Active Bodies, Active Minds

How physical activity can improve learning for tamariki and rangatahi

SPORT NEW ZEALAND
IHI AOTEAROA

Introduction

The education sector in Aotearoa is facing many challenges, including variable achievement statistics (most pronounced for low income, Māori and Pacific students), attendance rates and increasing mental health challenges. However, a growing body of evidence supports the positive role that physical activity (including organised sport) can play in addressing these challenges and giving the next generation the skills and knowledge they need to succeed.

Sport New Zealand aims to maintain and improve the physical activity levels of tamariki and rangatahi in Aotearoa. In line with our strategic priority of 'active schools and kura', we support schools and kura to provide quality play, active recreation and sport opportunities.

This report highlights how physical activity can improve learning for tamariki and rangatahi. It consolidates the findings from both international and national research published in peer-reviewed journals. These show clear evidence that physically active tamariki and rangatahi:

- engage more in learning
- stay in school longer
- have higher levels of achievement
- experience higher levels of mental wellbeing.

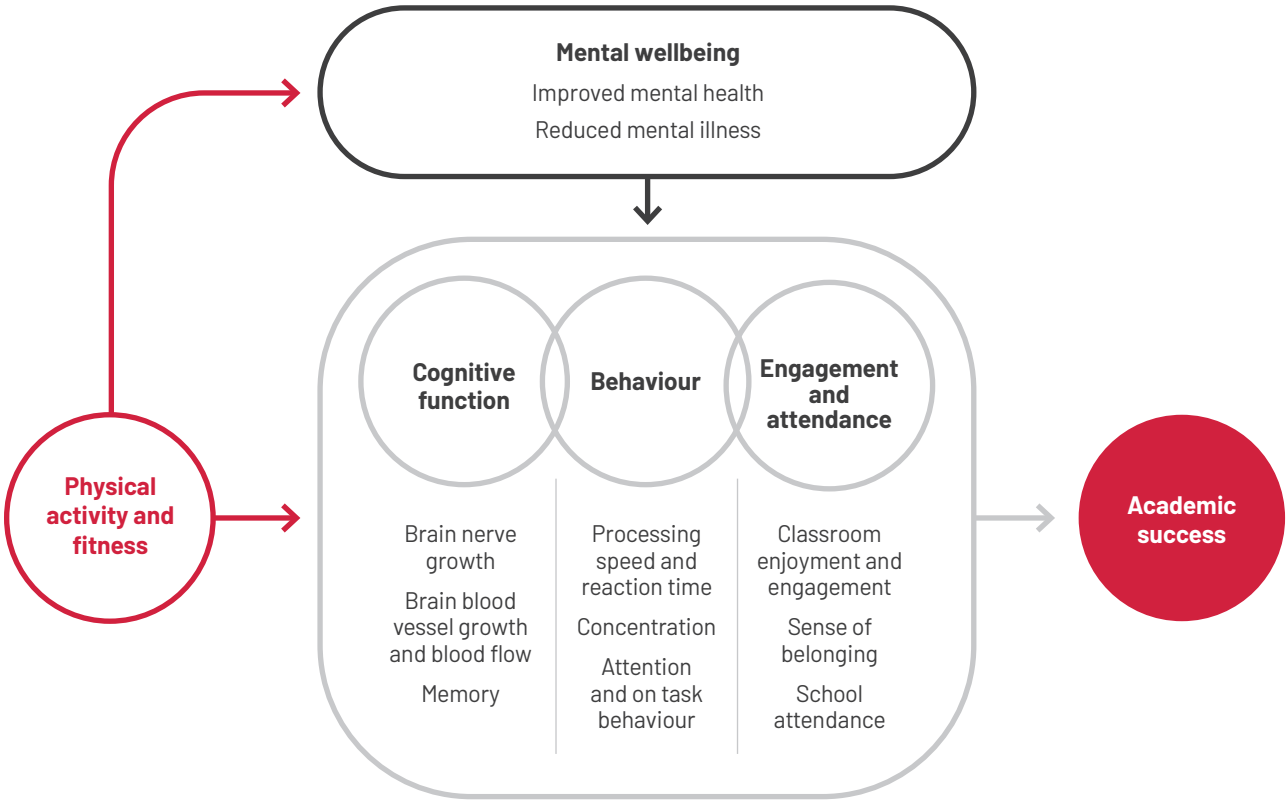
The research highlights that increased time allocated to physical activity – whether through sport, physical education (PE), integrated learning, brain breaks, free play at break time, or Education Outside the Classroom (EOTC) – can positively impact engagement and success at school. Ultimately, it can set our tamariki and rangatahi up for improved life outcomes not just as youth, but right through their adult years.

Who is this report for?

This report is intended for anybody who is interested in understanding or advocating for the role of physical activity in schools and kura.

This might include:

- Principals or teachers creating a compelling business case to the board for greater investment in physical activity initiatives.
- Sport and active recreation organisations advocating to schools, funders, or the Ministry of Education.
- Individuals, organisations, or community groups gathering evidence to support the design of new initiatives working to address educational challenges.



About the evidence and terms used in this report

Most of the evidence in this report comes from systematic reviews and meta-analyses. These types of studies are considered the most trusted form of evidence because they critically interpret the results from a large number of published studies on the same topic area. Umbrella Reviews have also been used. These are an evaluation of a number of systematic reviews and provide an even higher level of confidence in the findings.

An international consensus statement is a critical analysis of a specific topic, based on current research, by a group of experts in the field.

Where review-level evidence was not readily available, intervention studies have also been included. When possible, the intervention studies in this report have included a control and/or comparison group.

Some evidence from cohort studies (which look at the same group of people over an extended period of time) and cross-sectional studies (which look at a population group at a single point in time) has also been included in this report. Although a critical part of the evidence landscape, these types of studies offer a lower level of certainty about the direction of causation.

In this report, we consistently refer to young people as tamariki and rangatahi, regardless of the terms used in the evidence.

We generally use the term 'physical activity' to include play, active recreation, sport and PE, unless specified otherwise in the evidence.

In this report

Physical activity and academic success

What does the evidence tell us?

Most internationally published peer-reviewed research provides evidence of a positive relationship between physical activity and better academic achievement across many subject areas. A variety of physical activity interventions have shown potential for improved academic outcomes, including through sport, physical education, learning integration, unstructured play, brain breaks and Education Outside the Classroom (EOTC).

Summary of evidence

- Two umbrella reviews (of systematic reviews and meta-analyses) reported small to medium positive associations between physical activity and academic outcomes for tamariki and rangatahi.[1,2]
- Multiple studies have found that physical activity and increased cardiorespiratory fitness can positively impact academic outcomes across a number of subject areas, including maths, reading, spelling and language development.[1, 3, 4, 5, 6, 7, 8, 9]
- Benefits of guided play have been found across subject areas, including maths and literacy.[10]
- An international consensus statement highlighted that time taken away from academic lessons in favour of physical activity does not come at the cost of academic performance in tamariki and rangatahi.[11]
- A New Zealand study found that higher numbers of Māori and Pacific secondary students take Health and Physical Education (HPE) as a subject and experience a comparatively higher level of success in this learning area than other subject areas. This suggests that for some Māori and Pacific students, experiencing success with courses within the HPE learning area may help support their engagement and achievement in other areas.[12]
- A meta-analysis found that both interventions using single sessions and interventions with repeated sessions over a longer period of time at school can improve cognitive outcomes and academic performance for rangatahi.[7, 11, 13, 14]

A variety of approaches to integrating physical activity into educational settings have been found to be effective

- An international consensus statement stated that physical activity before, during and after school promotes academic performance in tamariki and rangatahi. However, a 2022 systematic review found participation during school hours to be the most beneficial for academic performance.[11, 15]
- Studies have found that sport participation had a positive effect on numeracy, literacy and overall academic performance.[15, 19, 20, 21, 22]
- The relationship between sport participation and academic achievement appears to be impacted by how often tamariki and rangatahi are participating. One study found that sports participation was most beneficial for academic performance when it was at a moderate dose (1–2 hours per week), compared with no sport or a high dose of sport (3+ hours per week).[15, 19, 20, 21]
- Systematic reviews have found evidence that integration of physical activity into classroom lessons benefited maths-related skills and wider academic achievement.[13, 16]
- A randomised, controlled trial integrating physical activity into learning resulted in an estimated additional four months of learning gains for students in spelling and maths compared with the control group.[6]
- Several intervention studies have found that physical activity breaks immediately before learning were effective in improving students' on-task behaviour and academic scores. Findings suggest that short, moderate-intensity bouts of physical activity are more effective than longer bouts.[17, 18]
- International studies have found that regular exposure to EOTC, particularly in natural environments, is positively associated with academic outcomes across a number of subject areas, including reading performance and maths.[23]

+4 months

Integrating physical activity into learning resulted in an additional four months of learning gains for students in spelling and maths.[6]

Case studies

Celebrating the impact of playing sport on attendance and achievement at secondary school

In 2023, Wellington High School principal, Dominic Killalea and Palmerston North Boys' High School rector, David Bovey took a close look at student data to better understand the relationship between students' participation in co-curricular activities and improved attendance and achievement. They'd both had a hunch for many years that there would be a correlation.

Speaking of what he found, Bovey said, "Attendance of those who participated in co-curricular activities was on average 8.3 percentage points higher than those who did not. In terms of achievement for Year 9 and 10s, average achievement across core subjects was on average 7.6 percentage points higher for students that participated in co-curricular activities. For students in Year 11-13, NCEA credits were on average 7.8 to 28.2 NCEA credits higher compared to those students who did not participate."

The results were similar at Wellington High School. In 2023, the average attendance of students who participated in at least one sport, cultural activity or club was 15 percentage points higher than those who didn't participate in any sport, cultural activity or club.

> **"Our philosophy in relation to sport is that there should be a level at which every student can participate and enjoy themselves. This is because students build connections with other students through these activities – they become part of a team, and the team depends on them. At the same time, they are building friendships which they want to further cultivate at school."**

Dominic Killalea
Wellington High School principal

Play Lab – using play to introduce maths concepts in a fun and engaging way at Kaikorai Valley College

Play Lab is a tool for teachers to support students to learn through movement, with a focus on tamariki whaikaha (disabled children). Sport NZ's Disability Inclusion Fund has supported Sport Otago to introduce Play Lab to 15 schools across Otago. Play Lab is a valuable tool, both for managing behavioural challenges and for non-disabled learners who become disengaged with traditional learning. A major outcome is seeing Play Lab foster inclusion of all students within unstructured and free play.

Read the full case study and watch the video

> **"It's getting involved with maths in a really fun way. I think that's probably a real key to realise maths happens in the world around us. It's just that fun, engaging motivation that the students need at this age."**

Nicole Lowery, Year 7 teacher
Kaikorai Valley College

Physical activity and cognition

What does the evidence tell us?

Increasing physical activity and cardiorespiratory fitness is beneficial to brain structure, function and cognition in tamariki and rangatahi. This in turn may establish the foundation upon which improvements in academic achievement are realised.

Summary of evidence

Brain development

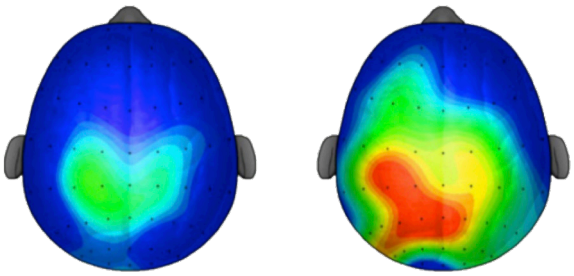
- Systematic reviews and an international consensus statement have provided evidence that physical activity and cardiorespiratory fitness are related to enhanced brain structure and function in tamariki and rangatahi.[11, 13, 24]
- Systematic review and intervention studies have found aerobic exercise and improvements in cardiorespiratory fitness in tamariki and rangatahi:
  - can increase the growth, density and efficiency of neural resources in regions of the brain that support adaptation to task demands, fatigue, attention, memory and learning.[1, 24, 25, 26]
  - can enhance the integrity of white matter tracts in the regions of the brain important for cognitive processes.[24, 27]
  - can improve vasculature and blood circulation in regions of the brain important for learning and memory.[28]

Cognition

- International umbrella and systematic reviews have found evidence of a relationship between physical activity and cognitive function in tamariki and rangatahi across several domains, including working memory, attention, time on-task, cognitive flexibility and cognitive life skills.[2, 29, 30]
- The cognitive outcomes for tamariki and rangatahi of single physical activity sessions (acute) and repeated physical activity sessions over time (chronic), are slightly different:

  Acute physical activity – positive effect on physiological arousal and attention, response accuracy, attention, processing speed and inhibition.[1, 14, 29]

Image showing students' neural activity during a test after sitting (left image) or walking for 20 minutes (right image). Blue represents lower neural activity, red represents higher activity.[29]



Chronic physical activity – positive effect on processing speed, attention, cognitive flexibility, language and working memory.[14]

Physical activity and school engagement and attendance

What does the evidence tell us?

Attendance and engagement are intrinsically linked to education success. Research internationally and in New Zealand has found that integrating more physical activity into schools, including in-classroom time, can improve social skills, a sense of belonging and identity, classroom engagement, and increase attendance rates. Many of these benefits continue through to adult years, better equipping individuals to reach their potential.

Summary of evidence

Engagement

- International umbrella and systematic reviews found that increased physical activity can improve school engagement, including time on-task, concentration, lesson enjoyment and academic motivation.[2, 16, 30]
- Two intervention studies in the United States and Australia found that integrating physical activity into classroom time increased time on-task by around 20% compared with those in the control group.[5, 17]
- International evidence suggests a positive relationship between participation in physical activity (particularly sport) and improved social skills, communication skills, teamwork, resilience and pro-social behaviour for tamariki and rangatahi.[38, 39, 40, 41]
- The Ka Awatea research project found that Māori students' concept of belonging and success at school is grounded in cultural identity and being able to engage meaningfully with Māori culture. Games and activities that come from te ao Māori, such as kapa haka, waka ama, poi and Te Reo Kori offer opportunities for connection with culture, feelings of belonging and dynamic ways to access their learning potential.[31, 32, 33]
- Studies conducted in New Zealand and internationally have found learning outside the classroom in nature increased students' concentration, self-discipline, engagement and intrinsic motivation for learning. These benefits have been shown for neurotypical tamariki who are least motivated in classroom settings.[23, 34, 35]
- Literature reviews have found positive associations between access to unstructured play/recess and improved on-task behaviour, attention, concentration, less fidgeting and improved learning.[36, 37]
- An Australian cohort study provides evidence that the impact of participation in sport on engagement in education continues after school, finding tamariki who continued with sport participation in adolescence were more likely to study at university.[21]
- Furthermore, a British study found participation in sport at university correlated with greater employability compared with those who just attended the gym or did not engage in sport. For graduates who both take part in sport and undertake volunteering, this effect was even greater.[40]

Attendance

- Several international studies have found that students who are more physically active had better attendance rates and reduced absenteeism than those who were less active.[21, 42, 43]
- A cross-sectional study found that tamariki in the most active quartile had 89% reduced odds of absenteeism relative to the least active quartile. For rangatahi, those in the most active quartile had 41% reduced odds of absenteeism.[45]
- National and international studies have reported that EOTC, particularly in nature, increased attendance and reduced dropouts among 'at risk' students.[23, 36]

56%

A longitudinal study of Australian children found that students who continued sport participation from childhood to adolescence has 56% lower odds of absenteeism.

+5 hours

Integrating physical activity into classroom time can increase students' time on-task by up to 20%. This equates to an extra five hours of on-task time per week.[5, 17]

97.5%

In a New Zealand study, 97.5% of survey respondents (principals, teachers and curriculum leaders) believed that EOTC improved student engagement.[36]

Case studies

Addressing attendance and engagement through sport

It's 11.30am on Friday at Waipukurau School and a group of Year 5 and 6 boys are eagerly waiting to be released into the school hall which, for the next hour, will be transformed into a boxing gym. These ākonga are part of the Mauria Te Pono – Believe in Yourself programme.

The weekly sessions started last year after the school contacted Sport Hawkes Bay Healthy Active Learning lead, Dani Paki for support with a group of boys struggling with school, attendance, behaviour and self-regulation. The impact of the programme at Waipukurau is impressive.

Year 6 student, Ben says he learns better when he's moving, which is why he likes Mauria Te Pono and never misses a day of school when it's on. He says physical activity gives him energy, so that when he returns to the classroom he is alert and able to take in more information.

> **"It's not boring. You are not sitting inside listening to the teacher talk. You are outside having fun."**
>
> Ben
> Year 6 student

Year 8 student, Ezra hadn't tried boxing until last year but said, "... I got put in the [boxing] group and then ever since, on Thursdays, I always came to school."

Read the full case study

Using sport as a tool to increase learning and engagement

The Sport in Education (SiE) programme used sport as a context for learning and engagement across core subjects in 22 schools across New Zealand, with impressive results.

Teachers noticed students' engagement improved, across different subject areas where sport was integrated into the learning environment.

> **"SiE students had a 34% greater engagement and an increase in positive attitudes to Maths compared to the other classes. The results were staggering and as a consequence we have more Maths teachers on-board next year!"**
>
> Teacher

Students participating in the programme spoke positively about the experience:

> **"I have improved dramatically in all of my classes. My Achieved marks have turned into Merits and Excellences and I am actually proud of myself."**
>
> Student

> **"Before this I didn't believe I would have passed NCEA ... It has helped me in other classes and improved my confidence ... I have noticed my academic grades improve and it has helped my learning and discipline ..."**
>
> Student

Not only were students more engaged, but they also turned up more. Those involved in the programme had 6% higher attendance compared with their peers not participating in the programme.[44]

Bringing the curriculum to life through Education Outside the Classroom

Some see EOTC as just another day out of the classroom, but a recent New Zealand study has highlighted EOTC's valued contribution to curriculum enrichment and its positive impacts on student engagement.

Ninety two per cent of teachers in the study agreed that EOTC lead to a more enriched curriculum experience. Many said it provided an opportunity for "authentic, relevant, and engaging learning opportunities that are difficult to achieve in a normal classroom."

> **"More often than not, [students are] more engaged and they want to be there and doing it; they want to learn things ... they are just immersed in it, they can't help but learn."**
>
> Staff member

Student's interviewed said the experience of learning outside the classroom helped to bring the curriculum "alive". One said EOTC was seen as "much more engaging and interesting". For some this meant that "you learn more outside than inside."

> **"If you experience what you are learning about, I feel like you get a better understanding of it because you have a personal account of what's happened. You can have your own opinions of it."**
>
> Staff member

Read the full report

Igniting a passion for learning through connecting with te taiao

At Te Kura o te Muriwai in Tairāwhiti, one of 34 kura supported by the kaupapa Māori initiative, Mātaiao, ākonga are igniting their passion for numeracy and literacy through connecting with te taiao (the environment).

Principal Maiangi Mackey says ākonga are sharing their learning in the classroom and playground, and kaiako understand the value in expanding the classroom to beyond four walls.

> **"Ka manahau ahau ki te ako ki te taiao. Me te rongo i ngā manu e waiata ana me ngā wairere e haere ana. Ka tino harikoa ahau ki te ako i ngā mahi taiao. Me tana ki te mahi ōrite ki Albert Einstein engari he Māori te hanga."**
>
> **"I get excited to be able to go out and learn in the environment. To listen to the many bird sounds and observe the flowing waters. I am really happy when learning in and about the environment. And also, to learn similar things to Albert Einstein but in a way that's normal to us."**
>
> Ākonga
> Te Kura o Te Muriwai

Watch the video

Whole-school approach to physical activity for wellbeing

Kauri Flats principal Matt Williams and deputy Ezra Feau are committed to prioritising the wellbeing of their ākonga.

> **"When you have a healthier child, they want to be at school. They realise, 'Oh I'm not just here for my writing and reading, and math. I'm here for everything'. That's the type of environment we are trying to create here."**

Matt Williams
Kauri Flats principal

Now there are a number of activities for ākonga, including wilderness trails complete with insect hotels, mud kitchens, vege gardens, and Wheels Wednesday – a weekly event which allows skateboards, bikes and scooters to have full reign of the carpark. There's also a kete of equipment in every classroom to get ākonga outside and learning through movement – without having to go to the PE shed.

Matt says the key to positive attendance and engagement is making sure the school environment is one which ākonga want to come to - and physical activity and play is a key part of that.

"A lot of attendance is not just on the parents, it's kids who are disengaged. If they've got a learning programme that they want to come to school for, they are going to come to school," he says.

Read the full case study

Physical activity and mental health

What does the evidence tell us?

International studies consistently report that physical activity can improve mental health and reduce mental illness in tamariki and rangatahi.

Summary of evidence

- Systematic reviews and an international consensus statement reported that physical activity has the potential to positively influence psychological outcomes, including lower levels of psychological ill-being (such as depression, stress, negative affect and total psychological distress) and greater psychological wellbeing (such as self-image, satisfaction with life and happiness, and self-esteem) in tamariki and rangatahi.[11, 30, 45, 46, 47, 48]
- Systematic reviews and an international consensus statement describe the significant beneficial effect of school-related physical activity interventions on resilience, positive mental health, wellbeing and anxiety.[11, 49]
- Multiple studies show that participation in a sport, particularly team sport, may be associated with improved social and psychological health for tamariki and rangatahi across a variety of mental health outcomes. This is above and beyond improvements solely attributable to participation in physical activity. Such indicators include sense of belonging, self-esteem, happiness, social skills, depression, anxiety, and confidence and competence amongst sport participants compared with non-sport participants.[43, 50, 51, 52]
- International studies reported that activities taking place in natural green environments such as forests, or near blue spaces such as the ocean can have a positive effect on a broad array of wellbeing and stress indicators.[23, 53, 54]
- Play may have crucially important functions for positive mental health development, including formation and maintenance of friendships, self-regulation of emotions and ability to cope with stress and anxiety.[55]
- Data from Sport NZ's national participation survey, Active NZ, indicates that for tamariki and rangatahi there is a clear link between overall life satisfaction and the number of days they are active per week. For tamariki and rangatahi, sport and leisure time physical activity is more closely aligned to life satisfaction than active travel, PE, active breaks at school or domestic activity.[56]
- In 2019, the Sport NZ Social Return on Investment analysis estimated that a $56 million return could be attributed to increased wellbeing (happiness) of tamariki and rangatahi as a result of participation in play, active recreation and sport.[57]

Case studies

Re-engaging rangatahi through physical activity

Using youth voice as a starting point for thinking about student engagement at school is vital to the work of Blue Light, a registered charity that works in partnership with the police to deliver a range of youth programmes and activities in South Auckland.

In 2024, they released a report with findings from research looking to understand the experience of non-enrolled tamariki and rangatahi.

Experiencing boredom at school was a message repeated often by the young people in the study, particularly in the later years of school. This was also a factor the tamariki and rangatahi raised in relation to feeling that their wellbeing was not attended to in the school environment.

Providing activities that help students engage with others at school was highlighted as a strategy for re-engaging young people and supporting their wellbeing. One participant who had things to do during break time described the positive effect on their wellbeing:

> **"It [Polyfest] keeps you active and it helps with a lot of things like if you're out at morning tea and you're sitting by yourself and you just have to sit there and do nothing, but at the Māori unit kapa haka lets us do something and it makes our brain work. It's really good to keep your brain active."**
>
> Student

Read the full report

Mountain biking helping to transform lives for rangatahi

A Wellington-based mountain bike programme is giving secondary school students a taste of life on two wheels, and the benefits stem far beyond the bike.

The programme initially began with weekly lessons for Wainuiomata High School students, and now runs sessions for between 25 and 40 young people a day, four days a week, from 14 schools.

Mountain biking has transformed former Wainuiomata High School student Cody Joweitt's life:

> **"I was one of the originals on the programme, I was one of the biggest menaces at school, I have ADHD and anger issues, and I got into altercations. I hated school. Going mountain biking became something to look forward to. I set a goal to finish my schooling and the reward for staying at school and not being a menace was to go on the trails with Simon."**
>
> Cody Joweitt
> Former Wainuiomata High School student

> **"Everyone noticed a big change in my behaviour. People were proud of me, and it gave me an opportunity to not throw everything away when I was spiralling downhill … it's definitely helped set me on the right path and I'm a better person for it."**

Read the full case study

Neurodivergent students excel in the outdoors

With help from Tū Manawa funding through Nuku Ora, learning support teacher at Wellington East Girls' College, Sue Perry enlisted the support of outdoor education specialist, Leonie King to design a programme specifically for her neurodivergent students that focused on youth development, outdoor recreation and independence.

Over six months, the 20 students aged 16-19, built up their physical and mental stamina through outdoor activity days that included day walks on local tracks and bushcraft activities, overnight camps, and the Abel Tasman National Park five-day walk.

Their experiences have resulted in a huge shift in confidence and attitudes towards active recreation, says teacher Amanda Kotrotsos.

One student has since competed in College Sport Wellington competitions, while a young person with significant visual impairment, previously frightened to walk outside the classroom, even with her support worker, will now happily complete day hikes on uneven terrain.

Read the full case study

> **"Through their adventurous journeys the students have experienced being out of their comfort zones, they've learned to persevere when challenges are physically and mentally difficult, they've learned the joy of being in the outdoors, the fun, the exhilaration, the peacefulness and beauty of Aotearoa."**
>
> Sue Perry
> Learning Support Teacher

Collaborating to achieve educational outcomes

The evidence presented in this report highlights that the value of physical activity in an educational setting is strong. Consideration should be given to how physical activity can be used as a complementary approach to achieve better educational outcomes for all tamariki and rangatahi in Aotearoa.

Physical activity in schools made easier

Within schools and kura there are numerous ways educators can ensure tamariki and rangatahi have access to enriching physical activity environments and experiences.

These include the delivery of quality health and physical education, integrating movement into other learning areas, providing quality sport experiences, ensuring there is space and time to play, and connecting to te ao Māori through te taiao (the environment).

We encourage school leaders and Boards of Trustees to prioritise the provision of positive and inclusive physical activity within their strategic planning, professional learning programmes, and resourcing decisions. We also encourage teachers to prioritise positive and inclusive physical activity within their daily lesson plans.

In line with Sport NZ's strategic priority of 'active schools and kura', we offer a range of resources, funding, programmes and initiatives to support schools and kura. This support ensures students can access quality play, active recreation and sport experiences, allowing them to enjoy being active in ways that suit them.

To find out more about the resources, funding, programme and initiatives that your school can access visit sportnz.org.nz

References

1 Barbosa, A; Whiting, S; Simmonds, P; Moreno, R.S; Mendes, R; Breda, Joao. (2020). Physical Activity and Academic Achievement: An Umbrella Review. International Journal of Environmental Research and Public Health.

2 Erickson, K.I., Hillman, C., Stillman, C.M., Ballard, R.M., Bloodgood, B., Conroy, D.E., Macko, R., Marquez, D.X., Petruzello, S.J., Powell, K.E. (2019). Physical Activity, Cognition, and Brain Outcomes: A Review of the 2018 Physical Activity Guidelines. Medicine & Science in Sports & Exercise 51(6): p 1242-1251, June 2019. | DOI: 10.1249/MSS.0000000000001936

3 Álvarez-Bueno, C., Hillman, C. H., Cavero-Redondo, I., Sánchez-López, M., Pozuelo-Carrascosa, D. P., & Martínez-Vizcaíno, V. (2020). Aerobic fitness and academic achievement: A systematic review and meta-analysis. Journal of Sports Sciences, 38(5), 582–589. https://doi.org/10.1080/02640414.2020.1720496

4 Ishihara, T., Nakajima, T., Yamatsu, K., Okita, K., Sagawa, M., & Morita, N. (2020). Relationship of participation in specific sports to academic performance in adolescents: a 2-year longitudinal study. Scand J Med Sci Sports. 2020;30(8):1471–1482. PubMed ID: 32350922 doi:10.1111/sms.13703

5 Kibbe, D.L., Hackett, J., Hurley, M., McFarland, A., Schubert, K.G., Schultz, A., & Harris, S. (2011). Ten Years of Take 10! Integrating physical activity with academic concepts in elementary school classrooms. Preventative Medicine, 52.

6 Mullender-Wijnsma, M.J; Esther Hartman, M.S; de Greeff, J.W; Doolaard, S; Bosker, R.J; Visscher, C. (2016). Physically Active Math and Language Lessons Improve Academic Achievement: A Cluster Randomized Controlled Trial. Pediatrics, 137:3. https://doi.org/10.1542/peds.2015-2743

7 Muntaner-Mas, A., Morales, J. S., Martínez, de-Quel, Ó., Lubans, D. R., & García, H. A. (2024). Acute effect of physical activity on academic outcomes in school-aged youth: A systematic review and multivariate meta-analysis. Scandinavian Journal of Medicine & Science in Sports, 34(1), 1–14.

8 Robinson, K., Riley, N., Owen, K., Drew, R., Mavilidi, M. F., Hillman, C. H., Faigenbaum, A. D., Garcia-Hermoso, A., & Lubans, D. R. (2023). Effects of Resistance Training on Academic Outcomes in School-Aged Youth: A Systematic Review and Meta-Analysis. Sports Medicine, 53(11), 2095–2109.

9 Zhang, D., Shi, L., Zhu, X., Chen, S., & Liu, Y. (2023a). Effects of intervention integrating physical literacy into active school recesses on physical fitness and academic achievement in Chinese children. Journal of Exercise Science & Fitness, 21(4), 376–384.

10 Nesbitt, K. T., Blinkoff, E., Golinkoff, R. M., & Hirsh-Pasek, K. (2023). Making schools work: An equation for active playful learning. Theory Into Practice, 62(2), 141–154. https://doi.org/10.1080/00405841.2023.2202136

11 Bangsbo, J., Krustrup, P., Duda, J., Hillman, C. H., Andersen, L. B., Weiss, M., Williams, C. A., Lintunen, T., Green, K., Hansen, P. R., Naylor, P., Ericsson, I., Nielsen, G., Froberg, K., Bugge, A., Lundbye-Jensen, J., Schipperijn, J., Dagkas, S., Agergaard, S., von Seelen, J., Østergaard, C., Skovgaard, T., Busch, H., & Elbe, A. (2016). The Copenhagen Consensus Conference 2016: Children, Youth, and Physical Activity in Schools and During Leisure Time. British Journal of Sports Medicine, Published online first: [27th June 2016]. doi:10.1136/bjsports-2016-096325

12 Fitzpatrick, K. (2011). Trapped in physical: Maori and Pasifika achievement in HPE. ASIA Pacific Journal of Health, Sport and physical Education, 2 (3-4), 35-52

13 Donnelly, J., Hillman, C., Castelli, D., Etnier, J., Lee, S., Tomporowski, P., Lambourne, K., & Szabo-Reed, A. (2016). Physical Activity, Fitness, Cognitive Function, and Academic Achievement in Children: A Systematic Review. Medicine & Science in Sports & Exercise. 48. 1197-1222. 10.1249/MSS.0000000000000901

14 Haverkamp, B.W.R, Vertessen, K., van Ewijk, H., Oosterlaan, J. & Hartman, E. (2020). Effects of physical activity interventions on cognitive outcomes and academic performance in adolescents and young adults: a meta-analysis. J Sports Sci. 2020;38(23):2637–2660. PubMed ID: 32783695 doi:10.1080/02640414.2020.1794763

15 Owen, K. B., Foley, B. C., Wilhite, K., Booker, B., Lonsdale, C., & Reece, L. J. (2022). Sport Participation and Academic Performance in Children and Adolescents: A Systematic Review and Meta-analysis. Medicine & Science in Sports & Exercise, 54(2), 1–8.

16 Álvarez-Bueno, C., Pesce, C., Cavero-Redondo, I., Sánchez-López, M., GarridoMiguel, M., & Martínez-Vizcaíno, V. (2017a). Academic Achievement and Physical Activity: A Meta-analysis. Pediatrics, 140(6), e20171498. https://doi.org/10.1542/peds.2017-1498

17 Mavilidi, M. F., Mason, C., Leahy, A. A., Kennedy, S. G., Eather, N., Hillman, C. H., Morgan, P. J., Lonsdale, C., Wade, L., Riley, N., Heemskerk, C., & Lubans, D. R. (2021). Effect of a Time-Efficient Physical Activity Intervention on Senior School Students' On-Task Behaviour and Subjective Vitality: the "Burn 2 Learn" Cluster Randomised Controlled Trial. Educational Psychology Review, 33(1), 299–323. https://doi.org/10.1007/s10648-020-09537-x

18 Wold, H., Prusak, K. A., Barney, D. C., & Wilkinson, C. (2023). The Acute and Chronic Effects of GoNoodle Brain Breaks on Reading Fluency Among Elementary School Children. Physical Educator, 80(2), 191–211.

19 Burns, R. D., Brusseau, T. A., Pfledderer, C. D., & Fu, Y. (2020). Sports Participation Correlates With Academic Achievement: Results From a Large Adolescent Sample Within the 2017 U.S. National Youth Risk Behavior Survey. Perceptual and Motor Skills, 127(2), 448–467. https://doi.org/10.1177/0031512519900055

20 Chen, S., Li, X., Yan, J., & Ren, Z. (2021). To Be a Sportsman? Sport Participation Is Associated With Optimal Academic Achievement in a Nationally Representative Sample of High School Students. Frontiers in Public Health, 9, 730497. https://doi.org/10.3389/fpubh.2021.730497.

21 Owen, K.B; Foley, B.C; Smith, B.J; Manera, K.E; Corbett, L; Lim, M; Phongsavan, P; Qualter, P, Ding,D; Clare, P.J. (2023) Sport Participation for Academic Success: Evidence From the Longitudinal Study of Australian Children. Journal of Physical Activity and Health, Volume 21:3 (238-246)

22 Zhang, Y., Yan, J., Jin, X., Yang, H., Zhang, Y., Ma, H., & Ma, R. (2023b). Sports Participation and Academic Performance in Primary School: A Cross-Sectional Study in Chinese Children. International Journal of Environmental Research and Public Health, 20(4). https://doi.org/10.3390/ijerph20043678

23 Kuo, M., Barnes, M. & Jordan, C. (2019). Do Experiences with Nature Promote Learning? Converging Evidence of a Cause-and-Effect Relationship. Frontiers in Psychology. 10:305. https://doi.org/10.3389/fpsyg.2019.00305

24 Marques, A., Santos, D.A., Hillman, C.H., Sardinha, L.B. (2018). How does academic achievement relate to cardiorespiratory fitness, self-reported physical activity and objectively reported physical activity: a systematic review in children and adolescents aged 6–18 years. Br J Sports Med. 2018;52(16):1039–1039. PubMed ID: 29032365 doi: 10.1136/bjsports-2016-097361

25 Jeon, Y.K. & Ha, C.H. (2017). The effect of exercise intensity on brain derived neurotrophic factor and memory in adolescents. Environ Health Prev Med 22, 27.

26 Singh, A.S., Saliasi, E., van den Berg, V., Uijtdewilligen, L., et al. (2019). Effects of physical activity interventions on cognitive and academic performance in children and adolescents: a novel combination of a systematic review and recommendations from an expert panel. Br J Sports Med Epub. doi:10.1136/bjsports-2017-098136

27 Valkenborghs, S.R., Noetel. M, Hillman, C.H., Nilsson, M., Smith, J.J., Ortega, F.B. & Lubans, D.R. (2019). The impact of physical activity on brain structure and function in youth: a systematic review. Pediatrics. 2019;144(4): e20184032

28 Chaddock-Heymam, L., Erickson, K.I., Voss, M., Knecht, A., Pontifex, M.B., Castelli, D., Hillman, C., Kramer, A. (2013). The effects of physical activity on functional MRI activation associated with cognitive control in children: a randomized controlled intervention. Frontiers in Human Neuroscienc, volume 7, 2013

29 Hillman, C.H., Pontifex, M.B., Raine, L.B., Castelli, D.M., Hall, E.E., Kramer, A.F. (2009). The effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. Neuroscience. 2009 Mar 31;159(3):1044-54. doi: 10.1016/j.neuroscience.2009.01.057. Epub 2009 Feb 3. PMID: 19356688; PMCID: PMC2667807. Note: Brain scan image courtesy of Professor Charles Hillman, University of Illinois at Urbana-Champaign and sourced from Smith M, Witten K, Wild K. (2023). Proof points for Active School Travel, doi: 10.17608/k6.auckland.24312655

30 Owen, K.B; Parker, P.D; Van Zanden, B; MacMillan, F; Astell-Burt, T & Lonsdale, C. (2016). Physical Activity and School Engagement in Youth: A Systematic Review and Meta-Analysis. Educational Psychologist 51:2, 129-145, DOI:10.1080/00461520.2016.1151793.

31 Duckworth, F., Gibson, M., M, S. & Macfarlane, A. (2021). Mai i te Ao Rangatahi ki te Ao Pakeke Ka Awatea: A Study of Māori Student Success Revisited. AlterNative: An International Journal of Indigenous Peoples. 17. 3-14. 10.1177/1177180121995561

32 Macfarlane, A. H., Webber, M., Cookson-Cox, C., & MacRae, H. (2014). Kā Awatea: An iwi case study of Māori students' success. University of Canterbury.

33 Manatū Taonga - Ministry of Culture and Heritage. (2014). Nga hua a tane rore. The benefits of Kapa Haka. Scoping the research needs and option for developing a better understanding of the contribution that kapa haka makes to Aotearoa New Zealand society.

34 Hill, A., North, C., Cosgriff, M., Irwin, D., Boyes, M. & Watson, S. (2020). Education Outside the Classroom in Aotearoa New Zealand - A comprehensive national study: Final report. Christchurch, NZ: Ara Institute of Canterbury Ltd

35 Kuo, M., Browning, M.H.E.M., & Penner, M.L (2018). Do Lessons in Nature Boost Subsequent Classroom Engagement? Refuelling Students in Flight. Frontiers in Psychology. 8:2253. https://doi.org/10.3389/fpsyg.2017.02253

36 Ardelean, A; Smith, K; Russell, W. (2021). The Case for Play in Schools: A review of the literature. Sponsored by Sport England. Outdoor Play and Learning (OPAL) CIC, Bristol, England.

37 Whitebread, D; Neale, D; Jensen, H; Liu, C; Solis, L; Hopkins, E; Hirsh-Pasek & Zosh, J. (2017a). The role of play in children's development: A review of the evidence. The LEGO Foundation.

38 Allen, K., Bullough, S., Cole, D., Shibli, S., and Wilson, J. (2013). The Impact of Engagement in Sport on Graduate Employability Final Report. Sport Industry Research Centre Sheffield Hallam University.

39 Boyd, S., & Felgate, R. (2016). Planning the Game. What does Play. Sport Student Baseline Data tell us about Current Practice? New Zealand Council for Education (unpublished)

40 Bull, F.C., Al-Ansari, S.S., Biddle, S., Borodulin, K., Buman, M.P., Cardon, G., Carty. C., Chaput, J.P., Chastin. S., Chou, R., Dempsey, P.C., DiPietro, L., Ekelund, U., Firth, J., Friendenreich, C.M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P.T. et al. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. British Journal of Sports Medicine 2020;54:1451-1462.

41 Eime, R.M., Young, J.A., Harvey, J.T., Charity, M.J. & Payne, W.R.(2013). A systematic review of the psychological and social benefits of participation in sport for children and adolescents: informing development of a conceptual model of health through sport. Int J Behav Nutr Phys Act 10, 98 (2013). https://doi.org/10.1186/1479-5868-10-98

42 Gu, X., Zhang, T., Lun, A. C. T., Zhang, X., & Thomas, K. (2019). Do Physically Literate Adolescents Have Better Academic Performance? Perceptual & Motor Skills, 126(4), 585–602.

43 Loprinzi, P.D & Frith, E (2018) Accelerometer-Assessed Physical Activity and School Absenteeism Due to Illness or Injury Among Children and Adolescents: HANES 2003 to 2006. American Journal of Health Promotion, 2018, Vol 32(3), 571-577

44 Boyd, S. and Hopkins, R. (2016). Staying the Distance. Sport in Education - Sustaining Practice Developed through the Sport in Education Initiative. NZCER (unpublished)

45 Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., Kelly, P., Smith, J., Raine, L &Biddle, S. (2016) Physical activity for cognitive and mental health in youth: a systematic review of mechanisms. Pediatrics. 2016;138(3):e20161642

46 Majeed, S. (2022). Role of Physical Activity and Sports in Mental Health of Youth: A Review Article. Shield: Research Journal of Physical Education & Sports Science, 17, 1–20.

47 Rodriguez-Ayllon, M., Cadenas-Sánchez, C., Estévez-López, F., Muñoz, N. E., Mora-Gonzalez, J., Migueles, J. H., Molina-García, P., Henriksson, H., MenaMolina, A., Martínez-Vizcaíno, V., Catena, A., Löf, M., Singh AS, Saliasi E, van den Berg V, et al.(2019) Effects of physical activity interventions on cognitive and academic performance in children and adolescents: a novel combination of a systematic review and recommendations from an expert panel. Br J Sports Med Epub. doi:10.1136/bjsports-2017-098136

48 Wegner, M., Amatriain-Fernandez, S., Kaulitzky, A., Murillo-Rodriguez, E., Machado, S., & Budde, H. (2020). Systematic Review of Meta-Analyses: Exercise Effects on Depression in Children and Adolescents. Frontiers in Psychiatry, Vol. 11, https://doi.org/10.3389/fpsyt.2020.00081."

49 Andermo, S., Hallgreen, M., Nguyen, T., Jonsson, S., Petersen, S., Friberg, M., Stubbs, B & Elinder, L.S. (2020). School-related physical activity interventions and mental health among children: a systematic review and meta-analysis. Sports Medicine-Open, 6:25. https://doi.org/10.1186/s40798-020-00254-x

50 Andersen MH, Ottesen L, Thing LF. (2019). The social and psychological health outcomes of team sport participation in adults: an integrative review of research. Scand J Public Health. 2019;47(8):832–850

51 Murphy, J., Patte, K. A., Sullivan, P., & Leatherdale, S. T. (2021). Exploring the Association Between Sport Participation and Symptoms of Anxiety and Depression in a Sample of Canadian High School Students. Journal of Clinical Sport Psychology, 15(3), 268–287.

52 Wilson, O.W.A., Whatman, C.; Walters, S., Keung, S.; Enari, D., Rogers, A., Millar, S.-K., Ferkins, L., Hinckson, E., Hapeta, J., Sam, M. & Richards, J. (2022). The Value of Sport: Wellbeing Benefits of Sport Participation during Adolescence. Int. J. Environ. Res. Public Health 2022, 19, 8579. https://doi.org/10.3390/ijerph19148579

53 Dettweiler, U., Gerchen, M., Mall, C., Simon, P., & Kirsch, P. (2023). Choice matters: Pupils' stress regulation, brain development and brain function in an outdoor education project. British Journal of Educational Psychology, 93, 152–173. https://doi.org/10.1111/bjep.12528

54 Vert, C; Gascon, M; Ranzani, O; et al. (2020). Physical and mental health effects of repeated short walks in a blue space environment: A randomised crossover study. Environmental Research, 30 June 2020.

55 Whitebread, D. (2017b). Free Play and Children's Mental Health. The Lancet, 1 (November 2017)

56 Sport New Zealand (2023). Active New Zealand: Snapshot of the Participation Landscape 2023. Wellington

57 Sport New Zealand (2022). Social Return on Investment (SROI) of Recreational Physical Activity in Aotearoa New Zealand. Summary Report. October 2022. Wellington.

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