

# A comparison of strength profiles in children screened using the Movement Assessment Battery for Children-2

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Studies have shown that children with low motor proficiency (LMP) produce substantially lower maximum force and are less powerful in comparison with their typically developing (TD) peers. The evidence from this research gives support to the theory that muscular strength and power may be underlying deficits that contribute to the movement difficulties found in children.



## BACKGROUND

Research in TD children suggests that up to 70% of the variability of performance across a range of motor skills could be due to muscular strength and physical development variables. When compared to their peers, children with low movement proficiency (LMP), exhibit poor motor skills and movement difficulties that interfere with daily activities.

Additionally, a recent review by Rivilis and colleagues (2011) demonstrated that cardiorespiratory fitness, anaerobic capacity, muscle strength and endurance, power, and body composition are all negatively affected by poor motor proficiency.

Given the links between motor proficiency and muscle strength the aim of this study was to investigate muscle strength across tasks of varied complexity in children across a spectrum of motor proficiency.

## METHODS

Sixty four children (M age 7.9±1.5yrs) participated in the study. Movement proficiency was assessed via the Movement Assessment Battery for Children-2 (MABC-2) and according to scores:

- 41 children were classified as TD (>17<sup>th</sup> %);
- 8 considered 'at risk of movement difficulties' (LMP1; 6-16<sup>th</sup> %)
- 18 with 'significant movement difficulties' (LMP2; <5<sup>th</sup> %)

Children completed a series of strength assessments, of varying task complexity, in 3 sessions within 2 weeks. Strength assessments included:

- Peak torque of the knee flexors and extensors assessed isometrically and isokinetically using a **Biodex dynamometer**;
- **5-repetition maximum (5RM) leg press**; and
- The **Resistance Training Skills Battery for Children (RTSBc)**.



## RESULTS

Analyses of variance between groups revealed RTSBc scores to be significantly different ( $F(2,61)=13.179, p<0.001$ ), with TD children scoring significantly higher than those at risk of movement difficulties (LMP1;  $p=0.021$ ) and those with significant difficulties (LMP2;  $p<0.001$ ).

5RM scores were also significantly different between groups ( $F(2,61)=5.618, p=0.006$ ), but only between TD children and the LMP2 group. No differences were found between groups for isometric or isokinetic measures of strength.

	Typically Developing (n=41)		Low Movement Proficiency 1 (n=8)		Low Movement Proficiency 2 (n=18)	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
RTSBc Score	49.60	5.52	42.25*	6.94	40.05**	9.09
5RM Leg Press	41.24	15.01	31.25	3.53	30.17	8.64

\* $p\leq 0.05$  \*\* $p\leq 0.01$

## DISCUSSION

- Results demonstrate that strength profiles of children screened using the MABC-2 change along with the complexity of the task.
- No differences were observed in strength between TD children and those at risk (LMP1) or those with significant movement difficulties (LMP2) for limb-isolated tasks such as the Biodex, however tasks requiring more motor planning and control, such as 5RM and RTSBc elicited a significant difference.
- Children with significant movement difficulties often performed poorly compared to TD children or even children 'at risk' of difficulties.

## TRANSLATION TO PRACTICE

*These findings suggest that interventions targeting children with motor impairments should target functional strength and coordination, rather than isometric or isolated strengthening exercises.*



## REFERENCES:

1. Lubans DR, Morgan PJ, Cliff DP, Barnett LM, Okely AD. Fundamental movement skills in children and adolescents. *Sports medicine*. 2010;40(12):1019-35.
2. Barnett, L. M., van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2009). Childhood motor skill proficiency as a predictor of adolescent physical activity. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, 44(3), 252–259.
3. Rivilis, I., Hay, J. A., Cairney, J., Klentrou, P., Liu, J., & Faught, B. (2011). Physical activity and fitness in children with developmental coordination disorder: a systematic review. *Research in Developmental Disabilities*, 32(3), 894–910.

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