp. k, Poland
[98] Pomeranian Medical University in Szczecin, Department of Psychiatry, Szczecin, Poland
[99] University of Białystok, Institute of Sociology, Society and Cognition Unit, Białystok, Poland
[100] Pomeranian Medical University in Szczecin, Department of Gastroenterology, Szczecin, Poland
[101] The Centre for Digestive Diseases Endoklinika, Szczecin, Poland
[102] King's College London, London, United Kingdom
[103] University of Manchester, Division of Psychology and Mental Health, Manchester, United Kingdom
[104] Bristol Medical School, University of Bristol, Bristol, United Kingdom
[105] Istanbul Topkapı University, Istanbul, Turkey101Adnan Menderes University Department of Child and Adolescent Psychiatry, Aydın, Turkey
[106] Uskudar University, Department of Psychiatry and Psychology, Istanbul, Turkey
[107] Griffith University, South East Queensland, Australia
[108] Mindgardens Neuroscience Network, Sydney, Australia
[109] Deakin University School of Medicine, Victoria, Australia
[110] UNSW Sydney, School of Clinical Medicine, Discipline of Psychiatry & Mental Health, Sydney, Australia
[111] University of Medicine and Pharmacy Grigore T. Popa, Faculty of Medicine, Iasi, Romania
[112] Institute of Psychiatry "Socola", Iasi, Romania
[113] Transilvania University of Brasov, Faculty of Medicine, Brasov, Romania
[114] Emergency Hospital "Nicolae Oblu", Iasi, Romania
[115] Psychiatry Department, University of Medicine and Pharmacy "Carol Davila" Bucharest, "Prof. Dr. Alexandru Obregia" Psychiatric Hospital, Bucharest, Romania
[116] Amsterdam University Medical Centers (location AMC), Department of Psychiatry, Amsterdam, the Netherlands
[117] University Medical Center Groningen, Antoni Deusinglaan 2, room 117, Groningen, Netherlands
[118] Utrecht University Medical Centre, Department of Psychiatry, Utrecht, the Netherlands

[119] Maastricht University, Department of Psychiatry and Neuropsychology, Maastricht, the Netherlands
[120] Department of Psychiatry and Behavioral Medicine, Carilion Clinic Virginia Tech Carilion School of Medicine, Roanoke, VA, USA
[121] China Medical University Beigang Hospital, Division of Psychiatry, Department of Internal Medicine, Taiwan
[122] Shenzhen University, School of Psychology, Shenzhen, China
[123] Peking University Institute of Mental Health, Department of Public Mental Health, Pekin, China
[124] UCLouvain, Institute of Neuroscience and Cliniques Universitaires Saint-Luc, Department of Adult Psychiatry, Brussels, Belgium
[125] Cliniques Universitaires Saint-Luc, Department of Adult Psychiatry, Brussels, Belgium
[126] Katholieke Universiteit Leuven (KU Leuven), Department of Neurosciences, Leuven, Belgium
[127] Asociación Psiquiátrica Mexicana, Mexico
[128] University of Minho, Life and Health Sciences Research Institute (ICVS), School of Medicine, Braga, Portugal
[129] ICVS/3B's - PT Government Associate Laboratory, Braga/Guimarães, Portugal
[130] Lisbon's Psychiatric Hospital Centre, Department of Psychiatry, Portugal
[131] Belarusian Medical Academy of Postgraduate Education, Belarus
[132] Clienia AG, Wetzikon Psychiatric Centre, Switzerland
[133] University Hospital of Psychiatry Zurich, Clinic for Child and Adolescent Psychiatry and Psychotherapy, Switzerland
[134] Kyambogo University, Department of Sociology and Social Administration, Kampala, Uganda
[135] Stanford University, Department of Psychology, CA, USA
[136] Universitäre Psychiatrische Kliniken Basel (UPK), Center of Affective, Stress and Sleep Disorders (ZASS), Basel, Switzerland
[137] Department of Psychiatry and Clinical Psychology, Mashhad University of Medical Sciences, Mashhad, Iran
[138] Kermanshah University of Medical Sciences, Medical Biology Research Center, Kermanshah, Iran
[139] Kharazmi University, Tehran, Iran
[140] University of Basel, Department of Sport, Exercise, and Health, Division of Sport Science and Psychosocial Health, Basel, Switzerland
[141] Kermanshah University of Medical Sciences, Substance Abuse Prevention Research Center, Kermanshah, Iran
[142] Kermanshah University of Medical Sciences, Sleep Disorders Research Center, Kermanshah, Iran
[143] Tehran University of Medical Sciences, School of Medicine, Tehran, Iran
[144] Center for Disaster Psychiatry and Disaster Psychology, Psychiatric Clinics of the University of Basel, Basel, Switzerland
[145] Pontificia Universidad Católica de Chile, Department of Psychiatry, School of Medicine, Santiago, Chile
[146] University of Kragujevac, Department of Psychiatry, Faculty of Medical Sciences, Kragujevac, Serbia
[147] University of Antioquia, Department of Psychiatry, Medellín, Colombia
[148] Nous Therapy Center, 1st Aggelaki str, Thessaloniki, 54636, Greece
[149] Jubilee Mission Medical College & Research Institute, Thrissur, India
[150] Pushpagiri Institute of Medical Sciences, Department of Psychiatry, Thiruvalla, Kerala, India
[151] Chairman, Pakistan Psychiatric Research Centre-Fountain House, Lahore, Pakistan
[152] Dean, Faculty of Psychiatry, College of Physicians and Surgeons, Pakistan
[153] Dean, Jinnah Postgraduate Medical Centre, Karachi, Pakistan
[154] Dean, Faculty of Medicine, Jinnah Sindh Medical University, Karachi, Pakistan
[155] Tees Esk & Wear Valleys NHS Foundation Trust, UK
[156] Essex Partnership University NHS Foundation Trust, UK
[157] UC San Diego, CA, USA
[158] University of British Columbia, Vancouver, Canada
[159] Department of Cancer Epidemiology and Prevention Research, Cancer Care Alberta, Alberta Health Services, Calgary, Canada
[160] Departments of Oncology and Community Health Sciences, University of Calgary, Calgary, Canada
[161] Okasha Institute of Psychiatry, Faculty of Medicine, Ain Shams University, Cairo, Egypt
[162] Oran 1 University, Department of Psychiatry-Addictology, Oran, Algeria
[163] Karolinska Institutet, Centre for Psychiatric Research and Education, Department of Clinical Neuroscience, Stockholm, Sweden
[164] University of Eastern Finland, Department of Forensic Psychiatry, Niuvanniemi Hospital, Kuopio, Finland
[165] Yonsei University College of Medicine, Department of Pediatrics, Seoul, South Korea
[166] Yonsei University, Wonju College of Medicine, Department of Psychiatry, Wonju, South Korea
[167] University of Monastir, Faculty of Medicine of Monastir, Research Unit "Vulnerability to Mental Disorders" LR05ES10, Monastir, Tunisia
[168] Republican Scientific and Practical Center of Mental Health, Almaty, Kazakhstan
[169] Gaza Community Mental Health Programme, Gaza, Palestine
[170] Sheba Medical Center, Israel
[171] The Feinstein Institute for Medical Research, Center for Psychiatric Neuroscience, Manhasset, NY, USA
[172] German Center for Mental Health (DZPG), partner site Berlin, Berlin, Germany
[173] German Center for Child and Adolescent Health (DZKJ), partner site Berlin, Berlin, Germany
[174] Einstein Center for Population Diversity (ECPD), Berlin, Germany

ARTICLE INFO

Keywords:
COVID-19
WHO-5
Children
Mental health
Pandemic
Psychiatry
Survey
Well-being

ABSTRACT

Few multinational studies have assessed risk factors and coping strategies associated with the impact of the COVID-19 pandemic on children's mental health over time. The Collaborative Outcomes study on Health and Functioning during Infection Times (COH-FIT) is the largest transcontinental, multi-wave, cross-sectional survey collecting multi-nation data on well-being and psychopathology during the pandemic. We analyzed country-specific, general-population-based, representative COH-FIT data of 6067 children aged 6–13 years from 12 countries across repeated cross-sectional waves over a period of >2 years (Apr/2020–May/2022), addressing through current and retrospective assessment pre- to intra-pandemic changes in well-being (WHO-5) and general psychopathology scores (P_c) (0–100) in relation to COVID-related deaths, stringency index, eight a priori risk factors, and 16 coping strategies in different responders at each wave. From pre- to intra-pandemic, WHO-5 scores decreased (−4.59, 95 %CI=−6.18 to −2.99, $p < 0.001$), while PC-scores increased (+6.68, 95 % CI=4.48–8.88, $p < 0.001$) significantly, following distinct time patterns but both returning to near pre-pandemic levels. Changes in both scores varied by country. WHO-5 scores correlated strongly with P_C and subdomain scores. Both score changes were significantly but minimally associated to COVID-19 deaths/stringency index. The proportion of children screening positive for depression increased from 3.9 % to 8.3 % (χ^2=145.70, $p <$

[#] Equal contribution (Joint first authors).

0.001) and for major depression from 0.6 % to 2.2 % (χ^2=68.64, $p < 0.001$) intrapandemic. WHO-5 and P_C-score changes were significantly associated with female gender, school closure, and pre-existing physical and mental conditions, with cumulative effects. The five most frequently endorsed coping strategies were family contact (85.2 %), friends (67.3 %), outdoor play (54.0 %), pet interaction (51.5 %), and internet use (50.9 %). Identified risk groups and coping strategies can inform targeted interventions and global public health policy.

Trial Registration: ClinicalTrials.gov; Identifier: NCT04383470

1. Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic emerged as a global crisis with unprecedented ramifications transcending geographical, cultural, and socioeconomic boundaries (Fauci et al., 2020). Apart from its public-health-related toll, the related restrictive measures posed immense challenges to every personal, societal, economical and professional aspect of life worldwide, especially in certain risk subgroups (GBD Demographics Collaborators, 2024). Children represent a particularly vulnerable societal group that requires special consideration (Singh et al., 2020), due to several age-specific biological and psychosocial risk factors. Children are particularly vulnerable to neurodevelopmental disruption due to the combination of a heightened biological plasticity and altered stress-response system reactivity during this critical developmental phase (Agorastos et al., 2019, 2018) together with increased exposure to subjective stress, dependency on social interactions, familial stressors (e.g., higher parental stress among preschoolers), undiagnosed neurodiversity concerns, restricted access to social and educational activities or entertainment, and limited coping abilities (Loades et al., 2020; Marques de Miranda et al., 2020; Samji et al., 2022; Tso et al., 2022), as well as specific pandemic-related stressors, such as social and physical activity disruptions, reduced access to supportive services, and unsupervised use of electronic media. Moreover, over 50 % of those with a mental disorder develop it by age 18 (Solmi et al., 2022c).

Since the beginning of the pandemic, a growing body of high-quality, cohort-based research has examined its impact on children's mental health. Recent meta-analytic evidence suggests a moderate detrimental pandemic influence on mental health of children around the world, with higher prevalences of emotional and behavioral problems than pre-pandemic (Dragioti et al., 2022; Jing et al., 2024; Miao et al., 2023), especially in children of specific risk groups [e.g., pre-existing somatic conditions (Vasquez et al., 2020) and mental health problems (Cortese et al., 2020)]. A large meta-analysis of 53 longitudinal cohort studies from 12 countries including 40,807 children and adolescents identified additional risk factors, including female gender, low income-class and lower socioeconomic country of residence (Madigan et al., 2023). Families with children at risk struggled even harder to cope with pandemic-related restrictions on top of additional child-related obstacles affecting daily routines (e.g., home schooling) (Becker et al., 2020).

However, mental health studies in children often resulted in mixed or even contradictory findings, due to high cross-study heterogeneity of study design, setting, outcomes, assessment tools, timing, geographical and cultural factors (Dragioti et al., 2022). Most studies have important limitations, such as a focus on isolated psychopathology domains, small sample sizes, data collection restricted to one country/language or population subgroup, combined reporting of children/adolescents as well as non-representative sampling (Dragioti et al., 2022). Moreover, most studies are either cross-sectional, single time-point studies or longitudinal studies that did not account for variation in COVID-related parameters (e.g., death rates, restrictive measures) over time. These facts limit the generalizability of many findings, posing methodological barriers to the synthesis of current evidence. Although the large meta-analysis of Madigan et al. offers some comparison and evidence on international variations in psychopathology in children and adolescents (Madigan et al., 2023), no individual study has offered simultaneous transcontinental assessments. Finally, most studies focused on psychopathology only, neglecting the important area of helpful coping strategies.

The "Collaborative Outcomes study on Health and Functioning during Infection Times" (COH-FIT) is the largest international, multi-language (30 languages) online study worldwide measuring the impact of COVID-19 pandemic on health and functioning in representative and weighted, convenience samples of adults, adolescents, and children across 5 continents over a period of >2 years, cross-sectionally assessing different responders in different waves (Solmi et al., 2022a, b). Leveraging current, intra-pandemic and retrospective, pre-pandemic COH-FIT data of minors, this report aims to provide comprehensive transcontinental insights into mental health trajectories amidst the evolving pandemic landscape in children. COH-FIT results on adults (Solmi et al., 2024a, 2024c) and adolescents (Solmi et al., 2024b) have been previously published, as well as the validation of both a composite psychopathology P-score and the multi-language translation (Solmi et al., 2023). In this article, we report nationally representative global and country-related findings on pre- to intra-pandemic changes in well-being and overall psychopathology in children over a period of >2 years, hypothesizing worsened well-being and increased psychopathology globally, enhanced impairment in vulnerable subgroups with cumulative effects across multiple risk factors, and a negative relationship to current death rates and stringency measures over time. We also report on the subjectively endorsed coping strategies for dealing with the pandemic.

2. Experimental procedures

2.1. Study design

The COH-FIT design has been described in detail previously (Solmi et al., 2022a, b). This article presents an analysis of COH-FIT Children (COH-FIT-C) data in association to COVID-related deaths, stringency measures and several other related factors, from a large, transcontinental, representative child sample (age: 6–13 years) collected over a period of >2 years from 12 different countries (Table 1). Nationally representative data were collected cross-sectionally through polling institutes at distinct wave periods, including different participants at each wave (Suppl. Methods). Each child participated at one time point, but reported through current and retrospective assessment on intra- and pre-pandemic well-being and other data, enabling reconstruction of pre- vs. intra-pandemic differences.

2.2. COH-FIT questionnaire for children

For children, the COH-FIT-C, a condensed content survey instrument (compared to the adult/adolescent version) with developmentally appropriate language was applied after parental consent, as previously described (Solmi et al., 2022b) (see also Suppl. Methods, Table S1).

2.3. Primary and secondary outcomes

The two co-primary outcomes were the pre- to intra-pandemic changes in overall well-being [assessed by the World Health Organization 5-item Well-being Questionnaire, WHO-5 (Topp et al., 2015)], and general psychopathology (assessed by a four-dimensional composite psychopathology score, P_C-Score). For details on the P_C-Score

Table 1
Basic (raw/unweighted) participant characteristics.

Variable	Value	N	%
Age	6	112	1.8
	7	156	2.6
	8	126	2.1
	9	126	2.1
	10	1627	26.8
	11	1399	23.1
	12	1324	21.8
	13	1197	19.7
Gender	Boy	3308	54.5
	Girl	2753	45.4
	Other	6	0.1
Income Country Classification	High income	5345	88.1
	Middle income	722	11.9
	Low income	0	0.0
Stringency index	0–24	600	9.9
	25–49	1403	23.1
	50–74	3032	50.0
	75–100	1032	17.0
COVID-19-related loss	No	5620	92.6
	Yes	447	7.4
	Not reported	0	0.0
Month of survey completion	Apr-2020	268	4.4
	Jul-2020	2	0.0
	Oct - Nov 2020	1811	29.9
	Jan 2021	513	8.5
	Apr 2021	899	14.8
	Jun - Jul 2021	216	3.6
	Sept - Oct 2021	33	0.5
	Jan - Febr 2022	560	9.2
	Mar - May 2022	1765	29.1

development, see Suppl. Methods. Secondary outcomes were the subjective effectiveness of 16 specific coping strategies to deal with the pandemic. Covariates were selected risk factors, time-/country-specific COVID-related daily deaths and stringency measures.

2.4. Risk factors

Eight risk factors for poor well-being and mental health in children were selected *a priori* based on clinical judgement, available COH-FIT-C questionnaire items, prior publications (Solmi et al., 2024a,b,c) and targeted literature review (Panchal et al., 2023; Samji et al., 2022; Singh et al., 2020): COVID-19 positive test status, COVID-19-related loss, female gender, school closure, pre-existing physical condition, pre-existing mental disorder, low country income and immigrant status. Low country income was excluded as a risk factor, as this did not apply to the assessed countries.

2.5. Coping strategies

Sixteen specific coping strategies were identified *a priori* based on clinical judgment, prior publications (Solmi et al., 2024a, 2024b, 2024c), and a targeted literature review (Cauberghe et al., 2022; Raudenska et al., 2023; Solmi et al., 2020) and were ranked by the respondents by importance (very/somewhat/not) for successfully dealing with the pandemic: internet use, sport/exercise, school work/home schooling, watching TV, contact with family, contact with friends, playing outside, walking outside, playing inside, spending time with pet, listening to music, hobby/playing instrument, gaming, reading, COVID-related information, religion/meditation/spirituality, and "other".

2.6. COVID-19-related deaths and restrictive measures

Time-/region-specific COVID-related daily deaths, as well as a country-specific stringency index for restrictive measures were considered as provided from the Johns Hopkins University repository (https://coronavirus.jhu.edu/data) and the University of Oxford stringency metric (https://covidtracker.bsg.ox.ac.uk/), providing country-specific current daily ratings for severity of government-imposed restrictions (0–100) based on nine comprehensive metrics (e.g., school closures, facial coverings). All reporting followed the Consensus-Based Checklist for Reporting of Survey Studies (CROSS) eChecklist (Sharma et al., 2021).

2.7. P_C-score validation

The P-score has been previously validated in adults/adolescents as a five-dimensional factor of overall psychopathology (Solmi et al., 2023). Here, we performed an internal psychometric validation of the slightly modified, four-dimensional P_C-score in children following same structure and based on the same items as the validated P-score in adults/adolescents (excluding the psychosis item): anxiety, depression, posttraumatic and psychophysiologic symptoms (sleep, concentration difficulties, stress). Further details on P_C-score's structure and validation are described in Suppl. Methods.

2.8. Data analysis

For this paper, only nationally-representative data of at least 250 children aged 6–12 years old per country/wave, collected by standardized procedures of CAWI interviews by professional polling agencies and with a strict missingness and outlier threshold were included in further analyses (Suppl. Methods). Missing data input handling is described also in Suppl. Methods. WHO-5 and P_C scores were both rated on a visual analog scale (VAS) 0–100, with higher values indicating better well-being and poorer mental health, respectively. Each rating was matched with the respective daily country-specific stringency index and COVID-related death rate data. Descriptive time trends in well-being and P_C-score changes were explored with cubic regression splines (Suppl. Methods). Pre- vs. intra-pandemic outcome changes across time were examined through mixed-effects linear regression including country as a random-effect, as time impact across different nations is likely to vary, with sampling weights applied to correct for any minor imbalances across gender. We have also computed binary WHO-5 variables based on two clinical thresholds (<50 and <29 points), indicative of depression screening and clinical major depression accordingly (Topp et al., 2015). Paired *t*-test and McNemar's χ^2 test were used to compare pre- to intra-pandemic WHO-5/P_C raw score changes and category proportion changes with WHO-5 score <50/<29, respectively. A correlation analysis among co-primary outcomes was conducted. Independent *t*-tests were used to measure pre vs. intra-pandemic changes in subjects with vs. without each risk factor. An *a priori* derived cumulative risk score (sum of at-risk group memberships which each participant was identified to belong to; 0–8) was used to assess the effect of multiple concomitant risk factors on WHO-5/P_C-scores by regression analyses. Recall bias was assessed by examining associations between pre-pandemic ratings and time-interval between pre-pandemic baseline and time of survey administration, through polynomial regression analyses assessing any linear or quadratic trends (Suppl. Methods). R was used for all analyses, using the *MICE* (van Buuren and Groothuis-Oudshoorn, 2011), *ggplot2* (Wickham, 2016), *psych* (Revelle and Revelle, 2015) and *lavaan* (Lavaan, 2012) packages. Statistical significance was set at $p < 0.05$ (two-sided). We followed the EQUATOR reporting guidelines for observational studies (STROBE checklist for cross-sectional studies) (von Elm et al., 2007).

3. Results

3.1. Survey sample

Between April 27th, 2020 and May 30th, 2022, valid country-representative survey responses were collected from 6067 children

(mean age: 11.1 ± 1.6 years; range: 6–13; gender distribution: 45.4 % girls). General participant characteristics are provided in Table 1 and country-specific results in Suppl. Results. For data screening/missingness and recall bias analyses see Suppl. Results and Figure S1.

3.2. P_C-score model structure and psychometrics

Results of model testing are presented in Suppl. Results, Figure S2 and Table S2. The second-order and correlated-factors model both met established model fit thresholds, with the first exhibiting marginally more favorable fit indices for RMSEA and BIC. All factor-item loadings except for one were >0.70 (Figure S2) demonstrating good convergent validity. The General Factor-subdomain loadings ranged from 0.83–0.93 indicating a strong degree of commonality in males and females (Table S3). Reliability was high for both the total P_C-score (ω=0.94) and separate subdomains (ω=0.85-0.88) (Table S4). Measure invariance was satisfactory across different country, language and gender groups (Suppl. Results, Table S5). WHO-5 and P_C-scores showed moderate correlations for both the overall (r=- 0.46, $p < 0.001$) and the domain scores (r =−0.30 to −0.52, $p < 0.001$) respectively (Table S6).

3.3. Changes in well-being

Weighted mixed-effects regression analyses indicated an overall decrease (worsening) in WHO-5 well-being during the pandemic of 4.59 (95 % CI: 2.99–6.18) points ($t = 5.85$, $p < 0.001$) from a pre-pandemic baseline of 81.66 (standardized mean difference, SMD=0.28) (Figure S3) The proportion of children scoring WHO-5 < 50 increased from 3.9 % pre-pandemic to 8.3 % intra-pandemic (χ^2=145.70, $N = 6067$, $p < 0.001$), while the proportion of children scoring WHO-5 < 29 increased from 0.6 % pre-pandemic to 2.2 % intra-pandemic (χ^2=68.64, $N = 6067$, $p < 0.001$). The random-effects intercept term showed a WHO-5 score change magnitude variation across countries (SD=2.64) (Figure S5). Follow-up individual country-wide comparisons indicated significant worsening in all assessed countries, except Canada, Russia and USA (Table 2).

3.4. Changes in P_C-score

The P_C-score increased (worsened) by 6.68 (95 % CI 4.48–8.88) points ($t = 5.96$, $p < 0.001$) from the pre-pandemic baseline of 33.67 (SMD=0.28) (Figure S4), with a notable variation in P_C-score change size (SD=3.80) across countries (Figure S6). Individual country-wide comparisons indicated significant worsening of psychopathology in all countries except France and Canada (Table 2). Additionally, the proportion of children, whose P_C-scores increased relative to pre-pandemic levels by at least 20 %, 30 %, 40 % and 50 % were 46 %, 40 %, 35 % and 32 %, respectively.

3.5. Change trajectories in well-being, P_C-score, COVID-19 deaths and restrictions

Fig. 2 shows regression splines fitted to WHO-5 scores [$F = 21.03$, $p < 0.001$] and P_C-scores [$F = 10.04$, $p < 0.001$] across time, along with daily stringency index and COVID-related death rates rescaled to a similar metric to facilitate visual comparison. The WHO-5 score appeared to be relatively stable in the first survey phase, followed by a distinct fall between Dec 2020 and April 2021 and a subsequent continuous improvement towards normalization at survey end (June 2022) (Fig. 1A). The P_C-score showed a different pattern with subsequent sharp rises and falls, and a final improvement towards normalization at survey end (Fig. 1B). There was a very small but significant association of WHO-5 score changes with COVID-related deaths (r=−0.06, $p < 0.001$) and stringency index (r=−0.11, $p < 0.001$), respectively. P_C-score changes correlated significantly only with the stringency index (r=- 0.04, $p < 0.001$) but not with COVID-related deaths ($r = 0.00$, $p = 0.937$).

Table 2
Changes in well-being (WHO-5) and overall psychopathology (P_C-score) in children across countries, sorted by magnitude of change.

Country		Pre-pandemic		Intra-pandemic		Weighted change	
	N	M	SD	M	SD	M	p
	WHO-5 score						
Germany	771	80.89	15.88	72.68	21.04	−8.22	<0.001
Poland	391	83.49	14.04	75.53	19.50	−7.96	<0.001
Brazil	504	84.14	15.26	77.48	19.65	−6.61	<0.001
Greece	242	77.53	20.82	71.27	21.32	−6.26	0.001
France	246	80.59	16.54	75.09	18.43	−5.51	0.001
United Kingdom	585	78.58	15.19	73.24	18.75	−5.38	<0.001
Austria	532	83.12	15.22	78.45	18.43	−4.67	<0.001
Spain	1250	83.21	14.47	78.89	16.18	−4.39	<0.001
Italy	488	82.38	14.07	78.12	16.82	−4.27	<0.001
United States of America	515	77.57	18.37	76.78	17.98	−0.92	0.415
Canada	325	81.43	14.80	80.93	14.82	−0.49	0.671
Russia	218	85.51	14.42	85.34	14.70	−0.17	0.904
	P_C-score						
Brazil	504	33.95	23.16	46.62	23.11	12.66	<0.001
Poland	391	33.50	21.35	44.63	22.43	11.13	<0.001
Russia	218	19.88	19.76	30.11	20.24	10.23	<0.001
Germany	771	26.32	21.39	35.75	23.50	9.44	<0.001
Austria	532	24.95	21.78	33.15	22.18	8.21	<0.001
Greece	242	35.92	20.95	42.28	20.87	6.36	0.001
United Kingdom	585	33.56	22.02	39.80	24.14	6.33	<0.001
Italy	488	34.10	20.88	39.90	22.62	5.82	<0.001
Spain	1250	35.16	21.72	40.12	22.69	5.13	<0.001
United States of America	515	55.60	27.35	59.33	26.67	3.79	0.024
France	246	37.26	20.64	38.37	23.51	1.17	0.559
Canada	325	29.14	21.47	28.90	21.57	−0.24	0.888

3.6. Risk factors

Following risk factors were statistically significantly associated with greater reductions of WHO-5 scores intra- vs. pre-pandemic: female gender, school closure, pre-existing mental disorder, and pre-existing physical condition (Fig. 2, Table S7). Following risk factors were statistically significantly associated with greater increases of P_C scores intra- vs. pre-pandemic: COVID-19 positive test status, female gender, school closure, pre-existing mental disorder and pre-existing physical condition. Presence of more concomitant risk factors was associated in regression analyses with larger decreases in WHO-5 well-being (β=−0.07, $p < 0.001$) and greater increases in P_C-scores (β=0.09, $p < 0.001$).

3.7. Coping strategies

The five coping strategies most frequently rated as “very important” to deal with the COVID-19 pandemic were: “contact with family” (85.2 %), “contact with friends” (67.3 %), “playing outside” (54.0 %), “spending time with pet” (51.5 %) and “internet use” (50.9 %) (Fig. 3, Table S8).

4. Discussion

COH-FIT-C aimed to comprehensively capture the global impact of the COVID-19 pandemic on well-being and overall mental health in children, aged 6–13, continuously over 2 years from its beginning and to identify significant risk factors and subjectively-rated helpful coping strategies. To the best of our knowledge, this is the first transcontinental study to simultaneously assess pre- to intra-pandemic changes in well-being and overall psychopathology, as well as coping strategies, in such a large representative sample of children in 12 countries around the

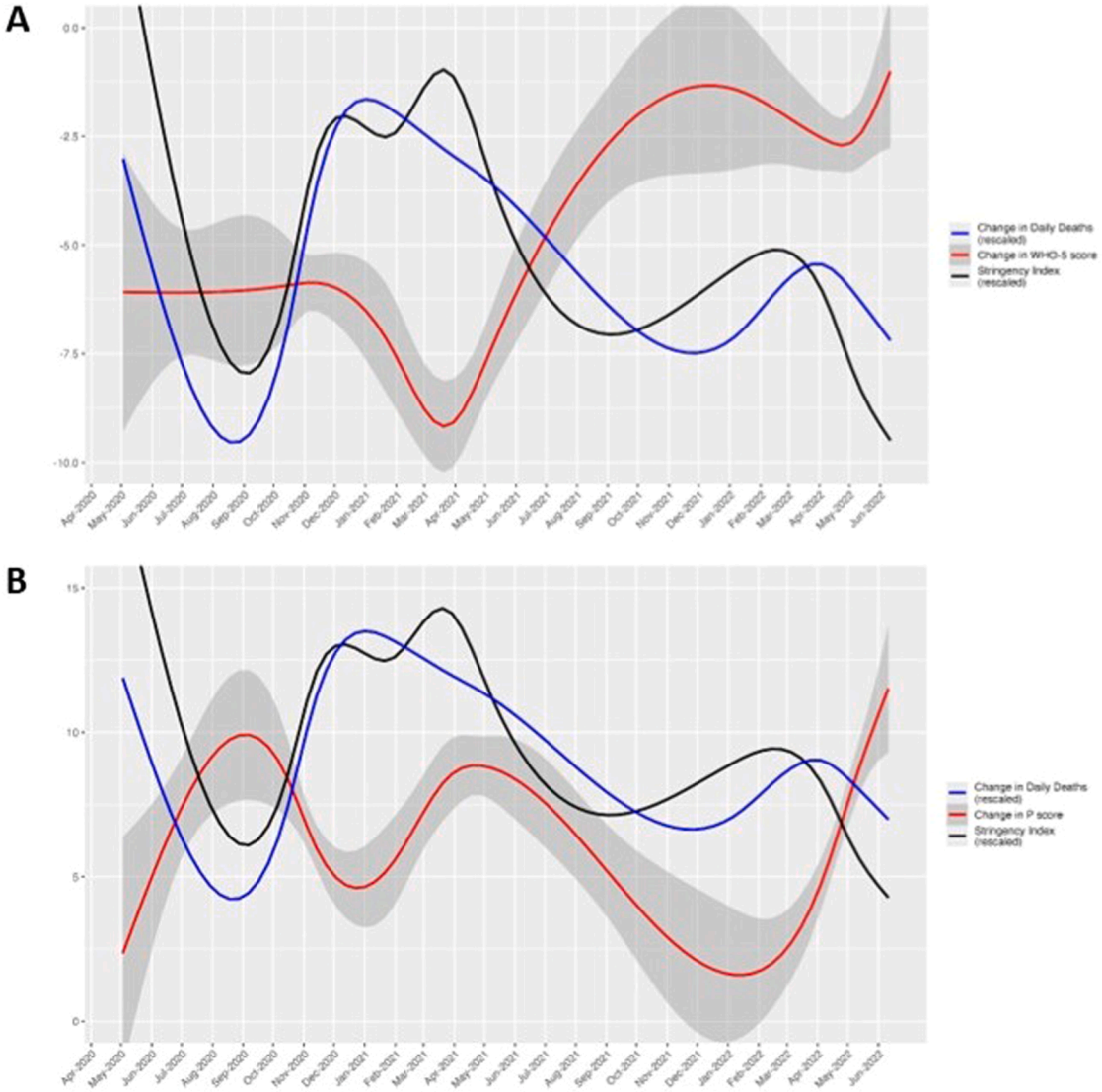


Fig. 1. Trajectory of change in (A) WHO-5 well-being score and (B) composite overall psychopathology P_C-score, stringency index and COVID-related daily death rate in children.
Legend: Stringency and daily death rate rescaled to same metric as WHO/Pc-score outcome to facilitate comparison.

world for >2 years. First, we validated the four-dimensional P_C-score of overall psychopathology in children, showing a good fit and very satisfactory psychometric properties. P_C total and its domain scores, showed highly significant negative associations with the WHO-5 total score, as did the five-dimensional P-scores in prior COH-FIT reports in adults (Solmi et al., 2023) and adolescents (Solmi et al., 2024b), suggesting a very similar psychometric structure.

Our main results suggested an overall pre- to intra-pandemic worsening in both well-being and overall psychopathology, yet heterogeneously across risk factor subgroups and countries. Regression splines revealed that WHO-5 and P_C-score reacted differently over time, both showing only a small association to stringency index and COVID-related death rates. However, both the WHO-5 and P_C-score showed an improvement towards normalization to pre-pandemic levels by summer 2022. These findings are in accordance with our previously published COH-FIT findings in 8115 adolescents (Solmi et al., 2024b), where very similar patterns emerged, as well as with meta-analytic evidence from longitudinal studies in children suggesting a distinct decline in mental health around April/May 2020, which subsequently normalized (Deng et al., 2023; Miao et al., 2023). However, previously conducted and meta-analyzed studies employed less comprehensive assessments than included in this study (using both WHO-5 and the 4-factor, 6-item P_C-score), and did not extensively assess risk factors or detailed temporal relationships with stringency of imposed restrictions or COVID-death rates.

Consistent with previous meta-analyses in children/adolescents (Deng et al., 2023; Miao et al., 2023), we found an overall deterioration of well-being and psychopathology across many countries, but not in all. Children's well-being did not significantly worsen in Canada, Russia, and USA, while no significant increases in P_C-score were apparent in Canada and France. These findings could rely on several different possible reasons, such as specific measures/policies, geographic distribution, time of data collection, cultural reporting biases, unmeasured factors, etc. Interestingly, these country-specific results in children were very similar with our prior results in adolescents (Solmi et al., 2024b), suggesting country-based/cultural differences or data collection effects rather than young age effects on response reliability.

While well-being and psychopathology deterioration in our whole sample featured small effect sizes consistent with previous findings in adolescents (Dragioti et al., 2022; Jing et al., 2024; Miao et al., 2023), specific subgroups showed particularly distinct pre- to intra-pandemic differences. A larger degree of both well-being and P_C-score

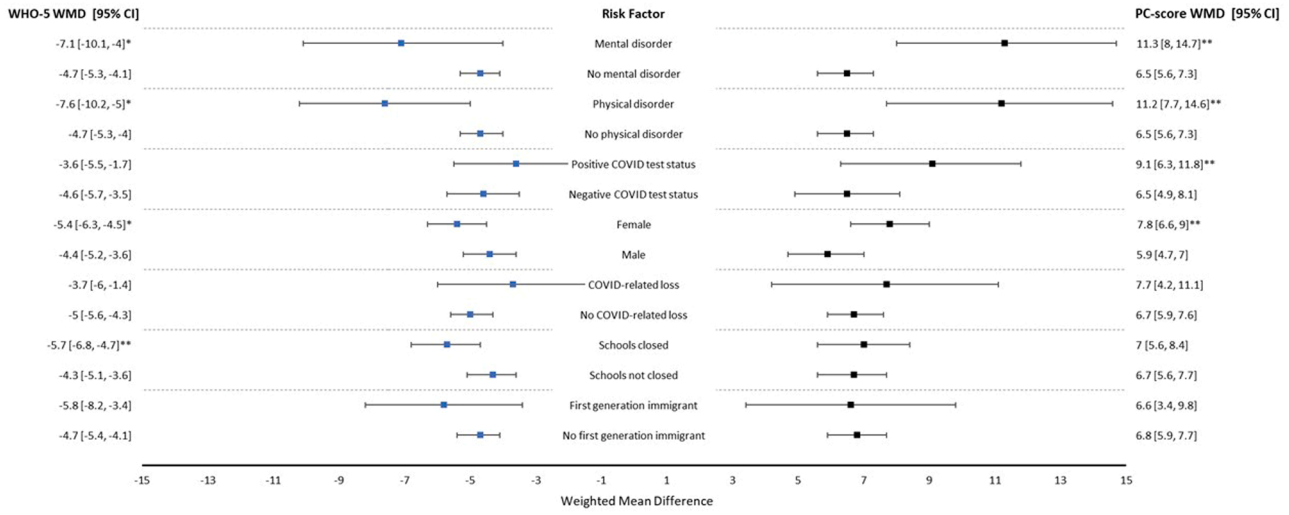


Fig. 2. Forest plot of changes in WHO-5 well-being and PC-scores across risk groups in children.
Legend: WMD: weighted mean difference. *, $p < 0.05$, significant difference with vs. without risk factor; ** $p < 0.001$, significant difference with vs. without risk factor.

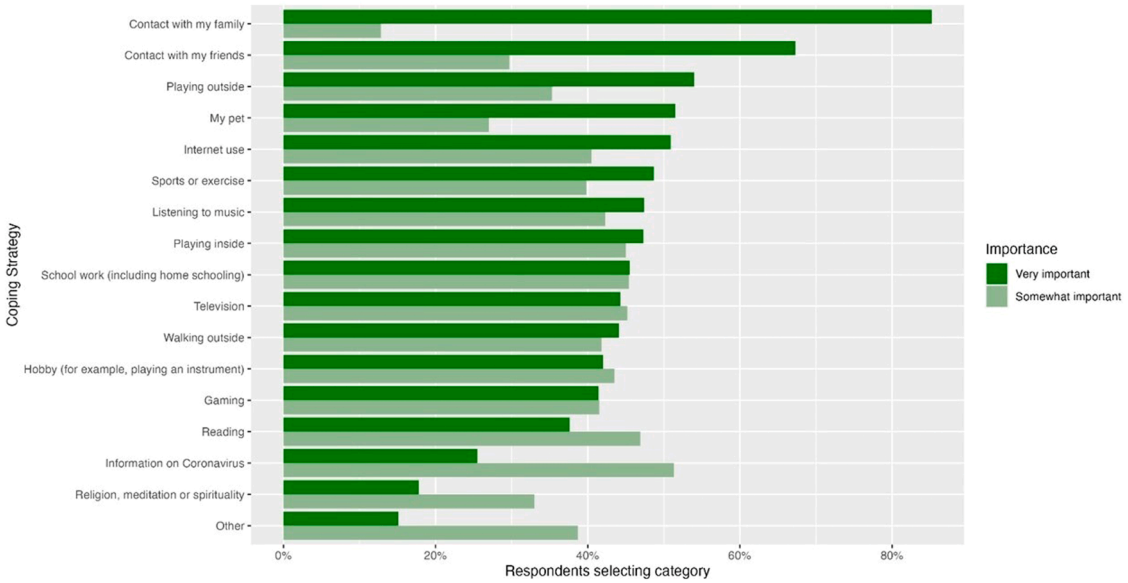


Fig. 3. Most important coping strategies during COVID-19 pandemic in children.

deterioration was significantly associated with female gender, school closure, pre-existing physical condition and pre-existing mental disorder. P_C-score changes were additionally associated to COVID-19 positive test status, while COVID-related loss and immigrant status were not associated with higher risk. These findings show several similarities to our findings in adolescents (Solmi et al., 2024b), but are of overall lower magnitude to our findings in adults (Solmi et al., 2023), which may partly rely on insufficient capturing of well-being in children by WHO-5 items, which are mainly related to depressed mood. Concomitant presence of multiple risk factors was associated with larger deterioration in well-being and psychopathology, similarly to our previously published findings in adolescents (Solmi et al., 2024b) and relevant prior literature (Samji et al., 2022; Theberath et al., 2022). These child risk groups should be considered by clinicians and governmental policies when allocating resources to protect mental health (Arrondo et al., 2022), while children with multiple risk factors should be prioritized. Additionally, our results suggest that school closures seem to affect only well-being but not psychopathology, although its precise impact likely depends on exact timing and duration, among other factors (Christie et al., 2022). Finally, results on coping suggest that the subjectively as "most important" rated strategies in children are mainly focused inside the bounds of the family, in contrast to the ones previously reported in adolescents (Solmi et al., 2024b), where internet use, social contacts and exercise were rated as most important/helpful.

COH-FIT-C has several strengths that compensate limitations of other studies (Dragioti et al., 2022; Newlove-Delgado et al., 2023). First, the vast majority of similar studies (94 %) were based on convenience samples (Newlove-Delgado et al., 2023), introducing significant selection bias (Pierce et al., 2021), while COH-FIT-C relies only on country-representative sampling. Second, most previous studies in children/adolescents have focused overwhelmingly on isolated domains of psychopathology (e.g., internalizing behaviors), while COH-FIT-C assessed overall well-being, four-dimensional psychopathology and preferred coping strategies. Third, contrary to most studies based in one/few countries, COH-FIT-C's transcontinental results provide a unique overview on well-being and psychopathology changes across 12

countries, finding mostly consistent, but also divergent results. Fourth, most previous reports have not accounted for local death rates or extent of restrictive policies. Our data suggest a small but significant association of well-being changes with COVID-related deaths and stringency index, while P_C-score changes were slightly associated with COVID-related deaths, but not stringency index, similar to our adolescent findings (Solmi et al., 2024b). Fifth, most previous children surveys investigated either relatively small samples, mixed samples with adolescents, or only brief time periods. Our large sample size of 6067 children with data covering >2 years, allowed not only the detection of pre- to intra-pandemic changes and exploration of temporal trends early in the pandemic's course, but also the investigation of specific risk--factors' impact on main outcomes across time. Sixth, our study did not use parental ratings of child well-being and behavior as many others, but instead focused on self-ratings in children-appropriate language.

Notwithstanding the above strengths of our study, a number of limitations should be mentioned. As our findings are based on repeated cross-sectional rather than longitudinal data, they do not capture changes over time directly. However, the pattern of changes observed in our study is consistent with large-scale meta-analytic evidence from longitudinal data (Deng et al., 2023; Miao et al., 2023; Salanti et al., 2022). The retrospective pre-pandemic rating represents another limitation *per se and* may introduce systematic recall bias, associated with over- or underestimation of findings, although no relevant drift in the retrospective recall of pre-pandemic WHO-5 or P_C-score was detected. In addition, mood-congruent recall bias cannot be ruled out, especially through same-session assessment of pre- and intra-pandemic ratings, whereby children experiencing poorer current well-being may retrospectively evaluate the pre-pandemic period less positively. Moreover, the data were collected in waves and not continuously, while not all countries could be addressed at the same time or with the same number of waves due to differences in local feasibility, ethics approval timelines or available funding and resources, leading to uneven temporal coverage across nations. Country-specific results may, thus, have been influenced by wave design and time of data collection, which additionally influence cross-country comparability and generalizability, noting that countries with fewer waves contribute less temporal resolution, while it is also important to note that no low-income countries were included in the representative data collection, affecting global representativeness. Additionally, cultural differences exist across countries which might also partially explain differences in the results. While we acknowledge language is different from culture to culture and that subtle cultural response tendencies can never be fully excluded in large multinational surveys, our extensive translation processes by native-speaking experts, as well as the multiple questionnaire validation and invariance testing across countries and languages substantially reduces the likelihood that such factors materially influenced our observed findings. Finally, digital barriers could have precluded a larger participation of child populations.

Despite these limitations, COH-FIT-C provides long-term, transcontinental representative data on the mental health impact of the pandemic in children across 12 countries during 2 years of the pandemic. Our unique data on the influence of stringency measures, COVID-related deaths and specific risk factors on overall well-being and general psychopathology, as well as on favorable coping strategies in children can guide individuals, clinicians and public health policies towards better mental health prevention strategies in the event of future pandemics/other crises, tailored to the needs of specific at-risk subpopulations.

Funding statement

All the institutions and funding agencies are listed in Table S9. COH-FIT PIs and collaborators have applied/are actively applying for several national and international grants to cover expenses related to the coordination of the study, website, nationally representative samples, advertisement of the study, and future dissemination of study findings.

Author contribution statement

For the overall COH-FIT project, MS & CUC wrote the study protocol and drafted the first version of the CPH-FIT-C questionnaire that was then further adapted and revised incorporating input from all COH-FIT collaborators. Conceptualization: MS and CUC, data curation: CUC, MS, TT, AE, ED, FL, AK; formal analysis: MS, CUC, TT, AA, DM; funding acquisition: please see funding list; investigation: all authors; methodology: MS, CC, AA, TT; project administration: all authors; resources: all authors; software: CUC, MS, EA, TT, AA; supervision: MS, CUC; visualization: TT, MS, CUC, AA; writing – original draft: AA, TT; writing – review & editing: MS, CUC. All authors read, contributed to the critical revision of the first draft and approved the final version of the manuscript. All local researchers contributed to and approved translations of the COH-FIT survey in their respective language.

Role of funding source

All the institutions and funding agencies are listed in Table S9. COH-FIT PIs and collaborators have applied/are actively applying for several national and international grants to cover expenses related to the coordination of the study, website, nationally representative samples, advertisement of the study, and future dissemination of study findings.

Declaration of competing interest

Conflict of interest statements of all authors are detailed in Table S10.

Acknowledgements

All authors thank all respondents who took the COH-FIT-C survey, funding agencies and all professional and scientific national and international associations supporting or endorsing the COH-FIT project. We would also like to acknowledge the contributions made by Friedrich Leisch and Björn Gerdle to the success of this project who have since deceased.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.euroneuro.2025.112741.

References

Agorastos, A., Pervanidou, P., Chrousos, G.P., Baker, D.G., 2019. Developmental trajectories of early life stress and trauma: a narrative review on neurobiological aspects beyond stress system dysregulation. Front. Psychiatry 10, 118.

Agorastos, A., Pervanidou, P., Chrousos, G.P., Kolaitis, G., 2018. Early life stress and trauma: developmental neuroendocrine aspects of prolonged stress system dysregulation. Hormones 17, 507–520.

Arrondo, G., Solmi, M., Dragioti, E., Eudave, L., Ruiz-Goikoetxea, M., Ciaurriz-Larraz, A. M., Magallon, S., Carvalho, A.F., Cipriani, A., Fusar-Poli, P., Larsson, H., Correll, C. U., Cortese, S., 2022. Associations between mental and physical conditions in children and adolescents: an umbrella review. Neurosci. Biobehav. Rev. 137, 104662.

Becker, S.P., Breaux, R., Cusick, C.N., Dvorsky, M.R., Marsh, N.P., Sciberras, E., Langberg, J.M., 2020. Remote learning during COVID-19: examining school practices, service continuation, and difficulties for adolescents with and without Attention-Deficit/Hyperactivity disorder. J. Adolesc. Health 67, 769–777.

Cauberghe, V., De Jans, S., Hudders, L., Vanwesenbeeck, I., 2022. Children's resilience during Covid-19 confinement. A child's perspective-which general and media coping strategies are useful? J. Community Psychol. 50, 1503–1520.

Christie, H., Hiscox, L.V., Halligan, S.L., Creswell, C., 2022. Examining harmful impacts of the COVID-19 pandemic and school closures on parents and carers in the United Kingdom: a rapid review. JCPP Adv. 2, e12095.
Cortese, S., Asherson, P., Sonuga-Barke, E., Banaschewski, T., Brandeis, D., Buitelaar, J., Coghill, D., Daley, D., Danckaerts, M., Dittmann, R.W., Doepfner, M., Ferrin, M., Hollis, C., Holtmann, M., Konofal, E., Lecendreux, M., Santosh, P., Rothenberger, A., Soutullo, C., Steinhausen, H.C., Taylor, E., Van der Oord, S., Wong, I., Zuddas, A., Simonoff, E., European, A.G.G., 2020. ADHD management during the COVID-19 pandemic: guidance from the European ADHD Guidelines Group. Lancet Child Adolesc. Health 4, 412–414.
Deng, J., Zhou, F., Hou, W., Heybati, K., Lohit, S., Abbas, U., Silver, Z., Wong, C.Y., Chang, O., Huang, E., Zuo, Q.K., Moskalyk, M., Ramaraju, H.B., Heybati, S., 2023. Prevalence of mental health symptoms in children and adolescents during the COVID-19 pandemic: a meta-analysis. Ann. N. Y. Acad. Sci. 1520, 53–73.
Dragioti, E., Li, H., Tsitsas, G., Lee, K.H., Choi, J., Kim, J., Choi, Y.J., Tsamakis, K., Estrade, A., Agorastos, A., Vancampfort, D., Tsiptsios, D., Thompson, T., Mosina, A., Vakadaris, G., Fusar-Poli, P., Carvalho, A.F., Correll, C.U., Han, Y.J., Park, S., Il Shin, J., Solmi, M., 2022. A large-scale meta-analytic atlas of mental health problems prevalence during the COVID-19 early pandemic. J. Med. Virol. 94, 1935–1949.
Fauci, A.S., Lane, H.C., Redfield, R.R., 2020. Covid-19 - navigating the Uncharted. N. Engl. J. Med. 382, 1268–1269.
Demographics Collaborators, G.B.D., 2024. Global age-sex-specific mortality, life expectancy, and population estimates in 204 countries and territories and 811 subnational locations, 1950-2021, and the impact of the COVID-19 pandemic: a comprehensive demographic analysis for the Global Burden of Disease Study 2021. Lancet 403, 1989–2056.
Jing, J.Q., Yang, C.J., Wang, Y., Su, X.Y., Du, Y.J., 2024. Impact of COVID-19 on emotional and behavioral problems among preschool children: a meta-analysis. BMC Pediatr. 24, 455.
Lavaan, R.Y., 2012. An R package for structural equation modeling. J. Stat. Softw. 48, 1–36.
Loades, M.E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., Linney, C., McManus, M.N., Borwick, C., Crawley, E., 2020. Rapid systematic review: the impact of social isolation and loneliness on the mental health of children and adolescents in the context of COVID-19. J. Am. Acad. Child Adolesc. Psychiatry 59, 1218–1239 e1213.
Madigan, S., Racine, N., Vaillancourt, T., Korczak, D.J., Hewitt, J.M.A., Pador, P., Park, J. L., McArthur, B.A., Holy, C., Neville, R.D., 2023. Changes in depression and anxiety among children and adolescents from before to during the COVID-19 pandemic: a systematic review and meta-analysis. JAMa Pediatr. 177, 567–581.
Marques de Miranda, D., da Silva Athanasio, B., Sena Oliveira, A.C., Simoes, E.S.A.C., 2020. How is COVID-19 pandemic impacting mental health of children and adolescents? Int. J. Disaster. Risk. Reduct. 51, 101845.
Miao, R., Liu, C., Zhang, J., Jin, H., 2023. Impact of the COVID-19 pandemic on the mental health of children and adolescents: a systematic review and meta-analysis of longitudinal studies. J. Affect. Disord. 340, 914–922.
Newlove-Delgado, T., Russell, A.E., Mathews, F., Cross, L., Bryant, E., Gudka, R., Ukoumunne, O.C., Ford, T.J., 2023. Annual Research Review: the impact of Covid-19 on psychopathology in children and young people worldwide: systematic review of studies with pre- and within-pandemic data. J. Child Psychol. Psychiatry 64, 611–640.
Panchal, U., Salazar de Pablo, G., Franco, M., Moreno, C., Parellada, M., Arango, C., Fusar-Poli, P., 2023. The impact of COVID-19 lockdown on child and adolescent mental health: systematic review. Eur. Child Adolesc. Psychiatry 32, 1151–1177.
Pierce, M., McManus, S., Hope, H., Hotopf, M., Ford, T., Hatch, S.L., John, A., Kontopantelis, E., Webb, R.T., Wessely, S., Abel, K.M., 2021. Mental health responses to the COVID-19 pandemic: a latent class trajectory analysis using longitudinal UK data. Lancet Psychiatry 8, 610–619.
Raudenska, J., Gumancik, J., Raudensky, M., Pasqualucci, A., Narvaez Tamayo, M.A., Varrassi, G., Javurkova, A., 2023. Play as a stress-coping method among children in light of the COVID-19 Pandemic: a review. Cureus 15, e43550.
Revelle, W., Revelle, M.W., 2015. Package 'psych.'. Compr. R. Arch. Netw. 337, 338.
Salanti, G., Peter, N., Tonia, T., Holloway, A., White, I.R., Darwish, L., Low, N., Egger, M., Haas, A.D., Fazel, S., Kessler, R.C., Herrman, H., Kieling, C., De Quervain, D.J.F., Vigod, S.N., Patel, V., Li, T., Cuijpers, P., Cipriani, A., Furukawa, T.A., Leucht, S., Investigators, M.C., Sambo, A.U., Onishi, A., Sato, A., Rodolico, A., Oliveira Solis, A. C., Antoniou, A., Kapfhammer, A., Ceraso, A., O'Mahony, A., Lasserre, A.M., Ipekci, A.M., Concerto, C., Zangani, C., Igwesi-Chidobe, C., Diehm, C., Demir, D.D., Wang, D., Ostinelli, E.G., Sahker, E., Beraldi, G.H., Erzin, G., Nelson, H., Elkis, H., Imai, H., Wu, H., Kamitsis, I., Filis, I., Michopoulos, I., Bighelli, I., Hong, J.S.W., Ballesteros, J., Smith, K.A., Yoshida, K., Omae, K., Trivella, M., Tada, M., Reinhard, M.A., Ostacher, M.J., Muller, M., Jaramillo, N.G., Ferentinos, P.P., Toyomoto, R., Cortese, S., Kishimoto, S., Covarrubias-Castillo, S.A., Siafis, S., Thompson, T., Karageorgiou, V., Chiocchia, V., Zhu, Y., Honda, Y., Investigatorsdagger, M.C., 2022. The impact of the COVID-19 pandemic and associated control measures on the mental health of the general population : a systematic review and dose-response meta-analysis. Ann. Intern. Med. 175, 1560–1571.
Samji, H., Wu, J., Ladak, A., Vossen, C., Stewart, E., Dove, N., Long, D., Snell, G., 2022. Review: mental health impacts of the COVID-19 pandemic on children and youth - a systematic review. Child Adolesc. Ment. Health 27, 173–189.
Sharma, A., Minh Duc, N.T., Luu Lam Thang, T., Nam, N.H., Ng, S.J., Abbas, K.S., Huy, N. T., Marusic, A., Paul, C.L., Kwok, J., Karbwang, J., de Waure, C., Drummond, F.J., Kizawa, Y., Taal, E., Vermeulen, J., Lee, G.H.M., Gyedu, A., To, K.G., Verra, M.L., Jacqz-Aigrain, E.M., Leclercq, W.K.G., Salminen, S.T., Sherbourne, C.D., Mintzes, B., Lozano, S., Tran, U.S., Matsui, M., Karamouzian, M., 2021. A consensus-based checklist for reporting of survey studies (CROSS). J. Gen. Intern. Med. 36, 3179–3187.
Singh, S., Roy, D., Sinha, K., Parveen, S., Sharma, G., Joshi, G., 2020. Impact of COVID-19 and lockdown on mental health of children and adolescents: a narrative review with recommendations. Psychiatry Res. 293, 113429.
Solmi, M., Estrade, A., Thompson, T., Agorastos, A., Radua, J., Cortese, S., Dragioti, E., Leisch, F., Vancampfort, D., Thygesen, L.C., Aschauer, H., Schloegelhofer, M., Akimova, E., Schneeberger, A., Huber, C.G., Hasler, G., Conus, P., Cuenod, K.Q.D., von Kanel, R., Arrondo, G., Fusar-Poli, P., Gorwood, P., Llorca, P.M., Krebs, M.O., Scanferla, E., Kishimoto, T., Rabbani, G., Skonieczna-Zydecka, K., Brambilla, P., Favaro, A., Takamiya, A., Zoccante, L., Colizzi, M., Bourgin, J., Kaminski, K., Moghadasin, M., Seedat, S., Matthews, E., Wells, J., Vassilopoulou, E., Gadelha, A., Su, K.P., Kwon, J.S., Kim, M., Lee, T.Y., Papsuev, O., Mankova, D., Boscutti, A., Gerunda, C., Saccon, D., Righi, E., Monaco, F., Croatto, G., Cereda, G., Demurtas, J., Brondino, N., Veronese, N., Enrico, P., Politi, P., Ciappolino, V., Pfennig, A., Bechdolf, A., Meyer-Lindenberg, A., Kahl, K.G., Domschke, K., Bauer, M., Koutsouleris, N., Winter, S., Borgwardt, S., Bitter, I., Balazs, J., Czobor, P., Unoka, Z., Mavridis, D., Tsamakis, K., Bozikas, V.P., Tunvirachaisakul, C., Maes, M., Rungnirundorn, T., Supasitthumrong, T., Haque, A., Brunoni, A.R., Costardi, C.G., Schuch, F.B., Polanczyk, G., Luiz, J.M., Fonseca, L., Aparicio, L.V., Valvassori, S.S., Nordentoft, M., Vendsborg, P., Hoffmann, S.H., Sehli, J., Sartorius, N., Heuss, S., Guinart, D., Hamilton, J., Kane, J., Rubio, J., Sand, M., Koyanagi, A., Solanes, A., Andreu-Bernabeu, A., Caceres, A.S.J., Arango, C., Diaz-Caneja, C.M., Hidalgo-Mazzei, D., Vieta, E., Gonzalez-Penas, J., Fortea, L., Parellada, M., Fullana, M.A., Verdolini, N., Farkova, E., Janku, K., Millan, M., Honciuc, M., Moniuszko-Malinowska, A., Loniewski, I., Samochowiec, J., Kiszkiel, L., Marlicz, M., Sowa, P., Marlicz, W., Spies, G., Stubbs, B., Firth, J., Sullivan, S., Darcin, A.E., Aksu, H., Dilbaz, N., Noyan, O., Kitazawa, M., Kurokawa, S., Tazawa, Y., Anselmi, A., Cracco, C., Machado, A.I., Estrade, N., De Leo, D., Curtis, J., Berk, M., Ward, P., Teasdale, S., Rosenbaum, S., Marx, W., Horodnic, A.V., Oprea, L., Alexinschi, O., Ifteni, P., Turliuc, S., Ciuhodaru, T., Bolos, A., Matei, V., Nieman, D.H., Sommer, I., van Os, J., van Amelsvoort, T., Sun, C.F., Guu, T.W., Jiao, C., Zhang, J., Fan, J., Zou, L., Yu, X., Chi, X., de Timary, P., van Winke, R., Ng, B., Pena, E., Arellano, R., Roman, R., Sanchez, T., Movina, L., Morgado, P., Brissos, S., Aizberg, O., Mosina, A., Krinitski, D., Mugisha, J., Sadeghi-Bahmani, D., Sadeghi, M., Hadi, S., Brand, S., Errazuriz, A., Crossley, N., Ristic, D.I., Lopez-Jaramillo, C., Efthymiou, D., Kuttichira, P., Kallivayalil, R.A., Javed, A., Afridi, M.I., James, B., Seb-Akahomen, O. J., Fiedorowicz, J., Carvalho, A.F., Daskalakis, J., Yatham, L.N., Yang, L., Okasha, T., Dahdouh, A., Gerdle, B., Tiihonen, J., Shin, J.I., Lee, J., Mhalla, A., Gaha, L., Brahim, T., Altynbekov, K., Negay, N., Nurmagambetova, S., Jamei, Y.A., Weiser, M., Correll, C.U., 2022a. The collaborative outcomes study on health and functioning during infection times in adults (COH-FIT-Adults): design and methods of an international online survey targeting physical and mental health effects of the COVID-19 pandemic. J. Affect. Disord. 299, 393–407.
Solmi, M., Estrade, A., Thompson, T., Agorastos, A., Radua, J., Cortese, S., Dragioti, E., Leisch, F., Vancampfort, D., Thygesen, L.C., Aschauer, H., Schloegelhofer, M., Akimova, E., Schneeberger, A., Huber, C.G., Hasler, G., Conus, P., Cuenod, K.Q.D., von Kanel, R., Arrondo, G., Fusar-Poli, P., Gorwood, P., Llorca, P.M., Krebs, M.O., Scanferla, E., Kishimoto, T., Rabbani, G., Skonieczna-Zydecka, K., Brambilla, P., Favaro, A., Takamiya, A., Zoccante, L., Colizzi, M., Bourgin, J., Kaminski, K., Moghadasin, M., Seedat, S., Matthews, E., Wells, J., Vassilopoulou, E., Gadelha, A., Su, K.P., Kwon, J.S., Kim, M., Lee, T.Y., Papsuev, O., Mankova, D., Boscutti, A., Gerunda, C., Saccon, D., Righi, E., Monaco, F., Croatto, G., Cereda, G., Demurtas, J., Brondino, N., Veronese, N., Enrico, P., Politi, P., Ciappolino, V., Pfennig, A., Bechdolf, A., Meyer-Lindenberg, A., Kahl, K.G., Domschke, K., Bauer, M., Koutsouleris, N., Winter, S., Borgwardt, S., Bitter, I., Balazs, J., Czobor, P., Unoka, Z., Mavridis, D., Tsamakis, K., Bozikas, V.P., Tunvirachaisakul, C., Maes, M., Rungnirundorn, T., Supasitthumrong, T., Haque, A., Brunoni, A.R., Costardi, C.G., Schuch, F.B., Polanczyk, G., Luiz, J.M., Fonseca, L., Aparicio, L.V., Valvassori, S.S., Nordentoft, M., Vendsborg, P., Hoffmann, S.H., Sehli, J., Sartorius, N., Heuss, S., Guinart, D., Hamilton, J., Kane, J., Rubio, J., Sand, M., Koyanagi, A., Solanes, A., Andreu-Bernabeu, A., Caceres, A.S.J., Arango, C., Diaz-Caneja, C.M., Hidalgo-Mazzei, D., Vieta, E., Gonzalez-Penas, J., Fortea, L., Parellada, M., Fullana, M.A., Verdolini, N., Farkova, E., Janku, K., Millan, M., Honciuc, M., Moniuszko-Malinowska, A., Loniewski, I., Samochowiec, J., Kiszkiel, L., Marlicz, M., Sowa, P., Marlicz, W., Spies, G., Stubbs, B., Firth, J., Sullivan, S., Darcin, A.E., Aksu, H., Dilbaz, N., Noyan, O., Kitazawa, M., Kurokawa, S., Tazawa, Y., Anselmi, A., Cracco, C., Machado, A.I., Estrade, N., De Leo, D., Curtis, J., Berk, M., Ward, P., Teasdale, S., Rosenbaum, S., Marx, W., Horodnic, A.V., Oprea, L., Alexinschi, O., Ifteni, P., Turliuc, S., Ciuhodaru, T., Bolos, A., Matei, V., Nieman, D.H., Sommer, I., van Os, J., van Amelsvoort, T., Sun, C.F., Guu, T.W., Jiao, C., Zhang, J., Fan, J., Zou, L., Yu, X., Chi, X., de Timary, P., van Winke, R., Ng, B., Pena, E., Arellano, R., Roman, R., Sanchez, T., Movina, L., Morgado, P., Brissos, S., Aizberg, O., Mosina, A., Krinitski, D., Mugisha, J., Sadeghi-Bahmani, D., Sadeghi, M., Hadi, S., Brand, S., Errazuriz, A., Crossley, N., Ristic, D.I., Lopez-Jaramillo, C., Efthymiou, D., Kuttichira, P., Kallivayalil, R.A., Javed, A., Afridi, M.I., James, B., Seb-Akahomen, O. J., Fiedorowicz, J., Carvalho, A.F., Daskalakis, J., Yatham, L.N., Yang, L., Okasha, T., Dahdouh, A., Gerdle, B., Tiihonen, J., Shin, J.I., Lee, J., Mhalla, A., Gaha, L., Brahim, T., Altynbekov, K., Negay, N., Nurmagambetova, S., Jamei, Y.A., Weiser, M., Correll, C.U., 2022b. Physical and mental health impact of COVID-19 on children,

adolescents, and their families: the Collaborative Outcomes study on health and functioning during Infection Times - children and adolescents (COH-FIT-C&A). J. Affect. Disord. 299, 367–376.

Solmi, M., Radua, J., Olivola, M., Croce, E., Soardo, L., Salazar de Pablo, G., Il Shin, J., Kirkbride, J.B., Jones, P., Kim, J.H., Kim, J.Y., Carvalho, A.F., Seeman, M.V., Correll, C.U., Fusar-Poli, P., 2022c. Age at onset of mental disorders worldwide: large-scale meta-analysis of 192 epidemiological studies. Mol. Psychiatry 27, 281–295.

Solmi, M., Thompson, T., Cortese, S., Estrade, A., Agorastos, A., Radua, J., Dragioti, E., Vancampfort, D., Thygesen, L.C., Aschauer, H., Schlogelhofer, M., Aschauer, E., Schneeberger, A., Huber, C.G., Hasler, G., Conus, P., Cuenod, K.Q.D., von Kanel, R., Arrondo, G., Fusar-Poli, P., Gorwood, P., Llorca, P.M., Krebs, M.O., Scanferla, E., Kishimoto, T., Rabbani, G., Skonieczna-Zydecka, K., Brambilla, P., Favaro, A., Takamiya, A., Zoccante, L., Colizzi, M., Bourgin, J., Kaminski, K., Moghadasin, M., Seedat, S., Matthews, E., Wells, J., Vassilopoulou, E., Gadelha, A., Su, K.P., Kwon, J. S., Kim, M., Lee, T.Y., Papsuev, O., Mankova, D., Boscutti, A., Gerunda, C., Saccon, D., Righi, E., Monaco, F., Croatto, G., Cereda, G., Demurtas, J., Brondino, N., Veronese, N., Enrico, P., Politi, P., Ciappolino, V., Pfennig, A., Bechdolf, A., Meyer-Lindenberg, A., Kahl, K.G., Domschke, K., Bauer, M., Koutsouleris, N., Winter, S., Borgwardt, S., Bitter, I., Balazs, J., Czobor, P., Unoka, Z., Mavridis, D., Tsamakis, K., Bozikas, V.P., Tunvirachaisakul, C., Maes, M., Rungnirundorn, T., Supasitthumrong, T., Haque, A., Brunoni, A.R., Costardi, C.G., Schuch, F.B., Polanczyk, G., Luiz, J.M., Fonseca, L., Aparicio, L.V., Valvassori, S.S., Nordentoft, M., Vendsborg, P., Hoffmann, S.H., Sehli, J., Sartorius, N., Heuss, S., Guinart, D., Hamilton, J., Kane, J., Rubio, J., Sand, M., Koyanagi, A., Solanes, A., Andreu-Bernabeu, A., Caceres, A.S.J., Arango, C., Diaz-Caneja, C.M., Hidalgo-Mazzei, D., Vieta, E., Gonzalez-Penas, J., Fortea, L., Parellada, M., Fullana, M.A., Verdolini, N., Andrlikova, E., Janku, K., Millan, M.J., Honciuc, M., Moniuszko-Malinowska, A., Loniewski, I., Samochowiec, J., Kiszkiel, L., Marlicz, M., Sowa, P., Marlicz, W., Spies, G., Stubbs, B., Firth, J., Sullivan, S., Darcin, A.E., Aksu, H., Dilbaz, N., Noyan, O., Kitazawa, M., Kurokawa, S., Tazawa, Y., Anselmi, A., Cracco, C., Machado, A.I., Estrade, N., De Leo, D., Curtis, J., Berk, M., Carvalho, A.F., Ward, P., Teasdale, S., Rosenbaum, S., Marx, W., Horodnic, A.V., Oprea, L., Alexinschi, O., Ifteni, P., Turliuc, S., Ciuhodaru, T., Bolos, A., Matei, V., Nieman, D. H., Sommer, I., van Os, J., van Amelsvoort, T., Sun, C.F., Guu, T.W., Jiao, C., Zhang, J., Fan, J., Zou, L., Yu, X., Chi, X., de Timary, P., van Winkel, R., Ng, B., Pena, E., Arellano, R., Roman, R., Sanchez, T., Movina, L., Morgado, P., Brissos, S., Aizberg, O., Mosina, A., Krinitski, D., Mugisha, J., Sadeghi-Bahmani, D., Sheybani, F., Sadeghi, M., Hadi, S., Brand, S., Errazuriz, A., Crossley, N., Ristic, D.I., Lopez-Jaramillo, C., Efthymiou, D., Kuttichira, P., Kallivayalil, R.A., Javed, A., Afridi, M.I., James, B., Seb-Akahomen, O.J., Fiedorowicz, J., Daskalakis, J., Yatham, L.N., Yang, L., Okasha, T., Dahdouh, A., Tiihonen, J., Shin, J.I., Lee, J., Mhalla, A., Gaha, L., Brahim, T., Altynbekov, K., Negay, N., Nurmagambetova, S., Jamei, Y.A., Weiser, M., Correll, C.U., 2024a. Collaborative outcomes study on health and functioning during infection times (COH-FIT): insights on modifiable and non-modifiable risk and protective factors for wellbeing and mental health during the COVID-19 pandemic from multivariable and network analyses. Eur. Neuropsychopharmacol. 90, 1–15.

Solmi, M., Thompson, T., Cortese, S., Estrade, A., Agorastos, A., Radua, J., Dragioti, E., Vancampfort, D., Thygesen, L.C., Aschauer, H., Schlogelhofer, M., Aschauer, E., Schneeberger, A.A., Huber, C.G., Hasler, G., Conus, P., Do Cuenod, K.Q., von Kanel, R., Arrondo, G., Fusar-Poli, P., Gorwood, P., Llorca, P.M., Krebs, M.O., Scanferla, E., Kishimoto, T., Rabbani, G., Skonieczna-Zydecka, K., Brambilla, P., Favaro, A., Takamiya, A., Zoccante, L., Colizzi, M., Bourgin, J., Kaminski, K., Moghadasin, M., Seedat, S., Matthews, E., Wells, J., Vassilopoulou, E., Gadelha, A., Su, K.P., Kwon, J.S., Kim, M., Lee, T.Y., Papsuev, O., Mankova, D., Boscutti, A., Gerunda, C., Saccon, D., Righi, E., Monaco, F., Croatto, G., Cereda, G., Demurtas, J., Brondino, N., Veronese, N., Enrico, P., Politi, P., Ciappolino, V., Pfennig, A., Bechdolf, A., Meyer-Lindenberg, A., Kahl, K.G., Domschke, K., Bauer, M., Koutsouleris, N., Winter, S., Borgwardt, S., Bitter, I., Balazs, J., Czobor, P., Unoka, Z., Mavridis, D., Tsamakis, K., Bozikas, V.P., Tunvirachaisakul, C., Maes, M., Rungnirundorn, T., Supasitthumrong, T., Haque, A., Brunoni, A.R., Costardi, C.G., Schuch, F.B., Polanczyk, G., Luiz, J.M., Fonseca, L., Aparicio, L.V., Valvassori, S.S., Nordentoft, M., Vendsborg, P., Hoffmann, S.H., Sehli, J., Sartorius, N., Heuss, S., Guinart, D., Hamilton, J., Kane, J., Rubio, J., Sand, M., Koyanagi, A., Solanes, A., Andreu-Bernabeu, A., San Jose Caceres, A., Arango, C., Diaz-Caneja, C.M., Hidalgo-Mazzei, D., Vieta, E., Gonzalez-Penas, J., Fortea, L., Parellada, M., Fullana, M.A., Verdolini, N., Andrlikova, E., Janku, K., Millan, M.J., Honciuc, M., Moniuszko-Malinowska, A., Loniewski, I., Samochowiec, J., Kiszkiel, L., Marlicz, M., Sowa, P., Marlicz, W., Spies, G., Stubbs, B., Firth, J., Sullivan, S., Darcin, A.E., Aksu, H., Dilbaz, N., Noyan, O., Kitazawa, M., Kurokawa, S., Tazawa, Y., Anselmi, A., Cracco, C., Machado, A.I., Estrade, N., De Leo, D., Curtis, J., Berk, M., Carvalho, A.F., Ward, P., Teasdale, S., Rosenbaum, S., Marx, W., Horodnic, A.V., Oprea, L., Alexinschi, O., Ifteni, P., Turliuc, S., Ciuhodaru, T., Bolos, A., Matei, V., Nieman, D. H., Sommer, I., van Os, J., van Amelsvoort, T., Sun, C.F., Guu, T.W., Jiao, C., Zhang, J., Fan, J., Zou, L., Yu, X., Chi, X., de Timary, P., van Winkel, R., Ng, B., Pena de Leon, E., Arellano, R., Roman, R., Sanchez, T., Movina, L., Morgado, P., Brissos, S., Aizberg, O., Mosina, A., Krinitski, D., Mugisha, J., Sadeghi-Bahmani, D., Sheybani, F., Sadeghi, M., Hadi, S., Brand, S., Errazuriz, A., Crossley, N., Ristic, D.I., Lopez-Jaramillo, C., Efthymiou, D., Kuttichira, P., Kallivayalil, R.A., Javed, A., Afridi, M.I., James, B., Seb-Akahomen, O.J., Fiedorowicz, J., Daskalakis, J., Yatham, L.N., Yang, L., Okasha, T., Dahdouh, A., Tiihonen, J., Shin, J.I., Lee, J., Mhalla, A., Gaha, L., Brahim, T., Altynbekov, K., Negay, N., Nurmagambetova, S., Jamei, Y.A., Weiser, M., Correll, C.U., 2024b. Collaborative outcomes study on health and functioning during infection times (COH-FIT): global and risk-group stratified course of well-being and mental health during the COVID-19 pandemic in adolescents. J. Am. Acad. Child Adolesc. Psychiatry.

Solmi, M., Thompson, T., Estrade, A., Agorastos, A., Radua, J., Cortese, S., Dragioti, E., Leisch, F., Vancampfort, D., Thygesen, L.C., Aschauer, H., Schlogelhofer, M., Aschauer, E., Schneeberger, A., Huber, C.G., Hasler, G., Conus, P., Do Cuenod, K.Q., von Kanel, R., Arrondo, G., Fusar-Poli, P., Gorwood, P., Llorca, P.M., Krebs, M.O., Scanferla, E., Kishimoto, T., Rabbani, G., Skonieczna-Zydecka, K., Brambilla, P., Favaro, A., Takamiya, A., Zoccante, L., Colizzi, M., Bourgin, J., Kaminski, K., Moghadasin, M., Seedat, S., Matthews, E., Wells, J., Vassilopoulou, E., Gadelha, A., Su, K.P., Kwon, J.S., Kim, M., Lee, T.Y., Papsuev, O., Mankova, D., Boscutti, A., Gerunda, C., Saccon, D., Righi, E., Monaco, F., Croatto, G., Cereda, G., Demurtas, J., Brondino, N., Veronese, N., Enrico, P., Politi, P., Ciappolino, V., Pfennig, A., Bechdolf, A., Meyer-Lindenberg, A., Kahl, K.G., Domschke, K., Bauer, M., Koutsouleris, N., Winter, S., Borgwardt, S., Bitter, I., Balazs, J., Czobor, P., Unoka, Z., Mavridis, D., Tsamakis, K., Bozikas, V.P., Tunvirachaisakul, C., Maes, M., Rungnirundorn, T., Supasitthumrong, T., Haque, A., Brunoni, A.R., Costardi, C.G., Schuch, F.B., Polanczyk, G., Luiz, J.M., Fonseca, L., Aparicio, L.V., Valvassori, S.S., Nordentoft, M., Vendsborg, P., Hoffmann, S.H., Sehli, J., Sartorius, N., Heuss, S., Guinart, D., Hamilton, J., Kane, J., Rubio, J., Sand, M., Koyanagi, A., Solanes, A., Andreu-Bernabeu, A., Caceres, A.S.J., Arango, C., Diaz-Caneja, C.M., Hidalgo-Mazzei, D., Vieta, E., Gonzalez-Penas, J., Fortea, L., Parellada, M., Fullana, M.A., Verdolini, N., Andrlikova, E., Janku, K., Millan, M.J., Honciuc, M., Moniuszko-Malinowska, A., Loniewski, I., Samochowiec, J., Kiszkiel, L., Marlicz, M., Sowa, P., Marlicz, W., Spies, G., Stubbs, B., Firth, J., Sullivan, S., Darcin, A.E., Aksu, H., Dilbaz, N., Noyan, O., Kitazawa, M., Kurokawa, S., Tazawa, Y., Anselmi, A., Cracco, C., Machado, A.I., Estrade, N., De Leo, D., Curtis, J., Berk, M., Carvalho, A.F., Ward, P., Teasdale, S., Rosenbaum, S., Marx, W., Horodnic, A.V., Oprea, L., Alexinschi, O., Ifteni, P., Turliuc, S., Ciuhodaru, T., Bolos, A., Matei, V., Nieman, D.H., Sommer, I., van Os, J., van Amelsvoort, T., Sun, C.F., Guu, T.W., Jiao, C., Zhang, J., Fan, J., Zou, L., Yu, X., Chi, X., de Timary, P., van Winkel, R., Ng, B., Pena de Leon, E., Arellano, R., Roman, R., Sanchez, T., Movina, L., Morgado, P., Brissos, S., Aizberg, O., Mosina, A., Krinitski, D., Mugisha, J., Sadeghi-Bahmani, D., Sheybani, F., Sadeghi, M., Hadi, S., Brand, S., Errazuriz, A., Crossley, N., Ristic, D.I., Lopez-Jaramillo, C., Efthymiou, D., Kuttichira, P., Kallivayalil, R.A., Javed, A., Afridi, M.I., James, B., Seb-Akahomen, O.J., Fiedorowicz, J., Daskalakis, J., Yatham, L.N., Yang, L., Okasha, T., Dahdouh, A., Tiihonen, J., Shin, J.I., Lee, J., Mhalla, A., Gaha, L., Brahim, T., Altynbekov, K., Negay, N., Nurmagambetova, S., Jamei, Y.A., Weiser, M., Correll, C.U., 2024c. Global and risk-group stratified well-being and mental health during the COVID-19 pandemic in adults: results from the international COH-FIT Study. Psychiatry Res. 342, 115972.

Solmi, M., Veronese, N., Galvano, D., Favaro, A., Ostinelli, E.G., Noventa, V., Favaretto, E., Tudor, F., Finessi, M., Shin, J.I., Smith, L., Koyanagi, A., Cester, A., Bolzetta, F., Cotroneo, A., Maggi, S., Demurtas, J., De Leo, D., Trabucchi, M., 2020.

Factors associated with loneliness: an umbrella review of observational studies. J. Affect. Disord. 271, 131–138.
Theberath, M., Bauer, D., Chen, W., Salinas, M., Mohabbat, A.B., Yang, J., Chon, T.Y., Bauer, B.A., Wahner-Roedler, D.L., 2022. Effects of COVID-19 pandemic on mental health of children and adolescents: a systematic review of survey studies. SAGe Open Med. 10, 20503121221086712.
Topp, C.W., Ostergaard, S.D., Sondergaard, S., Bech, P., 2015. The WHO-5 Well-Being Index: a systematic review of the literature. Psychother. Psychosom. 84, 167–176.
Tso, W.W.Y., Wong, R.S., Tung, K.T.S., Rao, N., Fu, K.W., Yam, J.C.S., Chua, G.T., Chen, E.Y.H., Lee, T.M.C., Chan, S.K.W., Wong, W.H.S., Xiong, X., Chui, C.S., Li, X., Wong, K., Leung, C., Tsang, S.K.M., Chan, G.C.F., Tam, P.K.H., Chan, K.L., Kwan, M. Y.W., Ho, M.H.K., Chow, C.B., Wong, I.C.K., Lp, P., 2022. Vulnerability and resilience in children during the COVID-19 pandemic. Eur. Child Adolesc. Psychiatry 31, 161–176.
van Buuren, S., Groothuis-Oudshoorn, K., 2011. mice: multivariate imputation by chained equations in R. J. Stat. Softw. 45, 1–67.
Vasquez, L., Sampor, C., Villanueva, G., Maradiegue, E., Garcia-Lombardi, M., Gomez-Garcia, W., Moreno, F., Diaz, R., Cappellano, A.M., Portilla, C.A., Salas, B., Nava, E., Brizuela, S., Jimenez, S., Espinoza, X., Gassant, P.Y., Quintero, K., Fuentes-Alabi, S., Velasquez, T., Fu, L., Gamboa, Y., Quintana, J., Castiglioni, M., Nunez, C., Moreno, A., Luna-Fineman, S., Luciani, S., Chantada, G., 2020. Early impact of the COVID-19 pandemic on paediatric cancer care in Latin America. Lancet Oncol. 21, 753–755.
von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gotzsche, P.C., Vandenbroucke, J.P., Initiative, S., 2007. The strengthening the reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet 370, 1453–1457.
Wickham, H., 2016. Ggplot2: Elegant Graphics For Data Analysis, 2nd ed. Springer.