



HOW SPORTS MAKE KIDS FEEL BETTER

Riikka J. Karjalainen^{1,2†}, Léon R. Equinet^{1,2†}, Pauline W. Jansen^{1,2,3*}, Ryan L. Muetzel² and María Rodríguez-Ayllon^{4,5,6}

¹Department of Psychology, Education and Child Studies, Erasmus School of Social and Behavioural Sciences, Erasmus University, Rotterdam, Netherlands

²Department of Child and Adolescent Psychiatry/Psychology, Erasmus University Medical Center, Rotterdam, Netherlands

³The Generation R Study Group, Erasmus University Medical Center, Rotterdam, Netherlands

⁴Department of Epidemiology, Erasmus University Medical Center, Rotterdam, Netherlands

⁵Biomedical Research Institute of Malaga (IBIMA Platform Bionand), Malaga, Spain

⁶Prevention and Health Promotion Research Network (redIAPP) & Chronicity, Primary Care and Health Promotion Research Network (RICAPPS), Institute Carlos III (ISCIII), Madrid, Spain

YOUNG REVIEWERS:



LUCY
AGE: 15



RAY
AGE: 14



TORBEN
AGE: 15

Can sports make a difference in how you feel? We studied this question in 4,000 children in Rotterdam, the Netherlands. We found that children who played sports had fewer emotional problems, such as worrying or feeling sad. Curious to find out why, we explored various mechanisms that might explain how sports can affect mental health. Overall, we identified that self-esteem, which is how you perceive and feel about yourself, was the primary way that sports participation might help prevent or reduce emotional issues and concerns. In simpler terms, playing sports can boost your self-esteem, which in turn helps you deal with emotional

problems and worries. We also explored biological mechanisms (for example, brain size) and behavioral mechanisms (for example, sleep quality), but these did not explain the link between sports and mental health. Overall, the study showed that playing sports can potentially help young people feel better about themselves and boost their moods.

HOW PARTICIPATING IN SPORTS HELPS KIDS' FEELINGS

The journey of growing up from a child to an adolescent and eventually to an adult involves many changes and developments, both in people's bodies and our minds. We are curious about how kids can keep their minds healthy as they get older. When growing up, some children start to feel sad or experience more worries. If these feelings stick around and make kids feel really down, it may be necessary to get some help from a psychologist to start feeling better again. But do not worry, many people experience such feelings occasionally, and they often improve over time. Importantly, kids can do things to help themselves feel better! In the study we describe in this article, we explored things that can help children feel better and remain mentally healthy while growing up. Such protective factors act like shields to protect kids' minds from feeling too sad or anxious. Previous studies showed that **physical activity** (moving the body in various ways) is one important protective factor [1, 2]. Scientists have learned that playing outside, participating in sports, and generally staying active can help children's minds feel happier and healthier—and it may even protect their minds from negative feelings like sadness, anxiety, or worries. These negative feelings are called **emotional problems**. But how does this work? How can moving their bodies protect kids from emotional problems?

Scientists have found some specific ways that staying active might help reduce negative feelings. However, they still do not completely understand how all these factors work together. We believe physical activity can protect young people's minds through many different processes. So, the goal of our study was to figure out the main paths through which physical activity can help reduce emotional problems in young people by looking at it from a broader, more connected viewpoint. For that purpose, we investigated three types of mechanisms that might explain how physical activity may lead to a happier, healthier mind. These are called **neurobiological mechanisms**, **psychosocial mechanisms**, and **behavioral mechanisms**.

NEUROBIOLOGICAL MECHANISMS

Neurobiological mechanisms suggest that physical activity could benefit your brain. The brain is like a control center, helping you do

PHYSICAL ACTIVITY

Moving the body in various ways, including playing outside, going to school by bike, playing sports, or going to physical education class.

EMOTIONAL PROBLEMS

Feelings and behaviors that are difficult to see but can be upsetting or overwhelming. Some examples are feeling scared or being very nervous.

NEUROBIOLOGICAL MECHANISMS

Brain and nervous system processes that affect how people think, feel, and behave.

PSYCHOSOCIAL MECHANISMS

How people's thoughts, feelings, and social interactions influence their mental health and well-being.

BEHAVIORAL MECHANISMS

Actions and habits (e.g., sleep) people develop that can be affected by other actions (e.g., physical activity) and, in turn, affect mental health and well-being.

NEURONS

Cells that send messages from one part of the body to another. They help to think, feel, move, and remember things by carrying information quickly between different parts of the body.

SELF-ESTEEM

The way people view or evaluate themselves in various areas, such as how they feel about their bodies, their abilities, and how they are doing in life.

STATISTICAL ANALYSIS

The use of math to analyze data, find patterns, and make predictions. It helps scientists understand large amounts of information and figure out what works or does not work.

everything you do, like thinking, moving, and feeling. The brain also helps you understand the world around you. But the brain is not just one big, mushy organ. It is made up of lots of tiny cells called **neurons**. Physical activity helps neurons work together to make your brain function properly and, in turn, decrease the risk of developing emotional problems [3]. You can think about the brain as a muscle, getting stronger with exercise.

PSYCHOSOCIAL MECHANISMS

Psychosocial mechanisms suggest that physical activity can help you feel connected to yourself and others, which can help to reduce emotional problems. These connections could be through a sports team or club or making friends during playtime [4]. Furthermore, improving in sports could help kids feel more confident about themselves and increase their **self-esteem** (how good people feel about themselves).

BEHAVIORAL MECHANISMS

Being physically active and participating in physical education in school does not only make you feel good—it can also help you to develop long-lasting healthy habits. Physical activity helps you sleep better, encourages you to eat well, and helps you spend less time in front of screens. These are called healthy behavior habits, and they have a good influence on your mood. Imagine how you feel when you get a really good night's sleep, for example, compared to a night when you do not sleep well. So, healthy behavior habits can help keep you happy and prevent the development of emotional problems [5].

PLAYING SPORTS CAN HELP KIDS FEEL BETTER

Our study used data from the Generation R project. Generation R is a long-term project that started in 2002–2004 and followed children from before they were born. Today, the participants are young adults. More than 4,000 young people participated in the Generation R project, and we collected data at the ages of 5, 10, and 13. The participants are from Rotterdam, a city in the Netherlands. The aim of this study is to understand why some children grow up healthy, and others face challenges in their physical or mental development.

In this study, we aimed to find out which kinds of physical activities make some kids feel better. To do so, we ran a **statistical analysis** called Pearson correlation, which is a way to figure out how two things are related to each other. Imagine you want to know if studying more leads to better grades. Pearson correlation helps you see if there is a pattern between how much time you spend studying and your grades.

To start, we discovered that 6-year-olds who play sports had fewer feelings of being upset when they became teenagers. We did not see the same link for other types of physical activities, like playing outside or walking or biking to school (Figure 1). Remember, we were also curious about how things like the brain (a neurobiological mechanism), social connections (a psychosocial mechanism), and behavior habits (a behavioral mechanism) could explain why practicing sports is related to fewer emotional problems, like sadness and worry. So, we did another statistical test called mediation analysis, which is a way to understand how one thing leads to another through a third thing in the middle. Imagine you want to know how physical activity makes kids feel happier. Mediation analysis helps you figure out if something else, like better sleep, is the reason why physical activity leads to happiness. So, instead of just saying, “Physical activity makes you happy”, it might be: “Physical activity helps you sleep better, and better sleep makes you feel happier”. In other words, mediation analysis helps find the “in-between” reasons that explain how one thing (physical activity) is related to another (emotional problems).

Figure 1

Physical activity involves various ways of moving the body, including active school travel, physical education, sports, or playing outside. As highlighted in green, according to our study, playing sports during childhood was the only physical activity linked to feeling better emotionally in the early teenage years. 6y means data were collected when children were 6 years old. 13y means data were collected when children were 13 years old.

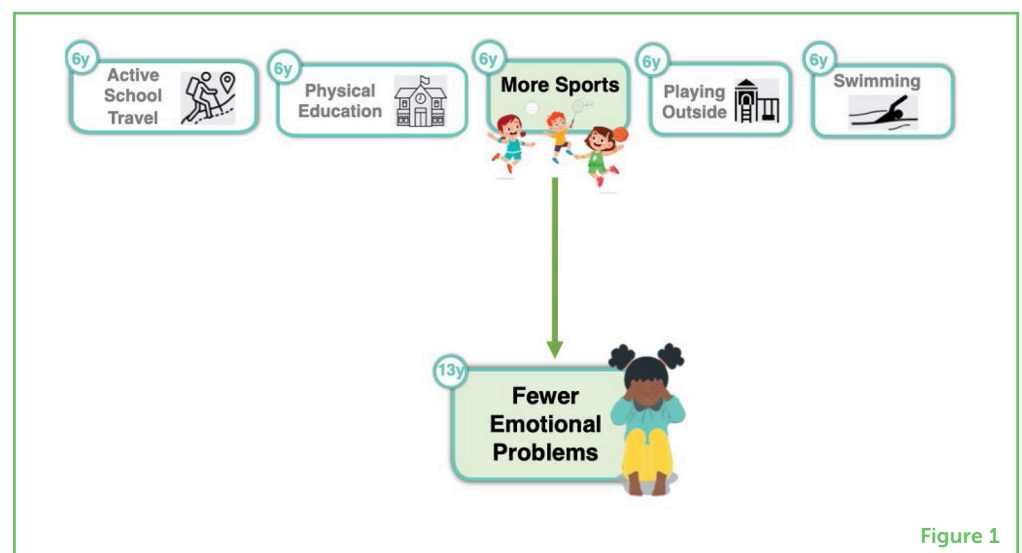


Figure 1

FEELING CONNECTED THROUGH SPORTS HELPS KIDS' SELF-ESTEEM

Overall, we found that only the psychosocial mechanism might explain how sports protect against emotional problems (Figure 2). The psychosocial mechanism tells us that when kids are active, it is not just about moving their bodies. It is about feeling connected with others, like making friends during sports. Practicing sports could help kids fulfill the human need to be with others. Self-esteem turned out to be particularly important. Doing sports could help to make kids feel better about themselves, which could help them handle worries, sadness, and anxiety better. During sports practice, kids learn new skills or improve the ones they already know, which can boost self-esteem.

Other psychosocial mechanisms, such as making friends in sports and having a better self-image, were not found to be as important as self-esteem.

Figure 2

We examined three types of mechanisms that might connect sports participation to fewer emotional problems in young people. The green arrows indicate that self-esteem was the primary mechanism through which sports participation might help prevent or lessen emotional problems. Self-esteem means how kids see themselves and feel about themselves. Sports could help feeling better emotionally by self-esteem.

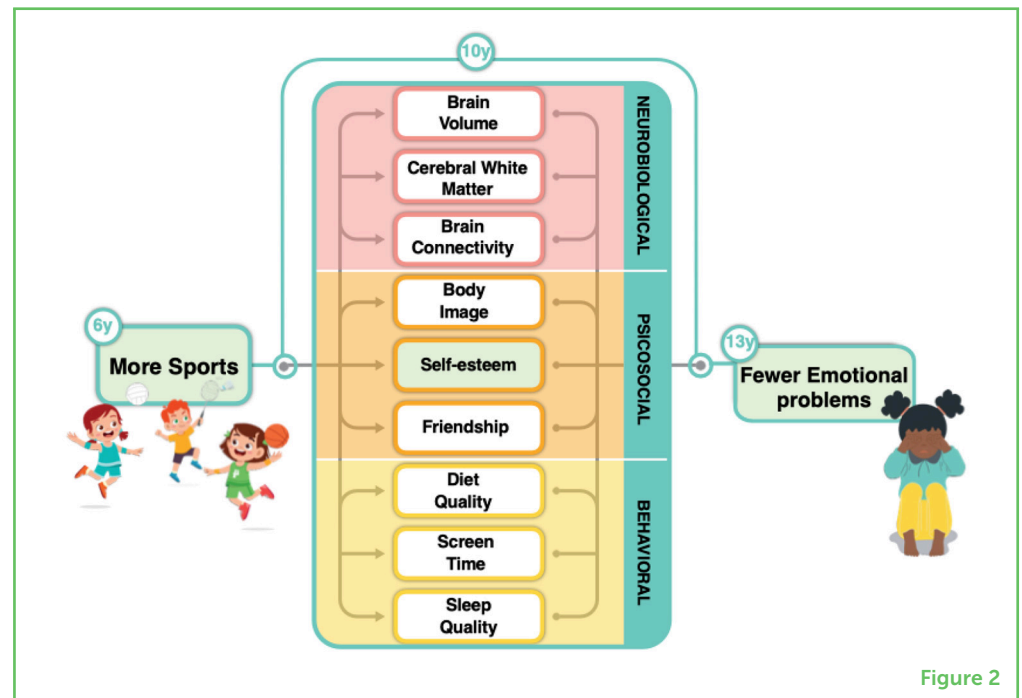


Figure 2

We did not find enough proof to show that other things besides self-esteem, like kids' brains or their habits, make a big difference in emotional problems. However, other scientists found evidence both for and against the role of neurobiological mechanisms—so some scientists concluded this mechanism to be meaningful while others did not. Similarly, there was not enough evidence for behavioral mechanisms, which involve whether things like healthy food, reduced screen time, or improved sleep quality can protect against emotional problems.

To summarize, in our study, only self-esteem was found to explain the relationship between sports participation and fewer emotional problems. We learned that feeling good about themselves is a big strength and a protective factor that could explain why being active in sports can make kids feel better emotionally.

WHAT IS SELF-ESTEEM AND HOW CAN YOU IMPROVE IT?

Self-esteem can be divided into several areas because there might be differences in how you see yourself in various aspects of your life. For example, some children think they are great at school but are less confident in their sports abilities. In our study, we found that youth who think they are good at sports were more likely to experience positive

effects on their overall mental health. That is why it is important to pick a sport you like—one you think you can do well at and develop further skills in. A sport that fits your classmate might not fit you! It is important to find which sport matches your unique skills and makes you feel happy. Try different sports to find out what you like the best.

The Big Point to Remember

From childhood to adolescence, several exciting changes happen in kids' bodies and minds. We wanted to explore how kids can shield their minds from emotional problems. Being anxious or sad is a normal part of life, but sometimes, it can become too much. We discovered that physical activity can be a protective factor and that it seems to influence emotional problems through psychosocial mechanisms. Such mechanisms involve connecting with others, making new friends, and gaining more confidence in your unique abilities and skills, which can help you to develop higher self-esteem.

It is important to keep in mind that our study has some limitations. Because we just observed people's behavior, we can only show that two things are related (like exercise and happiness), but we cannot prove that one thing causes the other. We also looked at physical activity and other factors all at the same time, which did not let us see how these things change as kids grow up. Finally, future studies could use devices like fitness watches to measure how much kids really move rather than relying on parents' reports of how active their kids are, which might not always be accurate. In the future, work to address these limitations could give researchers even more insight into how physical activity can act as a superhero shield to help promote better mental health!

AI TOOLS STATEMENT

The author employed AI-assisted tools to refine the text and improve its readability during the preparation of this work. Editorial revisions were subsequently carried out to further develop the manuscript. The author carefully reviewed and edited the content to guarantee its accuracy, originality, and compliance with the journal's requirements, assuming full responsibility for the final submission.

ORIGINAL SOURCE ARTICLE

Rodriguez-Ayllon, M., Neumann, A., Hofman, A., Voortman, T., Lubans, D. R., Yang-Huang, J., et al. 2023. Neurobiological, psychosocial, and behavioral mechanisms mediating associations between physical activity and psychiatric symptoms in youth in the Netherlands. *JAMA Psychiatry* 80:451–458. doi: 10.1001/jamapsychiatry.2023.0294

REFERENCES

1. Rodriguez-Ayllon, M., Cadenas-Sánchez, C., Estévez-López, F., Muñoz, N. E., Mora-Gonzalez, J., Migueles, J. H., et al. Role of physical activity and sedentary behavior in the mental health of preschoolers, children, and adolescents: a systematic review and meta-analysis. *Sports Med.* (2019) 49:1383–410. doi: 10.1007/s40279-019-01099-5
2. Rodriguez-Ayllon, M., Estévez-López, F., Cadenas-Sanchez, C., Gracia-Marco, L., Lubans, D. R., Ortega, F. B., et al. 2019. Physical activity, sedentary behavior, and mental health in young people: a review of reviews. *Adolesc. Health Wellbeing* 2019:35–73. doi: 10.1007/978-3-030-25816-0_3
3. Stillman, C. M., Esteban-Cornejo, I., Brown, B., Bender, C. M., and Erickson, K. I. 2020. Effects of exercise on brain and cognition across age groups and health states. *Trends Neurosci.* 43:533–43. doi: 10.1016/j.tins.2020.04.010
4. Conley, M. I., Hindley, I., Baskin-Sommers, A., Gee, D. G., Casey, B., and Rosenberg, M. D. 2020. The importance of social factors in the association between physical activity and depression in children. *Child Adolesc. Psychiat. Mental Health* 14:1–15. doi: 10.1186/s13034-020-00335-5
5. Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., et al. 2016. Physical activity for cognitive and mental health in youth: a systematic review of mechanisms. *Pediatrics* 138:e20161642. doi: 10.1542/peds.2016-1642

SUBMITTED: 22 February 2024; **ACCEPTED:** 07 April 2025;
PUBLISHED ONLINE: 12 May 2025.

EDITOR: Rajesh Kumar Kana, University of Alabama at Birmingham, United States

SCIENCE MENTORS: Yuki Kikuchi and Vonnie Denise Christine Shields

CITATION: Karjalainen RJ, Equinet LR, Jansen PW, Muetzel RL and Rodriguez-Ayllon M (2025) How Sports Make Kids Feel Better. *Front. Young Minds* 13:1390139. doi: 10.3389/frym.2025.1390139

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

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YOUNG REVIEWERS

LUCY, AGE: 15

Hai! My name is Lucy and I am 15 years old. I love to make art and learn new instruments in my spare time.

RAY, AGE: 14

My name is Ray and I am 13 years old. I have many interests such as birdwatching, mathematics, and unicycling. I like psychology and neurology since they are interesting fields of science with a diverse array of different topics.

TORBEN, AGE: 15

Torben is motivated, talented, and intelligent. In school, he likes science, math, music, history, and economics. He loves to read books and is learning Spanish and German. He plays piano and sings in several choirs and has won many local and national music awards. He has a special interest in neuroscience-related topics. He enjoys biking, soccer, hiking, swimming, waterskiing, scuba diving, horseback riding, and other activities that he carries out with his boyscout troop.

AUTHORS

RIIKKA J. KARJALAINEN

I am a master's student in Clinical Psychology at Erasmus University. I wrote my thesis on sports participation and academic achievement, and whether this relationship is influenced by self-esteem. I am interning as a psychologist in adult psychiatry and will be working as a school psychologist after graduating. I hope to bring more of a preventive perspective to schools through work.

LÉON R. EQUINET

I completed my master's degree in Clinical Psychology at Erasmus University Rotterdam in the Netherlands. I am currently working as an assistant in the Department of Neuropsychology in a rehabilitation center, and I am also working on the publication of my master's thesis. There, I explored the relationship between sports participation and self-esteem in youth more deeply by investigating the role of different types of sports. Educating children and adolescents on how to live a healthy lifestyle is really important to me. Hopefully, the importance of the prevention of mental health issues during developmental stages can gain more attention over the next few years.

PAULINE W. JANSEN

As a professor in Developmental Psychopathology, I am interested in the development of children and adolescents and aim to unravel why some children develop mental health problems while others grow up without any problems. For this, I use data from population-based birth cohorts like Generation R. In this

cohort, we follow a large group of up growing youth by repeatedly collecting information on how they are doing. I hold a combined position at the Department of Psychology, Education, and Child Studies of Erasmus University and the Department of Child and Adolescent Psychiatry/Psychology of the Erasmus Medical Centre. In these roles, I am involved in teaching activities for Psychology students and coordinate and supervise research on mental health within Generation R. [*p.w.jansen@erasmusmc.nl](mailto:p.w.jansen@erasmusmc.nl)



RYAN L. MUETZEL

I am an Assistant Professor in the Department of Child and Adolescent Psychiatry/Psychology as well as the Department of Radiology and Nuclear Medicine at the Erasmus MC in Rotterdam, the Netherlands. My lab primarily focuses on deepening our understanding of how the brain develops, particularly in the context of mental health and corresponding risk and resilience factors. To conduct my research, I use data from and lead the neuroimaging program within the Generation R Study, one of the largest neurodevelopmental cohorts in the world.



MARÍA RODRIGUEZ-AYLLON

I am a postdoctoral researcher at Erasmus Medical Center with the ambition of designing effective lifestyle interventions to protect young people's mental health. As a child, I was lucky to be able to experience the benefits of practicing sports. Ever since, I have been interested in understanding how sports affect health, which guided my study choices: I obtained a BSc and MSc in sports sciences at the University of Granada, Spain. Then, I conducted my PhD within the ActiveBrains project, whose aim was to explore the effects of a 20-week exercise program on children's brain, cognitive, and mental health.

[†]These authors have contributed equally to this work