Reference values for the Muscle Power Sprint Test (MPST) in children from the age of 5 up to and including 12 years

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Our primary goal is to establish generalizable reference values for the MPST in Dutch primary school children aged 5 up to and including 12 years.

Ethical review	Approved WMO
Status	Pending
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON57025

Source
ToetsingOnline

Brief title
MPST reference values

Condition

- Other condition

Synonym
Not applicable

Health condition

Niet gericht op bepaalde aandoeningen, maar op doorsnee Nederlandse lagereschoolkinderen

Research involving
Human

Sponsors and support

Primary sponsor: Erasmus MC, Universitair Medisch Centrum Rotterdam
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Children, Muscle Power Sprint Test, Physical endurance, Reference values

Outcome measures

Primary outcome

The primary study endpoint is to establish reference values for the MPST in

children from the age of 5 up to and including 12 years. The reported measure

will be the mean power generated during the six sprints.

Secondary outcome

- Sex

- Age

- Weight

Study description

Background summary

Children with birth defects - including congenital diaphragmatic hernia, congenital lung abnormalities, and congenital heart disease - are at risk for below-average lung function and exercise tolerance (1-3). This is one of the reasons why, at our tertiary hospital, children with congenital abnormalities are enrolled in a prospective, longitudinal follow-up program from birth as a part of standard care (4). This program involves outpatient visits at preset intervals during which the overall health and development of these patients are examined. They also undergo spirometry and tests with pediatric physiotherapists to assess their exercise tolerance. In the past, we used the Bruce protocol as the exercise test of choice for children aged 5 and above. This test involves walking on a treadmill with an incline - with increasing gradient and speed - until the subjects can no longer continue (8). The Bruce protocol comes with several limitations. Firstly, the steep incline of the

treadmill (> 10%) demands a lot of muscle power in the thighs, which patients with congenital conditions may not always be able to develop. Secondly, workload increases in large increments with each sequential step of the Bruce protocol which may force children to stop before reaching their peak oxygen uptake (5). The two aforementioned limitations could also trigger anxiety in the subjects, potentially leading to premature discontinuation of the Bruce protocol and thus reducing reliability of results. In the newer versions of the longitudinal follow-up program, the Bruce protocol was therefore replaced by other exercise tolerance tests, including the Muscle Power Sprint Test (MPST). In contrast to the Bruce protocol - testing aerobic capacity - the MPST is designed to assess anaerobic exercise capacity, which is important for young children to participate in daily activities such as playing with peers (6). The test is administered by having children sprint six times over a distance of fifteen meters, with a ten-second rest between each sprint. Using the formula "power = (total mass x 15 m^2)/$time^3$ ", the force generated during each sprint can be calculated (9). The average power of the six sprints is typically the measure that is reported and is presented as *mean power*. Dutch norm values for children aged 6-18 have been established with data gathered between 2012 and 2016, mainly in rural areas in the Netherlands (10). Due to the ongoing changes in the lifestyles of children and their environments, regularly updating reference values regarding exercise tolerance is essential. This is especially pertinent in light of the recent Covid-19 pandemic, which has contributed to a reduction in physical activity and the adoption of more sedentary lifestyles (7). Additionally, there are currently no established reference values for children aged 5, who undergo testing using the MPST in the light if our longitudinal follow-up program. Consequently, we lack comparative data for the results of their exercise tolerance tests at this time. 1. Hijkoop A, van Schoonhoven MM, van Rosmalen J, Tibboel D, van der Cammen-van Zijp MHM, Pijnenburg MW, et al. Lung function, exercise tolerance, and physical growth of children with congenital lung malformations at 8 years of age. Pediatr Pulmonol. 2019;54(8):1326-34. 2. Schaan CW, Macedo ACP, Sbruzzi G, Umpierre D, Schaan BD, Pellanda LC. Functional Capacity in Congenital Heart Disease: A Systematic Review and Meta-Analysis. Arq Bras Cardiol. 2017;109(4):357-67. 3. Toussaint-Duyster LCC, van der Cammen-van Zijp MHM, de Jongste JC, Tibboel D, Wijnen RMH, Gischler SJ, et al. Congenital diaphragmatic hernia and exercise capacity, a longitudinal evaluation. Pediatr Pulmonol. 2019;54(5):628-36. 4. Gischler SJ, Mazer P, Duivenvoorden HJ, van Dijk M, Bax NM, Hazebroek FW, et al. Interdisciplinary structural follow-up of surgical newborns: a prospective evaluation. J Pediatr Surg. 2009;44(7):1382-9. 5. Fredriksen PM, Ingjer F, Nystad W, Thaulow E. Aerobic endurance testing of children and adolescents--a comparison of two treadmill-protocols. Scand J Med Sci Sports. 1998;8(4):203-7. 6. Bailey RC, Olson J, Pepper SL, Porszasz J, Barstow TJ, Cooper DM. The level and tempo of children's physical activities: an observational study. Med Sci Sports Exerc. 1995;27(7):1033-41. 7. Stephanie S, Mike T, Mark T, Jae S, Yvonne B, Laurie B, et al. Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. BMJ Open Sport & Exercise Medicine. 2021;7(1):e000960. 8. van der Cammen-van Zijp MH,

Ijsselstijn H, Takken T, Willemsen SP, Tibboel D, Stam HJ, et al. Exercise testing of pre-school children using the Bruce treadmill protocol: new reference values. Eur J Appl Physiol. 2010;108(2):393-9. 9. Verschuren O, Takken T. The muscle power sprint test. J Physiother. 2014;60(4):239. 10. Steenman K, Verschuren O, Rameckers E, Douma-van Riet D, Takken T. Extended Reference Values for the Muscle Power Sprint Test in 6- to 18-Year-Old Children. Pediatr Phys Ther. 2016;28(1):78-84.

Study objective

Our primary goal is to establish generalizable reference values for the MPST in Dutch primary school children aged 5 up to and including 12 years.

Study design

The study adopts a prospective cross-sectional design, as new data regarding anaerobic performance is generated at a single time-point. The intervention involves administering the MPST to children from the age of 5 up to and including 12 years in collaboration with primary schools and after-school childcare centers. This design allows for the simultaneous assessment of different age groups.

Intervention

The Muscle Power Sprint Test (MPST) is an easy to perform field test of anaerobic capacity for children and adolescents. The only necessities for administration of this test are an open space, a stopwatch and two cones or lines. Test subjects are instructed to perform six 15m-sprints at maximum pace between the two cones / lines, with a 10-second rest in between each effort. The power that is generated with each sprint can be calculated using the formula: power = (total mass x 15 m^2)/$time^3$.

Study burden and risks

We estimate that the risk of injuries or other adverse effects from participation is not higher than the risks a child might encounter in a typical physical education class; on the contrary, we believe it is lower.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adolescents (12-15 years)
Children (2-11 years)

Inclusion criteria

- Age of 5 up to and including 12 years
- Attending primary education at one of the participating schools

Exclusion criteria

- Contra-indication for maximal exercise due to cardiac, respiratory, or other known morbidities
- Injuries limiting maximal exercise capacity
- Known with motor function impairment

Study design

Design

Study type: Interventional

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-10-2024
Enrollment:	480
Type:	Anticipated

Ethics review

Approved WMO

Date:	25-09-2024
Application type:	First submission
Review commission:	CCMO: Centrale Commissie Mensgebonden Onderzoek (Den Haag)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
ClinicalTrials.gov	NCT06448520
CCMO	NL86724.000.24