



Viewpoint

## **Lack of physical activity among European children and adolescents following the COVID-19 pandemic**

Klaus W. Lange and Yukiko Nakamura

Chair of Health Research and Neuropsychology, Faculty of Human Sciences (Psychology, Education and Sport Science), University of Regensburg, Regensburg, Bavaria, Germany

**Correspondence:** Klaus W. Lange, University of Regensburg, 93040 Regensburg, Germany. Email: Klaus.Lange@ur.de

**Received:** 6 January 2024; **Accepted:** 22 January 2024; **Published:** 24 January 2024

**Citation:** Lange, K.W., and Nakamura, Y. (2024). Lack of physical activity among European children and adolescents following the COVID-19 pandemic. *J. Dis. Prev. Health Promot.* 8, 1–4.

**DOI:** 10.5283/jdphp.45

### **Abstract**

During the COVID-19 pandemic and the associated lockdowns, children and young people spent significantly less time outdoors. A global decline in physical activity as well as an increase in screen time, obesity and mental disorders resulted. A systematic review of changes in physical activity among European children and adolescents stemming from the restrictions imposed during the COVID-19 pandemic revealed that the insufficient pre-pandemic physical activity levels further declined, by around a quarter, during the pandemic. This gives rise to a concern that some of the behaviours acquired during the pandemic will be retained permanently. Since inadequate physical activity levels in children and adolescents are a major health problem worldwide and may have lasting effects on the health of this generation, there is an urgent need for health practitioners and policy makers to take action.

### **Bewegungsmangel von Kindern und Jugendlichen in Europa nach der COVID-19-Pandemie**

Während der COVID-19-Pandemie und der damit verbundenen Lockdowns verbrachten Kinder und Jugendliche deutlich weniger Zeit im Freien. Die Folge waren ein allgemeiner Rückgang der körperlichen Aktivität sowie eine Zunahme von Bildschirmzeit, Adipositas und psychischen Störungen. Eine systematische Übersicht zu den Veränderungen der körperlichen Aktivität europäischer Kinder und Jugendlicher infolge der während der COVID 19-Pandemie auferlegten Einschränkungen zeigte, dass das bereits vor der Pandemie unzureichende Aktivitätsniveau während der Pandemie um etwa ein Viertel weiter zurückging. Das gibt Anlass zu der Sorge, dass einige der während der Pandemie erworbenen Verhaltensweisen dauerhaft beibehalten werden. Da mangelnde körperliche Aktivität bei Kindern und Jugendlichen weltweit ein großes Gesundheitsproblem darstellt und dauerhafte Auswirkungen auf die Gesundheit dieser Generation haben kann, müssen Gesundheitsexperten und politische Entscheidungsträger dringend tätig werden.

### **COVID-19パンデミック後のヨーロッパの子どもと青少年における身体活動の欠如**

COVID-19の大流行とそれに伴う屋外閉鎖期間中、児童や10代の若者が屋外で過ごす時間は著しく減少した。その結果、身体活動は世界的に減少し、ゲーム機や携帯電話などの画面を見ている時間、肥満、精神障害が増加した。COVID-19パンデミック時の制限によるヨーロッパの児童と10代の若者の身体活動の変化に関する系統的レビューによると、パンデミック前に不十分であった身体活動レベルは、パンデミック中にはさらに約4分の1低下していた。このことは、パンデミック中に取得した行動の一部が永続的に保持される可能性があることを懸念させる。児童や10代の若者たちの身体活動不足は、世界的に大きな健康上の問題でありこの世代の健康に持続的な影響を及ぼす可能性があるため、医療の専門家や政策担当者は緊急に対応する必要がある。

**Keywords:** Physical activity; Sedentary behaviour; COVID-19 pandemic; Non-communicable diseases; Mental disorders; Public health.

## 1. Introduction

Numerous studies have shown the beneficial effects of physical activity on both physical and mental health of children and adolescents. A positive impact of physical activity in various conditions, including cardiovascular diseases, obesity, metabolic diseases, cognitive functioning and mental disorders, has been found in young people (Dale et al., 2019; Lange, 2018; Lange et al., 2023a; Renninger et al., 2020; Skrede et al., 2019; Vazou et al., 2019). A lack of adequate physical activity levels in children and adolescents is a major health problem worldwide (Guthold et al., 2020) and is associated with a significant global health and economic burden (Ding et al., 2016; Katzmarzyk et al., 2022).

## 2. Physical activity among children and adolescents during the COVID-19 pandemic

Confinement to the home and psychological distress due to the COVID-19 pandemic may lead to harmful health behaviours, such as overeating, sedentary behaviour with reduced physical activity, elevated alcohol and tobacco use and increased screen time causing impaired sleep (Lange and Nakamura, 2020). In particular, a global decline in physical activity in children and adolescents was reported during the COVID-19 pandemic (Chaabna et al., 2022; Neville et al., 2022; Stockwell et al., 2021). Furthermore, the results of the first systematic review of studies of pandemic-related physical activity among the youth in Europe have recently been published (Ludwig-Walz et al., 2023b).

Before the COVID-19 pandemic, children and adolescents in Europe were found to be insufficiently physically active (World Health Organisation, 2021). During the pandemic, various public health and social measures, such as closures of kindergartens, schools and universities, and restricted access to physical activity opportunities, including outdoor play and sports clubs, limited the opportunities for regular physical activity in children and adolescents (Hale et al., 2021). Instead of school sports and sports club training, children and young people sat at home in front of the TV, learning computers or other digital media during the coronavirus lockdown (Madigan et al., 2022). The consequences of this became visible during the pandemic, with considerable weight gain observed in children (Lange et al., 2021).

A recently published review analysed data from previous studies conducted across Europe on changes in the physical activity of young people during the coronavirus pandemic. A total of 26 studies from 14 European countries with data from over 15,000 children and adolescents before the pandemic and over 13,000 during the pandemic were included (Ludwig-Walz et al., 2023b). This study found a considerable decline in all forms of physical activity (total physical activity, moderate-to-vigorous physical activity and sporting activity) among European children and adolescents during the COVID-19 pandemic compared to pre-pandemic levels. Children aged 8 to 12 were most affected by a lack of exercise, especially during times of closures of schools and sports clubs (Ludwig-Walz et al., 2023b).

The reported decrease in various forms of physical activity, by 20% to 25%, represents a substantial change in the daily habits of European children and adolescents (Ludwig-Walz et al., 2023b). It appears that the decline in physical activity among adolescents observed since 2001 (Guthold et al., 2020) has been accelerated by the pandemic. There is a risk that some of the behaviours from the pandemic will be retained permanently. Healthy lifestyle habits have been proposed to depend on stability mechanisms based on family, social and school support (Gardner et al., 2014; Hawlader et al., 2023). This stability was markedly disrupted for young people during strict lockdowns and school closures. When these restrictions were lifted, returning to a more active lifestyle appeared to be challenging for some children and adolescents (Walker et al., 2022). Inactive behaviours in youth can contribute to a perpetuation of these behavioural patterns into adulthood, which may result in long-term consequences for the health of young people (Telama, 2009; van Sluijs et al., 2021).

The rise in mental health disorders during the COVID-19 pandemic is a further issue of concern (Lange, 2020, 2021; Ludwig-Walz et al., 2022, 2023a). A recent systematic review points to an association between physical activity and mental health among the youth during the COVID-19 pandemic (Marconcin et al., 2022). A small positive impact of participation in organised sports on mental health in children and adolescents has been reported (Boelens et al., 2022). In particular, moderate positive effects of physical exercise interventions on the severity of adolescent depression have been found (Lange et al., 2023a; Wang et al., 2022). Participation in team sports compared to no sport participation was associated with fewer mental health difficulties, while participation in exclusively individual sports was associated with greater difficulties (Hoffmann et al., 2022). These findings suggest that team-based organised sports may be a means to support the mental health of young people. Physical activity and exercise, with their global accessibility, clinically meaningful efficacy and virtual absence of adverse effects, offer a promising option for the prevention and treatment of common mental disorders (Lange et al., 2023b).

## 3. Future directions

The World Health Organisation (2020) has strongly recommended that children and adolescents perform an average of 60 minutes of moderate-to-vigorous-intensity exercise daily. There is an urgent need to reverse the downward-trend in physical activity, which has been accelerated by the COVID-19 pandemic. Regular physical activity at a young age forms healthy lifestyle habits in later life (Hawlader et al., 2023) and helps reduce risk factors and medical conditions over the long term (van Sluijs et al., 2021). The actions that health practitioners and policy makers should take in this regard include comprehensive, targeted and low-threshold interventions to increase physical activity (World Health Organisation, 2019, 2020). Future programmes may include multi-component interventions, such as comprehensive school physical activity

programmes (Lai et al., 2014; Ruhland and Lange, 2021; Sutherland et al., 2016). Educational institutions are important for the promotion of physical activity, since they can reach children and adolescents on a broad basis (Woods et al., 2021). Maintaining opportunities for physical activity in times of crisis is therefore important, and school closures and restrictions in the social life of young people require careful consideration.

Physical activity should be portrayed as an attractive lifestyle component to be integrated permanently in daily life (Gelius et al., 2020; Lange, 2023b). Implementing and sustaining an active lifestyle in youth requires social support from family and peers (Mendonça et al., 2014; Yao and Rhodes, 2015) as well as easy access to urban blue-green infrastructure (Kärmeniemi et al., 2018; Li and Lange, 2023). Digital eHealth interventions may be effective in preventing lifestyle-related risk behaviours and promoting physical activity in adolescents (Champion et al., 2019; Shin et al., 2019). Monitoring of physical fitness in children and adolescents at the national level will allow the introduction of targeted interventions for the promotion of physical activity (Marzi et al., 2022; Popovic et al., 2021). Large-scale campaigns are needed to make public places and facilities available for physical activities in order to increase the level of exercise taking place in multiple settings, such as neighbourhoods, schools and workplaces (Lange, 2022).

#### 4. Conclusion

Various public health measures during the COVID-19 pandemic limited the opportunities for physical activity in children and adolescents. Consequently, the insufficient pre-pandemic physical activity levels of the European youth further declined during the pandemic. The effects of the social and public health restrictions may contribute to long-term behavioural changes in children and adolescents, which could accelerate the decline in physical activity observed for over 20 years and may have a lasting impact on the health of the next generation. Rigorous strategies and policies including comprehensive school programmes to increase physical activity in young people are therefore urgently needed.

#### Conflict of interest

The authors declared no conflict of interest.

#### References

- Boelens, M., Smit, M.S., Raat, H., Bramer, W.M., and Jansen, W. (2022). Impact of organized activities on mental health in children and adolescents: an umbrella review. *Prev. Med. Rep.* 101687, 25.
- Chaabna, K., Chaabane, S., Jithesh, A., Doraiswamy, S., Mamtani, R., and Cheema, S. (2022). Effect of the COVID-19 pandemic on the proportion of physically active children and adults worldwide: a systematic review and meta-analysis. *Front. Publ. Health* 10, 1009703.
- Champion, K.E., Parmenter, B., McGowan, C., Spring, B., Wafford, Q.E., Gardner, L.A., Thornton, L., McBride, N., Barrett, E.L., Teesson, M., and Newton, N.C. (2019). Effectiveness of school-based eHealth interventions to prevent multiple lifestyle risk behaviours among adolescents: a systematic review and meta-analysis. *Lancet Digit. Health* 1, e206–e221.

- Dale, L.P., Vanderloo, L., Moore, S., and Faulkner, G. (2019). Physical activity and depression, anxiety, and self-esteem in children and youth: an umbrella systematic review. *Ment. Health Phys. Act.* 16, 66–79.
- Ding, D., Lawson, K.D., Kolbe-Alexander, T.L., Finkelstein, E.A., Katzmarzyk, P.T., van Mechelen, W., and Pratt, M. (2016). The economic burden of physical inactivity: a global analysis of major non-communicable diseases. *Lancet* 388, 1311–1324.
- Gardner, B., Sheals, K., Wardle, J., and McGowan, L. (2014). Putting habit into practice, and practice into habit: a process evaluation and exploration of the acceptability of a habit-based dietary behaviour change intervention. *Int. J. Behav. Nutr. Phys. Act.* 11, 135.
- Gelius, P., Messing, S., Goodwin, L., Schow, D., and Abu-Omar, K. (2020). What are effective policies for promoting physical activity? A systematic review of reviews. *Prev. Med. Rep.* 18, 101095.
- Guthold, R., Stevens, G.A., Riley, L.M., and Bull, F.C. (2020). Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1.6 million participants. *Lancet Child Adolesc. Health* 4, 23–35.
- Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., and Tatlow, H. (2021). A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nat. Hum. Behav.* 5, 529–538.
- Hawladar, M.D.H., Mozi, N.-E., Sharmin, S., Monju, I.H., Ahmed, S.B., Sarker, W., Amin, M.A., Jhumur, S.S., and Dalal, K. (2023). The art of forming habits: applying habit theory in changing physical activity behaviour. *J. Public Health* 31, 2045–2057.
- Hoffmann, M.D., Barnes, J.D., Tremblay, M.S., and Guerrero, M.D. (2022). Associations between organized sport participation and mental health difficulties: data from over 11,000 US children and adolescents. *PLoS One* 17, e0268583.
- Kärmeniemi, M., Lankila, T., Ikäheimo, T., Koivumaa-Honkanen, H., and Korpelainen, R. (2018). The built environment as a determinant of physical activity: a systematic review of longitudinal studies and natural experiments. *Ann. Behav. Med.* 52, 239–251.
- Katzmarzyk, P.T., Friedenreich, C., Shiroma, E.J., and Lee, I.-M. (2022). Physical inactivity and non-communicable disease burden in low-income, middle-income and high-income countries. *Br. J. Sports Med.* 56, 101–106.
- Lai, S.K., Costigan, S.A., Morgan, P.J., Lubans, D.R., Stodden, D.F., Salmon, J., and Barnett, L.M. (2014). Do school-based interventions focusing on physical activity, fitness, or fundamental movement skill competency produce a sustained impact in these outcomes in children and adolescents? A systematic review of follow-up studies. *Sports Med.* 44, 67–79.
- Lange, K.W. (2018). Diet, exercise, and mental disorders – public health challenges of the future. *Mov. Nutr. Health Dis.* 2, 39–59.
- Lange, K.W. (2020). Mental health problems in COVID-19 and the need for reliable data. *Mov. Nutr. Health Dis.* 4, 64–69.
- Lange, K.W. (2021). Coronavirus disease 2019 (COVID-19) and global mental health. *Glob. Health J.* 5, 31–36.
- Lange, K.W. (2022). Olympic Games, the pandemic of physical inactivity and sport as medicine. *J. Dis. Prev. Health Promot.* 6, 4–6.
- Lange, K.W. (2023a). Jeremy Morris as a pioneer of behavioural epidemiology, social medicine and public health. *Scand. J. Publ. Health.* DOI: 10.1177/14034948231218313.
- Lange, K.W. (2023b). Sport for health: a call for action. *J. Dis. Prev. Health Promot.* 7, 1–5.
- Lange, K.W., and Nakamura, Y. (2020). Lifestyle factors in the prevention of COVID-19. *Glob. Health J.* 4, 146–152.
- Lange, K.W., Nakamura, Y., and Lange, K.M. (2023a). Sport and exercise as medicine in the prevention and treatment of depression. *Front. Sports Act. Living* 5, 1136314.
- Lange, K.W., Nakamura, Y., and Reissmann, A. (2023b). Sport and physical exercise in sustainable mental health care of common mental disorders: lessons from the COVID-19 pandemic. *Sports Med. Health Sci.* 5, 151–155.
- Lange, S.J., Kompaniyets, L., Freedman, D.S., Kraus, E.M., Porter, R., Blanck, H.M., and Goodman, A.B. (2021). Longitudinal trends in body mass index before and during the COVID-19 pandemic among persons aged 2–19 years – United States, 2018–2020. *MMWR Morb. Mortal. Wkly Rep.* 70, 1278–1283.
- Li, L., and Lange, K.W. (2023). Assessing the relationship between urban blue-green infrastructure and stress resilience in real settings: a systematic review. *Sustainability* 15, 9240.

- Ludwig-Walz, H., Dannheim, I., Pfadenhauer, L.M., Fegert, J.M., and Bujard, M. (2022). Increase of depression among children and adolescents after the onset of the COVID-19 pandemic in Europe: a systematic review and meta-analysis. *Child Adolesc. Psychiatry Ment. Health* 16, 109.
- Ludwig-Walz, H., Dannheim, I., Pfadenhauer, L.M., Fegert, J.M., and Bujard, M. (2023a). Anxiety increased among children and adolescents during pandemic-related school closures in Europe: a systematic review and meta-analysis. *Child Adolesc. Psychiatry Ment. Health* 17, 74.
- Ludwig-Walz, H., Siemens, W., Heinisch, S., Dannheim, I., Loss, J., and Bujard, M. (2023b). How the COVID-19 pandemic and related school closures reduce physical activity among children and adolescents in the WHO European Region: a systematic review and meta-analysis. *Int. J. Behav. Nutr. Phys. Act.* 20, 149.
- Madigan, S., Eirich, R., Pador, P., McArthur, B.A., and Neville, R.D. (2022). Assessment of changes in child and adolescent screen time during the COVID-19 pandemic: a systematic review and meta-analysis. *JAMA Pediatr.* 176, 1188–1198.
- Marconcin, P., Werneck, A.O., Peralta, M., Ihle, A., Gouveia, É.R., Ferrari, G., Sarmento, H., and Marques, A. (2022). The association between physical activity and mental health during the first year of the COVID-19 pandemic: a systematic review. *BMC Public Health* 22, 209.
- Marzi, I., Tcymbal, A., Gelius, P., Abu-Omar, K., Reimers, A.K., Whiting, S., and Wickramasinghe, K. (2022). Monitoring of physical activity promotion in children and adolescents in the EU: current status and future perspectives. *Eur. J. Public Health* 32, 95–104.
- Mendonça, G., Cheng, L.A., Mélo, E.N., and de Farias Júnior, J.C. (2014). Physical activity and social support in adolescents: a systematic review. *Health Educ. Res.* 29, 822–839.
- Neville, R.D., Lakes, K.D., Hopkins, W.G., Tarantino, G., Draper, C.E., Beck, R., and Madigan, S. (2022). Global changes in child and adolescent physical activity during the COVID-19 pandemic: a systematic review and meta-analysis. *JAMA Pediatr.* 176, 886–894.
- Popovic, S., Sarmento, H., Demetriou, Y., and Marques, A. (2021). Editorial: Monitoring and promoting physical activity and physical fitness in children. *Public Health* 9, 633457.
- Renninger, M., Hansen, B.H., Steene-Johannessen, J., Kriemler, S., Froberg, K., Northstone, K., Sardinha, L., Anderssen, S.A., Andersen, L.B., and Ekelund, U. (2020). Associations between accelerometry measured physical activity and sedentary time and the metabolic syndrome: a meta-analysis of more than 6000 children and adolescents. *Pediatr. Obes.* 15, e12578.
- Ruhland, S., and Lange, K.W. (2021). Effect of classroom-based physical activity interventions on attention and on-task behavior in schoolchildren: a systematic review. *Sports Med. Health Sci.* 3, 125–133.
- Shin, Y., Kim, S.K., and Lee, M. (2019). Mobile phone interventions to improve adolescents' physical health: a systematic review and meta-analysis. *Public Health Nurs.* 36, 787–799.
- Skrede, T., Steene-Johannessen, J., Anderssen, S.A., Resaland, G.K., and Ekelund, U. (2019). The prospective association between objectively measured sedentary time, moderate-to-vigorous physical activity and cardiometabolic risk factors in youth: a systematic review and meta-analysis. *Obes. Rev.* 20, 55–74.
- Stockwell, S., Trott, M., Tully, M., Shin, J., Barnett, Y., Butler, L., McDermott, D., Schuch, F., and Smith, L. (2021). Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. *BMJ Open Sport Exerc. Med.* 7, e000960.
- Sutherland, R.L., Campbell, E.M., Lubans, D.R., Morgan, P.J., Nathan, N.K., Wolfenden, L., Okely, A.D., Gillham, K.E., Hollis, J.L., Oldmeadow, C.J., Williams, A.J., Davies, L.J., Wiese, J.S., Bisquera, A., and Wiggers, J.H. (2016). The physical activity 4 everyone cluster randomized trial: 2-year outcomes of a school physical activity intervention among adolescents. *Am. J. Prev. Med.* 51, 195–205.
- Telama, R. (2009). Tracking of physical activity from childhood to adulthood: a review. *Obes. Facts* 2, 187–195.
- van Sluijs, E.M.F., Ekelund, U., Crochemore-Silva, I., Guthold, R., Ha, A., Lubans, D., Oyeyemi, A.L., Ding, D., and Katzmarzyk, P.T. (2021). Physical activity behaviours in adolescence: current evidence and opportunities for intervention. *Lancet* 398, 429–442.
- Vazou, S., Pesce, C., Lakes, K., and Smiley-Oyen, A. (2019). More than one road leads to Rome: a narrative review and meta-analysis of physical activity intervention effects on cognition in youth. *Int. J. Sport Exerc. Psychol.* 17, 153–178.
- Walker, R., House, D., Emm-Collison, L., Salway, R., Tibbitts, B., Sansum, K., Reid, T., Breheny, K., Churchward, S., Williams, J.G., de Vocht, F., Hollingworth, W., Foster, C., and Jago, R. (2022). A multi-perspective qualitative exploration of the reasons for changes in the physical activity among 10–11-year-old children following the easing of the COVID-19 lockdown in the UK in 2021. *Int. J. Behav. Nutr. Phys. Act.* 19, 114.
- Wang, X., Cai, Z.-D., Jiang, W.-T., Fang, Y.-Y., Sun, W.-X., and Wang, X. (2022). Systematic review and meta-analysis of the effects of exercise on depression in adolescents. *Child Adolesc. Psychiatry Ment. Health* 16, 16.
- Woods, C.B., Volf, K., Kelly, L., Casey, B., Gelius, P., Messing, S., Forberger, S., Lakerveld, J., Zukowska, J., and García Bengoechea, E. (2021). The evidence for the impact of policy on physical activity outcomes within the school setting: a systematic review. *J. Sport Health Sci.* 10, 263–276.
- World Health Organisation (2019). Global action plan on physical activity 2018–2030: more active people for a healthier world. Geneva: World Health Organisation.
- World Health Organisation (2020). WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organisation.
- World Health Organisation (2021). 2021 physical activity factsheets for the European Union Member States in the WHO European Region. Copenhagen: WHO Regional Office for Europe.
- Yao, C.A., and Rhodes, R.E. (2015). Parental correlates in child and adolescent physical activity: a meta-analysis. *Int. J. Behav. Nutr. Phys. Act.* 12, 10.