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Intensity and Type of Physical Activity and Semen Quality in Young Healthy Men Living in Brescia, North Italy

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INTRODUCTION

A decline in semen quality has been documented over recent decades, possibly linked to rising rates of obesity, unhealthy diets, and exposure to environmental toxins, although the exact causes remains a topic of debate [1]. Recreational physical activity (PA) has been associated with numerous heath benefits, including the prevention of chronic diseases and the promotion of overall well-being, and it is strongly recommended by the World Health Organization (WHO) and various Scientific Societies.

Physical activity is hypothesized to have a positive effect on semen quality due to its favorable impact on metabolic and endocrine functions [2]. However, excessive physical activity may have the opposite effect, potentially leading to reduced semen quality and fertility. This may be due to impaired function of the hypothalamic-pituitary-gonadal axis, increased oxidative stress, and chronic inflammation [3–5].

AIMS

To investigate this topic and add evidence, we conducted a cohort study aimed to assess the relationship between PA intensity and semen quality – measured by sperm concentration, total and progressive motility, and proportion of normal morphology cells - in a population of healthy young men living in Brescia, North Italy.

MATERIALS AND METHODS

A prospective study within the FAST randomized trial was conducted between April 2018 and June 2019 [6]. Semen quality parameters were assessed at the enrollment (baseline) and again after 4 and 8 months. Each semen sample was collected in a sterile container via masturbation after a period of sexual abstinence lasting at least 3 days and no more than 5 days. Samples were delivered to the laboratory within 30–40 minutes of collection, and a portion of each sample (<50 µl) was immediately processed for semen analysis (spermiogram). Additionally, a 20 ml blood sample was collected from each participant under fasting conditions.

PA was assessed at baseline and after 4 and 8 months using the International Physical Activity Questionnaire (IPAQ), which evaluates various types of activity - including walking, moderate-intensity, and vigorous-intensity activities - and estimates the total energy expenditure expressed in Metabolic Equivalent of Tasks (METs).

Due to the longitudinal nature of the data, a linear mixed model with robust variance estimation was used to assess the association between PA with sperm concentration. A generalized linear mixed model with a Poisson distribution was applied to evaluate total, progressive motility and normal morphology cell counts, using the total number of cells as an offset.

Restricted spline regression models were fitted to model the potential nonlinear shape of the associations between total PA and semen parameters.

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RESULTS

A total of 143 young healthy men (median age 20 years, IQR 19-21 years) participated in the study. The majority were engaged in moderate (45%) or high (43%) recreational PA, with a median expenditure of 1,960 (95% confidence interval, 1,055–3,182) Metabolic Equivalent of Tasks in min/wk.

The main results are presented in Table 1. An increase in total sperm motility (IRR 1.11, 95% CI, 1.05-1.17) and normal morphology (IRR 1.18, 95% CI, 1.03-1.35) was observed among participants engaged in moderate PA. Conversely, an inverse association was observed for walking and vigorous-intensity PA. No association was observed between PA and sperm concentration.

An inverse U-shape relationship was identified, with the highest values of total sperm motility and normal morphology occurring at intermediate levels of PA. No statistically significant trend was found for sperm concentration, although a U-shaped relationship association was suggested by the restricted cubic spline model.

CONCLUSIONS

Our findings are consistent with several studies previously conducted on healthy young men from the general population, as well as on male partners of infertile couples, which have shown that individuals engaging in moderate-to-high levels of physical activity tend to exhibit better semen quality compared to those with sedentary lifestyles or very high levels of activity. The results support current recommendations to engage in moderate physical activity to promote overall health, including improvement in semen quality [7]. Future research should investigate the mediating role of DNA methylation in the relationship between physical activity and semen quality.

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Table 1. Multivariable association estimates between physical activity levels and semen quality parameters

	Sperm concentration (106/ml)	*Total motility (%)*	*Cell with normal morphology (%)*
Physical activity	*(95% CI)*	*IRR (95% CI)*	*IRR (95% CI)*
IPAQ (x1000 MET)	*0.52 (-0.83,1.9)*	*0.98 (0.97,0.99)*	*0.99 (0.97,1.00)*
IPAQ category			
Low	*Ref*	*Ref*	*Ref*
Moderate	*-8.40 (-17,-0.53)*	*1.11 (1.05,1.17)*	*1.18 (1.03,1.35)*
Intense	*-3.30 (-13,6.7)*	*1.01 (0.94,1.07)*	*1.09 (0.95,1.26)*
Walking METs (x1000 METs)	*-0.73 (-3.8,2.3)*	*0.95 (0.93,0.98)*	*0.94 (0.89,0.99)*
Moderate METs (x1000 METs)	*1.80 (-0.85,4.4)*	*1.00 (0.99,1.02)*	*1.00 (0.97,1.04)*
Vigorous METs (x1000 METs)	*0.54 (-1.4,2.5)*	*0.97 (0.96,0.98)*	*0.99 (0.97- 1.01)*

Statistically significant at α=0.05

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