

The relationship between respiratory muscle strength and exercise in primary school children in Leicestershire

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Rationale:

Few studies relate respiratory muscle strength to physical activity. One study of 100 adults has shown a significant relationship between exercise and respiratory muscle strength, measured as maximum inspiratory or expiratory pressure (MIP and MEP, respectively).¹

A separate study reported that boys aged 7-8y who swim have larger maximum respiratory pressures than those who are sedentary. Data in healthy children, over a wider age range are lacking.²

Objectives:

I sought to determine the relationship between respiratory muscle strength and exercise in healthy children.

Methods:

- The children's families were contacted through the schools. Children took home a letter, consent form and a questionnaire. Children aged 5-11 were eligible if they were healthy and if parental consent was given. Each child gave assent at the time of my visit to the schools.
- I measured height, weight, and respiratory muscle strength (Vyntus pneumo, Carefusion). (Figure 1)
- Respiratory muscle strength was assessed by measurement of maximum expiratory and inspiratory pressures (MEP and MIP, respectively). For both measurements, the child breathed through a flow meter attached to a shutter. To measure MEP, after several quiet breaths, the child was asked to breathe in until the lungs were full, and the shutter was activated during this big breath. S/he was then encouraged to try and breathe out hard against the obstruction. The peak pressure was recorded and the manoeuvre was repeated several times. (Figure 2)
- Measurement of MIP was similar, except that the child breathed out as far as possible and then made a forceful inspiratory effort. (Figure 2)



Figure 1. Child breathing through flow meter and shutter

Respiratory Muscle Strength

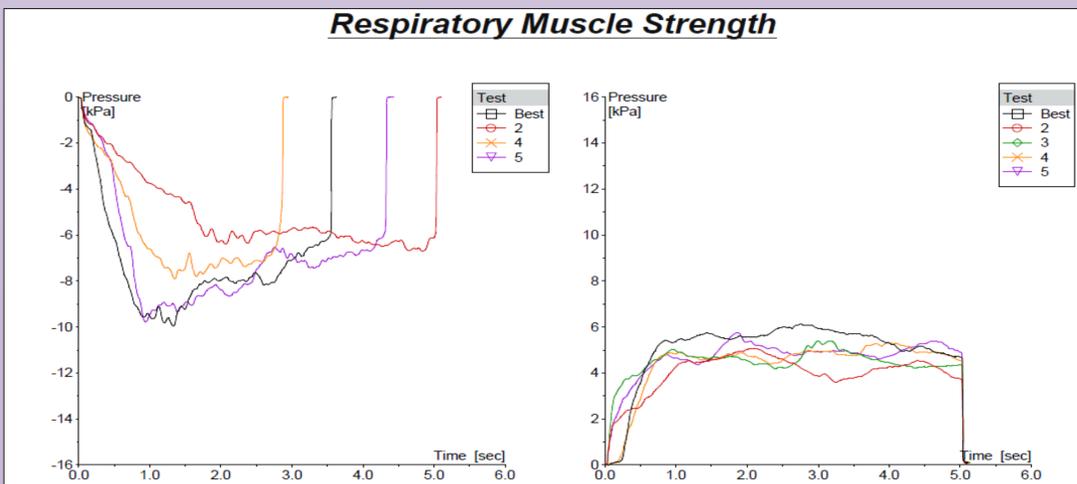


Figure 2. Manoeuvres of MIP (left panel) and MEP (right panel) obtained from a healthy boy aged 10 years. Respiratory efforts were maintained for over 2 seconds in each case. Repeatability (highest 2 values of peak MIP or MEP) was 1% or less, thereby meeting criteria for acceptability³.

Results:

- One hundred seventy-five children were studied. I have obtained MIP on 124 children (44 reported no exercise) and MEP on 138 (46 no exercise).
- MIP & MEP were higher in boys than in girls ($p=0.002$, $p=0.0003$) respectively (Figure 3 & 4)
- No significant differences were detected in MIP & MEP between boys who do exercise and boys who do not ($p=0.20$, $p=0.09$) respectively.
- Girls who exercise have greater inspiratory muscle strength (MIP) compared to those who do not ($p=0.0004$) (Figure 5)
- No significant difference was detected in MEP between girls who do exercise and girls who do not ($p=0.09$).

Results (continued):

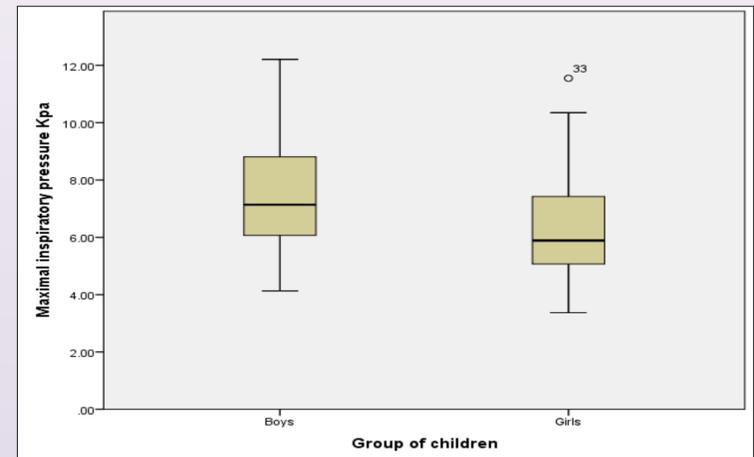


Figure 3. MIP in boys higher than in girls ($p=0.002$, t test)

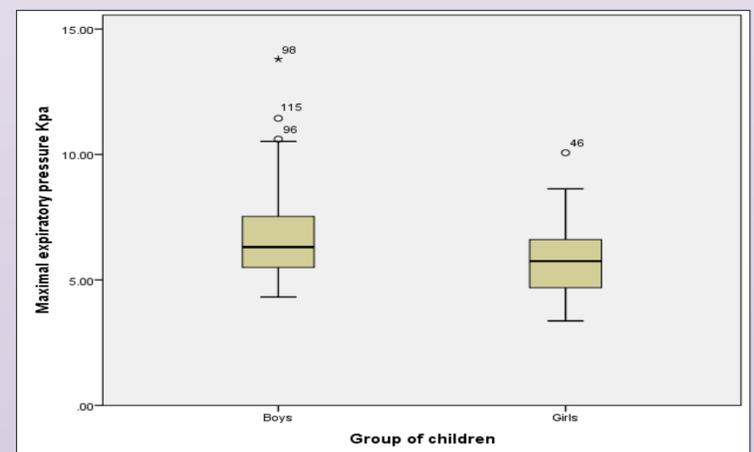


Figure 4. MEP in boys higher than in girls ($p=0.0003$, t test)

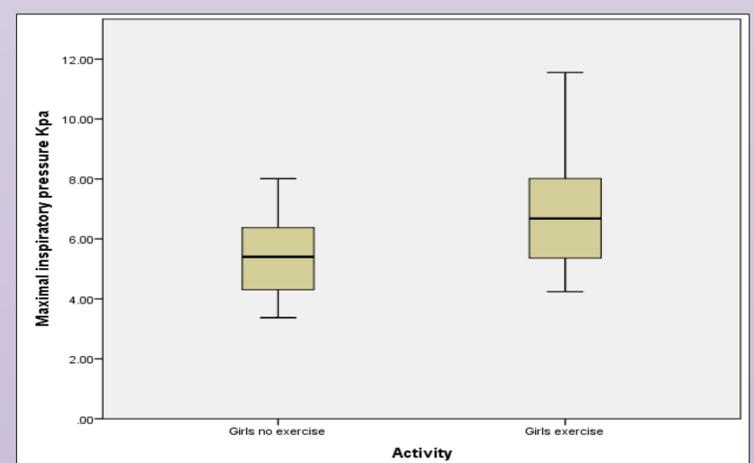


Figure 5. MIP in girls who do exercise higher than in girl who do not ($p=0.0004$, t test)

Conclusion:

Girls who exercise have greater maximal inspiratory pressure (MIP) but not MEP compared to those who do not. This does not appear to be the case in boys, and I will explore reasons for this as the study progresses.

References:

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- 2-Santos, Mara Lisiane de Moraes dos, Rosa, B.D., Ferreira, C.d.R., Medeiros, A.d.A. & Batiston, A.P. 2012, "Maximal respiratory pressures in healthy boys who practice swimming or indoor soccer and in healthy sedentary boys", *Physiotherapy theory and practice*, vol. 28, no. 1, pp. 26-31.
- 3-American Thoracic Society 2002, "ATS/ERS statement on respiratory muscle testing", *Am J Respir Crit Care Med.*, vol. 166, no. 4, pp. 518-624.

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