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From Movement to Emotion: Exploring How Motor Fitness Relates to Emotional Intelligence in Preschoolers

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ABSTRACT: Objective: To test multivariate links between motor fitness and emotional intelligence (EI) in preschoolers. Methods: Fifty-nine children (49–78 months) completed curl-ups, sit-and-reach, shuttle run, and anthropometry; parents rated EI (Perception/Expression, Understanding/Evaluation, Management/Regulation). We conducted correlations and two canonical correlation analyses (CCAs): one between anthropometrics and EI, and another between motor fitness and EI. Results: Bivariate tests showed better curl-ups related to higher EI and faster shuttle-run to better regulation. CCA for anthropometrics × EI was nonsignificant. The motor fitness×EI CCA yielded one significant function (R_c = .561, p = .005; redundancy ≈ 12% EI by motor), defined by curl-ups and shuttle-run on the motor side and regulation and perception/expression on the EI side. Conclusion: Specific motor abilities—core endurance and agility—show modest, multivariate associations with EI in preschoolers; adiposity markers do not. Findings support the use of play-based activities paired with explicit emotion-skills coaching in early education.

KEYWORDS: motor fitness; preschool; emotional intelligence; agility; muscular endurance.

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Introduction

Physical fitness in childhood encompasses the ability to engage in daily activities and play without experiencing excessive tiredness, thereby reducing long-term health risks. Foundational frameworks describe five components: body composition, cardiorespiratory fitness, muscular strength, muscular endurance, and flexibility (Caspersen et al., 1985). In early childhood, regular physical activity is associated with better fitness, healthier weight status, stronger bone health, and improved mental health and academic outcomes (Dentro et al., 2014; Pate et al., 1995). Emotional intelligence (EI) refers to the ability to perceive, understand, use, and regulate emotions in oneself and others (Mayer & Salovey, 1997), and relates to social functioning and adaptive behaviour in school and sport settings (Goleman, 1997; Lane et al., 2010; Petrides & Furnham, 2003). Although there are similar bodies of research on motor fitness and emotional intelligence, there is limited evidence linking the two in preschool-aged children. This study examined whether indicators of general physical fitness are associated with EI among children aged 4–6.8 years in northwest Croatia. Fitness was assessed using tasks from the President's Challenge battery (Franks & Safrit, 1999) and anthropometry; EI was assessed by parents using a verified scale for ages 4 to 8 (Kajbafnezhad, 2016).

Research Aim and Research Questions

This study aimed to investigate the potential relationship between general physical fitness and emotional intelligence in preschool-aged children.

Research questions:

1) Are motor fitness measures (curl-ups, sit-and-reach, shuttle run) associated with overall EI and its subscales (Perception/Expression; Understanding/Evaluation; Management/Regulation)?

2) How do anthropometric indicators (BMI, waist circumference, skinfolds) relate to motor tests and EI?

3) Do EI ratings differ by sex or age group in this sample?

Null hypothesis: There is no association between children's general physical fitness and their emotional intelligence.

Methods

Participants

Participants were 59 preschoolers (49–78 months; 4.1–6.8 years) from two preschools in northwest Croatia (33 girls, 26 boys). Age groups: 4 years (n = 19), 5 years (n = 28), 6 years (n = 12).

Measures

Motor fitness: President's Challenge tasks—curl-ups (30 s; abdominal endurance), sit-and-reach flexibility, and shuttle-run (agility). Anthropometry: height, weight (for BMI), waist circumference, and sum of skinfolds (triceps, abdomen, subscapular). Emotional intelligence: parent-reported scale for ages 4–8 with three subscales: Perception/Expression, Understanding/Evaluation, and Management/Regulation (Likert 1–5).

Procedure

Testing was conducted in preschool gymnasiums, while parents completed emotional intelligence questionnaires at home. Each session began with a brief warm-up. The average testing duration was approximately 20 minutes per child, adhering to ethical procedures in accordance with national guidelines and the Helsinki Declaration. Written parental consent was obtained for 59 out of 60 invited participants.

Data Analysis

Descriptive statistics were computed for all variables. Pearson correlations summarised bivariate associations. To examine multivariate links between variable sets, we conducted two canonical correlation analyses (CCA) in SPSS: (1) Anthropometrics (BMI, waist, skinfolds) × EI subscales; (2) Motor fitness (curl-ups, shuttle-run, flexibility) × EI subscales. The interpretation emphasised structure coefficients ($\lambda \geq .30$) and cross-loadings (loading × Rc). We report canonical correlations (Rc), Wilks' Lambda (Λ), F, degrees of freedom, p values, variance extracted (Set by Self), and redundancy (Set A by Set B).

Research Results

Descriptive Findings

According to BMI categorisation, 62.7% of children were of normal weight, 10.2% were overweight, 10.2% were obese, and 17.0% were underweight. Parent-rated EI subscales (1–5) showed no meaningful sex differences. Selected bivariate associations: curl-ups with EI sum $r = .335$ ($p = .009$) and with Perception/Expression $r = .419$ ($p = .001$); shuttle-run time with Management/Regulation $r = -.289$ ($p = .026$); sit-and-reach with shuttle-run $r = -.467$ ($p < .001$). BMI correlated strongly with waist ($r = .890$) and skinfolds ($r = .834$), as expected.

Canonical Correlation Analyses

Anthropometrics × EI: No significant functions ($Rc_1 = .419$, $Rc_1^2 = .176$; $\Lambda = .797$; $F(9, 129.14) = 1.40$; $p = .195$). Redundancy was minimal (EI explained by anthropometrics = .033; anthropometrics explained by EI = .031).
Motor fitness × EI: One significant function ($Rc_1 = .561$, $Rc_1^2 = .315$; $\Lambda = .650$; $F(9, 129.14) = 2.774$; $p = .005$). The motor variate was defined primarily by curl-ups (λ=.991) and shuttle-run (λ=.535); the EI variate by Management/Regulation (λ=.776) and Perception/Expression (λ=.737). Cross-loadings were meaningful for curl-ups (.556), shuttle-run (.300), regulation (.435), and perception/expression (.414). Redundancy indicated that motor fitness accounted for ~12.2% of EI variance and EI accounted for ~13.8% of motor variance via the first function.

Table 1

Canonical correlation summary for two analyses.

Analysis	Funct.	Rc	Rc²	Wilks' Λ	F	df1	df2	p	Var. Extracted (Set1)	Var. Extracted (Set2)	Redund. (S1 by S2)	Redund. (S2 by S1)
Anthrop. ×	1	0.42	0.18	0.80	1.40	9.00	129.14	0.20	0.18	0.19	0.03	0.03

EI												
Anthrop. × EI	2	0.16	0.02	0.97	0.46	4.00	108.00	0.77	0.67	0.48	0.02	0.01
Anthrop. × EI	3	0.09	0.01	0.99	0.49	1.00	55.00	0.49	0.15	0.33	0.00	0.00
Motor Fit × EI	1	0.56	0.32	0.65	2.77	9.00	129.14	**0.01**	0.44	0.39	0.14	0.12
Motor Fit × EI	2	0.21	0.04	0.95	0.71	4.00	108.00	0.59	0.18	0.26	0.01	0.01
Motor Fit × EI	3	0.09	0.01	0.99	0.42	1.00	55.00	0.52	0.38	0.35	0.00	0.00

Note. Loadings = correlations between observed variables and their own canonical variate (|r| ≥ .30). Cross-loadings = loading × Rc. Redundancy quantifies the variance one set explains in the other via the canonical function. Signs of loadings are arbitrary in CCA.

Discussion and Conclusions

The canonical analyses sharpen the bivariate picture and align our findings with the broader preschool literature. First, anthropometric indicators (BMI, waist, skinfolds) showed no reliable multivariate association with EI—consistent with the weak pairwise correlations and with the view that adiposity constrains performance in weight-bearing tasks more than it aligns with parent-reported socio-emotional skills in early childhood (e.g., Dumith et al., 2012; Hasan et al., 2016). Second—and more importantly—the motor fitness profile, centred on abdominal endurance (curl-ups) and agility (shuttle run), was jointly associated with EI, especially emotion regulation and perception/expression. The redundancy indices (~12–14%) indicate non-trivial shared variance for a small three-by-three design and converge with our bivariate correlations.

This research is related to some prior studies. For example, correlational evidence in typically developing preschoolers tends to show modest *socio-emotional* associations that depend on the measures and informants used; our pattern aligns with that reported by Salaj and Masnjak (2022). At the intervention level, *early-childhood education and care* (ECEC) programs reliably increase physical activity and fundamental movement skills. At the same time, pooled effects on social-emotional outcomes are small or uncertain, suggesting cautious causal claims and the need for better-powered EI endpoints (Grady et al., 2025). Teaching models that explicitly embed social-emotional learning into movement, such as the *Teaching Personal and Social Responsibility* (TPSR) model, report positive emotional and social outcomes and offer a pragmatic template for preschool practice (Aygun et al., 2024).

Findings from the current study suggest mechanisms, including a plausible pathway via *executive functions* (EF) and self-regulation, which develop rapidly between the ages of 3 and 6. Meta-analytic work indicates that cognitively engaging physical activity—games that tax inhibition, working memory, and switching—can improve EF, particularly inhibitory control; program features such as session length and total duration strengthen effects (Mao et al., 2024). In contrast, pooled effects for short, acute bouts are mixed (Dixon et al., 2025). This helps explain why sustained, controlled effort (curl-ups) and coordinated start-stop demands (shuttle run) align with EI regulation and perception/expression in our data.

The study has some implications. Namely, although cross-sectional, our results support integrated, play-based approaches that pair motor-skill practice with explicit EI/SEL coaching (emotion labelling, perspective-taking, calm-down routines). Programs may benefit from moderate-intensity, cognitively engaging games that deliberately recruit EF. Assessment should shift toward multi-informant EI (e.g., teacher and observer ratings) and incorporate relevant family/home factors to mitigate rater bias and clarify pathways. Future studies should expand the motor battery (e.g., cardiorespiratory endurance, upper-body strength) and test EF-mediated models in longitudinal or intervention designs.

The study also has some limitations. The sample was modest (N = 59), motor testing used three President's Challenge tasks due to logistical constraints; EI relied on parent report (potentially confounded by halo/social desirability); and the design was cross-sectional. These constraints likely attenuate effect sizes and limit causal inference.

In conclusion, multivariate analysis confirms that specific motor abilities—especially core endurance and agility—co-vary with emotion regulation and perception/expression in preschoolers, whereas adiposity markers do not. Practically, regular, play-based physical activity paired with intentional EI scaffolding in preschool and at home is a reasonable, low-risk strategy while more definitive trials accumulate.

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