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Weight, Waist, and Why It Matters: Somatic Drivers of Motor Competence in Children

Ivan Šerbetar [1], Lea Žmegač [2]

[1] *Assoc.Prof., Faculty of Teacher Education, University of Zagreb, Croatia*

[2] *Univ.mag.prim.educ, Croatia*

Corresponding author:
ivan.serbetar@ufzg.hr

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ABSTRACT: The study examined motor competence and somatic measures in 37 Croatian children aged 8–9 using MABC-2. Anthropometry included height, weight, BMI, waist circumference, waist-to-height ratio (WHtR), and four skinfolds. Weight status was evenly split: 48.65% were normal weight, 48.65% were overweight/obese, and one participant was underweight. No statistically significant gender differences appeared in somatic variables. In motor performance, girls outperformed boys on drawing (manual dexterity), whereas boys scored higher for catching and the combined aiming-and-catching domain; other domain differences were nonsignificant. Correlational analyses showed strong positive interrelations among adiposity indicators (weight, BMI, WHtR, waist, skinfolds). Balance correlated negatively with adiposity (r ≈ -0.50 to −0.60), and the total MABC-2 composite correlated negatively with BMI, WHtR, waist circumference, and skinfolds (r ≈ -0.35 to −0.44), indicating that higher adiposity was accompanied by lower motor competence. Traffic-light classification identified 78.4% children in typical development, 13.5% "at risk", and 8.1% possible DCD. Findings highlight urgent needs for screening, targeted PE, and healthy-weight promotion.

KEYWORDS: Motor competence, childhood obesity, balance, gender differences, developmental coordination disorder (DCD).

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Introduction

Motor competence refers to the ability to master both fine and gross motor skills essential for everyday activities and involvement in physical pursuits. It encompasses fundamental motor patterns such as running, jumping, throwing, catching, and maintaining balance (Barnett et al., 2016; Robinson et al., 2015). Childhood is a crucial phase for the development of these capacities as early deficits can affect later physical activity, psychosocial development, and overall health (Malina, 2004). Recent studies emphasise two interrelated challenges: the increasing prevalence of obesity among children and the growing number of children with low motor competence (Bao et al., 2024; Quka et al., 2019). Both issues are influenced by sedentary lifestyles, insufficient physical activity, and changes in social environments (Tan & Chia, 2024).

The Movement Assessment Battery for Children – Second Edition (MABC-2) is among the most widely used tools for evaluating children's motor competence. It assesses three domains: manual dexterity, aiming and catching, and balance (Henderson, Sugden, & Barnett, 2007). On the other hand, body measures such as height, weight, body mass index (BMI), waist circumference, waist-to-height ratio (WHtR), and skinfold thickness are standard indicators of physical development, nutritional status, and health risk (Mišigoj-Duraković, 2008; Gudaji et al., 2018). Understanding how these somatic dimensions relate to motor performance can guide preventive and educational strategies in schools and clinical practice.

Research Aim and Research Questions

This study aimed to clarify the relationship between motor competence and somatic characteristics in children aged 8–9 years. Specifically, the research aimed to discover the distribution of participants across BMI categories, to test sex differences in somatic measures (height, weight, BMI, waist circumference, skinfolds, WHtR) and/or on MABC-2 outcomes (manual dexterity, aiming & catching, balance), and finally to categorize overall motor competence using the MABC-2 traffic-light model (green/yellow/red) and describe its distribution.

Research Results

The study included 37 children aged 8–9 years (18 boys, 19 girls). Based on BMI, 48.65% were of normal weight (n=18), 48.65% were overweight or obese (n=18), and 2.7% were underweight (n=1). Somatic measures showed no statistically significant sex differences for height, weight, BMI, waist circumference, WHtR, or skinfolds.

Across somatic indices (Table 1), strong positive interrelations were observed (weight, BMI, WHtR, waist circumference, and skinfold sum; $r \approx .75–.95$). Balance performance correlated negatively with adiposity indicators—body weight, BMI, WHtR, waist circumference, and skinfolds—with moderate effect sizes ($r \approx -.50$ to $-.60$, $p < .01$) (Table 1). In contrast, somatic measures were not significantly associated with manual dexterity or aiming & catching subtest scores. The overall MABC-2 composite score was also negatively related to adiposity ($r \approx -0.35$ to -0.44, $p < 0.05$), indicating that higher adiposity was associated with lower overall motor competence (Table 1).

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Regarding gender differences in motor performance, girls achieved significantly better results on the drawing task (manual dexterity; $p = 0.03$), while boys outperformed girls in catching ($p = 0.01$) and the aggregated aiming & catching domain ($p < 0.001$). Other motor tests, including peg placement, threading, balance tasks, hopping, and beanbag throwing, did not yield statistically significant gender differences. As expected, the three MABC-2 domains showed a positive correlation with the total score.

Using the MABC-2 traffic-light classification, 78.4% of children were in the green zone (typical development; n=29), 13.5% in the yellow zone (at risk; n=5), and 8.1% in the red zone (significant difficulties; n=3). More boys fell within the green zone, whereas more girls appeared in the yellow and red zones, suggesting a slightly higher risk of motor difficulties among girls in this sample.

Table 1

Associations between measures

	1	**2**	**3**	**4**	**6**	**7**	**8**	**9**
1. *Height*	-							
2. *Weight*	**.69****	-						
3. *BMI*	**.38***	**.93****	-					
4. *WHtR*	.17	**.75****	**.89****	-				
6. *Sum of skinfolds*	.32	**.83****	**.92****	**.93****	-			
7. *Manual dexterity*	-.01	-.01	-.02	-.03	.01	-		
8. Aiming & catching	.08	-.09	-.15	-.13	-.23	-.03	-	
9. *Balance*	-.16	**-.50****	**-.57****	**-.59****	**-.60****	.06	.13	-
10. Composite score	-.05	-.32	**-.40***	**-.38***	**-.44****	**.55****	**.52****	**.69****

Note. * significant at p<.05; ** significant at p<.01

Discussion and conclusions

The present study provides important insights into the relationship between somatic measures and motor competence in children aged 8–9 years. Perhaps the most concerning finding is that nearly half of the participants were classified as overweight or obese. This proportion is higher than reported in several European school samples (Lobstein et al., 2020; Garrido-Miguel et al., 2019), underscoring the need for targeted interventions. Excess body mass during childhood not only increases the risk of chronic health problems later in life (Reilly & Kelly, 2011) but is also linked to reduced opportunities for engagement in physical activity, thereby creating a negative cycle of inactivity and weight gain (Stodden et al., 2008).

The analysis of motor skills revealed apparent gender differences. Girls achieved significantly higher scores on fine-motor tasks, specifically on the drawing test, while boys performed better at

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catching and in the overall aiming and catching domain. This aligns with previous studies showing that girls often excel at manual dexterity tasks, while boys tend to excel at object-control skills, such as throwing and catching (Barnett et al., 2016; Smits-Engelsman et al., 2023). These differences may reflect both biological predispositions and socially reinforced activity patterns, as boys are more frequently encouraged to engage in ball games. At the same time, girls may be more likely to engage in activities that require fine motor control and precision (Goodway et al., 2010).

Notably, the classification of children is based on the MABC-2 traffic-light model. While the majority of participants were in the green zone (typical development), five children were classified as "at risk" (yellow), and three fell into the red zone, indicating potential Developmental Coordination Disorder (DCD). Given the comparatively small sample, the proportion of children at motor risk (21.6%) is striking and higher than the commonly reported prevalence estimates of DCD, which range from 5% to 6% in the general population (Blank et al., 2019). This highlights the importance of early screening in schools, as undetected coordination difficulties may reduce children's participation in physical activity, limit social interactions, and negatively affect self-esteem (Cairney et al., 2019).

Correlation analyses enhance understanding of the processes responsible for these results. Strong positive correlations were expected among somatic variables (weight, BMI, WHtR, skinfolds), as these measures all reflect adiposity. Essentially, balance showed consistent negative associations with weight ($r = -.50$), BMI ($r = -.57$), WHtR ($r = -.59$), and skinfolds ($r = -.60$). This confirms previous evidence that excess body mass compromises postural control (D'Hondt et al., 2013), likely due to biomechanical disadvantages such as a higher center of mass and lower relative muscle strength. Interestingly, neither manual dexterity nor aiming and catching correlated significantly with adiposity, suggesting that overweight primarily limits gross motor skills that rely on balance and whole-body coordination rather than fine or upper-limb precision tasks (Davis et al., 2021).

The overall composite motor competence score also correlated negatively with adiposity indicators ($r = -0.35$ to -0.44), further supporting the conclusion that higher body fat is associated with poorer motor outcomes. On the other hand, the composite score was strongly positively correlated with all three motor domains (manual dexterity, aiming & catching, balance), which is consistent with the structure of the MABC-2 and validates the internal coherence of the test.

Taken together, these results highlights the dual challenge of childhood obesity and motor difficulties. On one hand, nearly half of the children are already overweight or obese, and on the other, a significant minority show risk or evidence of DCD. The observed sex differences emphasize the need for balanced curricula in physical education that boost both fine and gross motor skills. Early identification and targeted interventions can help prevent the downward spiral in which motor difficulties result in decreased physical activity, resulting in further weight gain and poorer motor outcomes (Stodden et al., 2008).

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