Faculty and PostDoc

Physical Fitness and Academic Performance in Normal Weight, Overweight, and Obese School children in Qatar: A Pilot Study for Physical Education Perspective

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BACKGROUND AND OBJECTIVES

Childhood obesity and loss of physical fitness are rising problems internationally. Although research concerning mitigation strategies has been enforced, empirical results until now fail to address problems and needs of the Gulf region, which has unique geographical and cultural features. Therefore, this study investigated academic performance (e.g., Arabic, mathematics, and science), and physical fitness in normal, overweight, and obese child handball athletes in Qatar.

Study aims were a) to describe physical and academic performance stratifying based on BMI and b) to evaluate interactions between BMI, physical fitness, and academic performance.

MATERIAL & METHODS

This investigation was completed during the in-season period (January to February 2020). First division Qatari male handball players (n = 33, age: 10.3 ± 0.6 years) participated. For academic performance, actual Grade Point Average (GPA) and subject-specific percentages in Arabic, mathematics, and science were obtained from the first semester of the 2019-2020 academic year from the school records (QU-IRB 1163-EA/19). Jump, sprint, agility, throwing, and endurance performance were the measures of physical fitness (Figure 1).

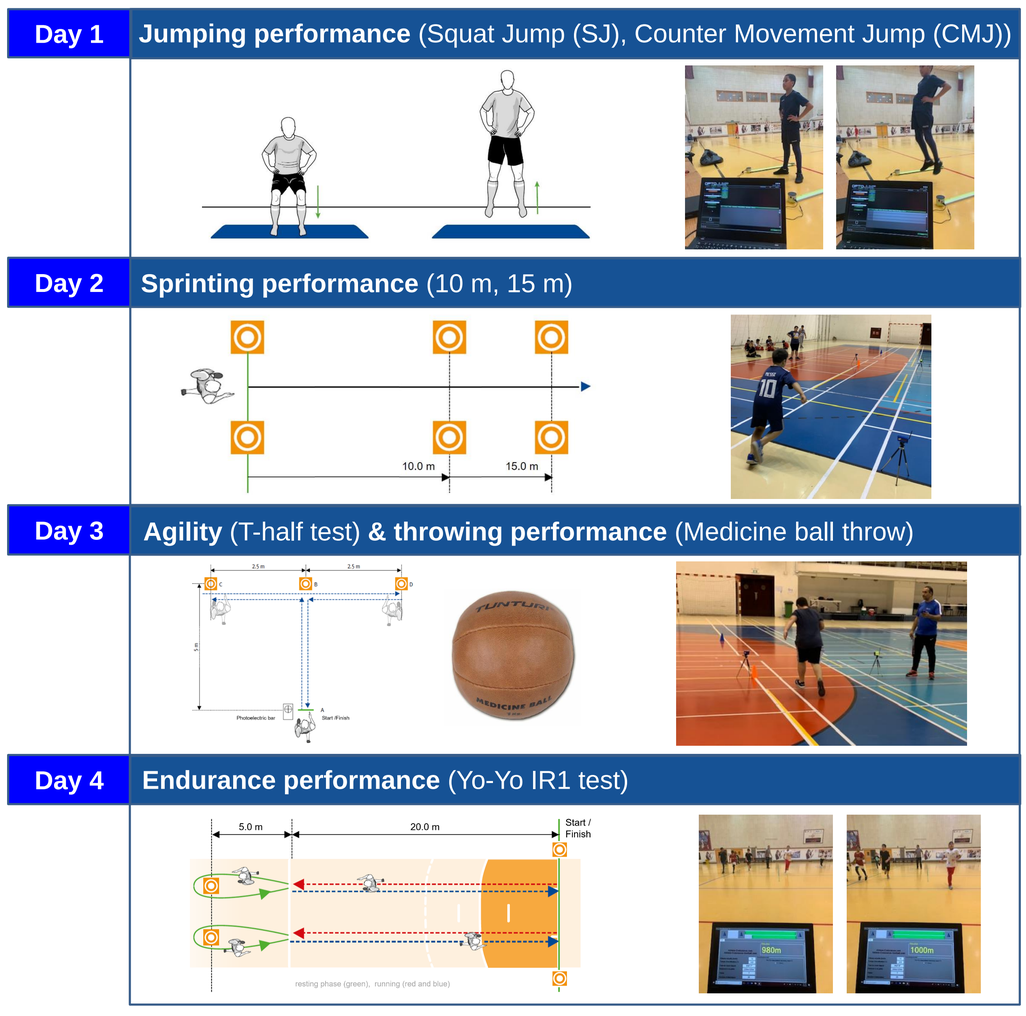

FIGURE 1 | Testing schedule in terms of content and time

RESULTS

TABLE 1 | Comparison of performance parameters between BMI age-adjusted groups (n=11). Meaningful effects (criteria: $p < 0.05$ and $\eta_p^2 > 0.15$) and performance maxima highlighted in bold.

	normal weight (18.0-20.9 kg/m²)	overweight (21.0-22.9 kg/m²)	obese (> 23.0 kg/m²)	Variance analysis p (η_p^2)	Significant and meaningful partial effects p (d)
Physical performance parameters					
Yo-Yo IR 1 [m]	**902 ± 227**	695 ± 274	782 ± 320	0.205 (0.094)	-
Medicine ball throw [m]	3.94 ± 0.91	3.77 ± 0.48	**4.08 ± 1.05**	0.659 (0.026)	-
Agility T-half test [s]	**8.68 ± 1.33**	9.79 ± 1.33	10.2 ± 1.43	**0.035 (0.190)**	normal weight vs. obese: 0.038 (1.10)
CMJ [cm]	**17.5 ± 2.69**	13.5 ± 2.92	12.8 ± 2.76	**0.001 (0.363)**	normal weight vs. overweight: 0.005 (1.43) normal weight vs. obese: 0.001 (1.73)
SJ [cm]	**17.2 ± 3.40**	13.2 ± 3.19	13.6 ± 2.26	**0.007 (0.269)**	normal weight vs. overweight: 0.009 (1.21) normal weight vs. obese: 0.030 (1.27)
10 m Sprint [s]	2.68 ± 0.48	**2.43 ± 0.35**	2.96 ± 0.55	**0.028 (0.200)**	overweight vs. obese: 0.024 (1.18)
15 m Sprint [s]	3.73 ± 0.51	**3.60 ± 0.46**	4.12 ± 0.72	0.083 (0.144)	-
Academic performance parameters					
Arabic	**88.1 ± 8.33**	80.9 ± 15.2	83.5 ± 17.7	0.470 (0.046)	-
Mathematics	**91.4 ± 15.0**	76.7 ± 14.4	87.5 ± 16.8	0.064 (0.158)	-
Science	**93.5 ± 6.23**	83.1 ± 7.70	85.5 ± 15.6	0.057 (0.164)	-

With the exception of medicine ball throw (obese: 4.08 ± 1.05 m) and sprinting parameters (overweight: 10 m: 2.43 ± 0.35 s; 15 m: 3.60 ± 0.46 s), normal weight participants exhibited the greatest performance. Between groups, only four (T-half test, CMJ, SJ, 10 m sprint) meaningful differences were observed.

Regarding relationships between different categories of parameters (anthropometric vs. physical performance vs. academic performance), two relevant ($r>0.5$) correlations were detected: BMI vs. CMJ: r=-0.569 (Figure 2a), Yo-Yo IR1 vs. science: r=0.548 (Figure 2b).

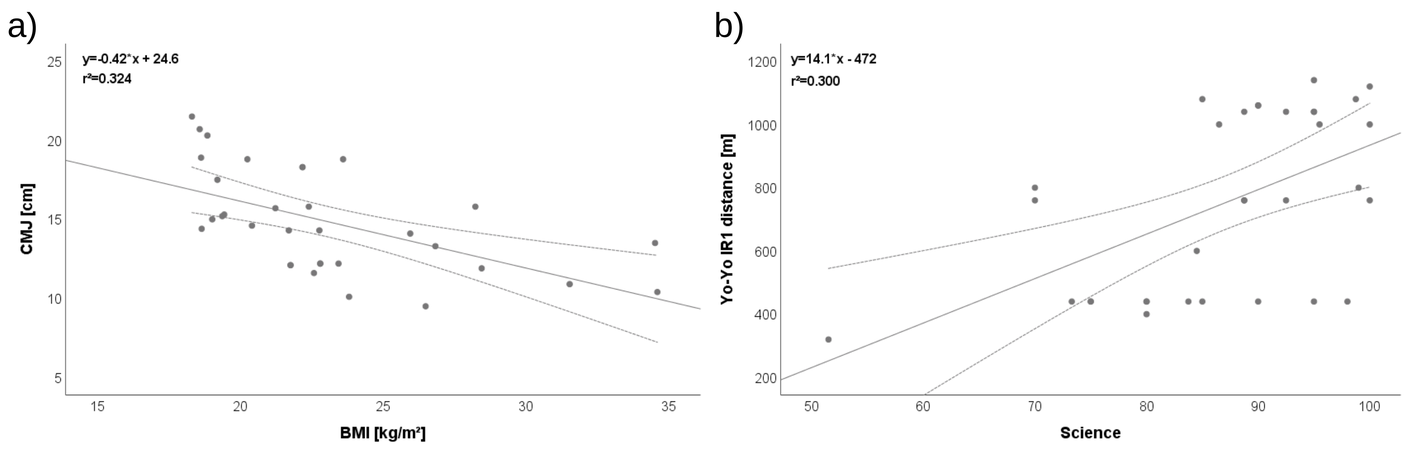

FIGURE 2a-b | Relationship between BMI and CMJ (a) and Science and Yo-Yo IR1 (b). Please note that one dot can represent several subjects.

CONCLUSIONS

Cardiorespiratory fitness is positive associated with academic performance. In all academic parameters, normal weight participants had the highest mean performance and the obese group the lowest. In contrast, anaerobic performance (e.g., sprinting, jumping, throwing) were not related to academic performance at ages studied herein.

These data provide more evidence that aerobic fitness is positively associated with academic performance. We propose, in line with previous literature (Hillmann et al. 2005, 2008; Esteban-Cornejo et al., 2014; Torrijos-Nino et al., 2014), there is an association between exercise, physical activity, aerobic capacity, brain plasticity, cognitive health, brain function and improved memory.