Physical activity is not related to semen quality in young healthy men

Lidia Mínguez-Alarcón, Ph.D.,[a] Jorge E. Chavarro, M.D., Sc.D.,[b,c] Jaime Mendiola, Ph.D.,[a] Audrey J. Gaskins, Sc.D.,[b] and Alberto M. Torres-Cantero, M.D., Ph.D.[a,d,e]

[a] Division of Preventive Medicine and Public Health, Department of Health and Social Sciences, University of Murcia School of Medicine, Murcia, Spain; [b] Departments of Nutrition and Epidemiology, Harvard School of Public Health; [c] Channing Division of Network Medicine, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts; [d] Regional Campus of International Excellence "Campus Mare Nostrum," University of Murcia; and [e] Department of Preventive Medicine, Reína Sofía University Hospital, Murcia, Spain

Objective: To study the relationship of physical activity with semen quality among healthy young men from Spain.
Design: Cross-sectional study.
Setting: University and college campuses of Murcia Region, Spain.
Patient(s): Healthy young men with untested fertility (n = 215).
Intervention(s): A physical examination, blood and semen samples, and completion of a questionnaire.
Main Outcome Measure(s): Semen quality parameters.
Result(s): Physical activity was not related to semen quality parameters. The adjusted percentage differences (95% confidence interval) in semen parameters comparing men in the top quartile of moderate-to-vigorous physical activity (≥9.5 h/wk) with men in the bottom quartile (≤3 h/wk) were 4.3% (−30.2%, 38.9%) for total sperm count, 7.2% (−30.6%, 45.1%) for sperm concentration, −2.42% (−6.53%, 1.69%) for sperm motility, and 12.6% (−12.0%, 37.2%) for sperm morphology.
Conclusion(s): In contrast to previous research among athletes, these data suggest that physical activity is not deleterious to testicular function, as captured by semen quality parameters in this population of healthy young men in Spain. (Fertil Steril® 2014;102:1103–9. ©2014 by American Society for Reproductive Medicine.)
Key Words: Semen quality parameters, physical activity, young healthy men, Spain

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Infertility affects approximately one in six couples who try to get pregnant (1), and male factor is identified in as many as 58% of the couples evaluated for infertility (2). Two meta-analyses have documented a drastic decrease in semen quality in Western populations during the 20th century (3, 4), and multiple single-center studies have found a continuation of this trend into the first decade of the 21st century (5–8). Although the downward trend in semen quality is likely multifactorial, with a variety of lifestyle factors exerting negative (9–11) and positive (12, 13) influences on spermatogenesis, the most commonly endorsed hypothesis is that this trend reflects increased population-wide exposure to endocrine-disrupting chemicals with estrogenic or antiandrogenic activity (3, 14, 15). Nevertheless, other factors coinciding with the decline may also explain this trend. For example, the obesity epidemic (16–18), increased paternal age (19), and secular changes in diet quality (20) are equally likely potential explanations for this downward trend. However, other alternative hypotheses like increased sedentary activity and lower physical activity (21, 22) have, until recently, received little attention (23, 24).

Physical activity is a particularly attractive target for potential lifestyle modification among men trying to conceive. On one hand, there is strong evidence of multiple health benefits in adults. All types and intensities of physical activity reduce rates of all-cause mortality, metabolic syndrome, high blood pressure, and coronary heart disease, and can improve bone health and cognitive function, for example (25–28). However, the literature on the relationship of physical activity with

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Reprint requests to: Lidia Mínguez-Alarcón, Ph.D., Division of Preventive Medicine and Public Health, Department of Health and Social Sciences, University of Murcia School of Medicine, 30100 Espinardo (Murcia), Spain (E-mail: minguez@um.es).

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semen quality and other markers of testicular function presents contradictory results (21, 22, 29–37). Many studies have reported that physical activity may be deleterious for sperm production (29–31, 36). However, the majority of studies in this field have focused almost exclusively on the effect of high-intensity training among elite athletes in a relatively narrow range of activities (29–37) or men presenting at fertility clinics (21), raising concerns on the generalizability of the existing literature. Specifically, high-intensity physical activity characteristic of professional athletes may have very different physiologic effects on testicular function than activity levels that most men in the general population are able to achieve. Moreover, men presenting to fertility centers tend to differ systematically from men in the general population in a wide variety of socio-economic factors, raising the possibility that associations identified in the setting of a fertility clinic may not be directly translatable to other men. To further address this question, we examined the relationship of moderate physical activity with semen quality among healthy young men from Spain.

MATERIALS AND METHODS

Study Population

The Murcia Young Men's Study was a cross-sectional study carried out between October 2010 and November 2011 in the Murcia Region of Spain. Subjects were healthy male university students, aged 18 to 23 years. Recruitment flyers were posted at university campuses. Two hundred forty students contacted study staff. Of these, 17 subjects were ineligible. Of the remaining 223 eligible men, 215 (96%) agreed to participate and completed a study visit. During the study visit, men underwent a physical examination and provided a semen sample. All of them also completed questionnaires concerning demographics, medical and reproductive history, medication use (antibiotics, antidepressants, and hormones), and smoking habits. Diet was assessed using a validated questionnaire (38–40). Men received a €50 gift card for their participation. Written informed consent was obtained from all subjects. The Research Ethics Committee of the University of Murcia approved this study (no. 495/2010, approved May 14, 2010).

Physical Examination

Body weight and height were measured using a digital scale (Tanita SC 330-S). Body mass index (BMI) was calculated as weight in kilograms divided by squared height in meters. Presence of varicocele was evaluated and recorded as no varicocele, only detected during Valsalva procedure, palpable, or visible. The presence of other scrotal abnormalities was also recorded. Testicular volume was measured using a Prader orchidometer (Andrology Australia).

Physical Activity Assessment

Participants were asked to report the number of hours they spent in a normal week over the past 3 months engaged in vigorous, moderate, or light exercise. Although this questionnaire has not been validated among Spanish men, similar physical activity questionnaires have been validated in other populations (41). Total activity was calculated as the sum of vigorous, moderate, and light activity. Moderate-to-vigorous activity was calculated as the sum of those categories. We also calculated the total metabolic equivalents (METs) and moderate-to-vigorous METs. Mild (<3 METs), moderate (3–6 METS), and vigorous (>6 METs) activities were given an average MET level of 2, 4.5, and 6, respectively, to calculate the total METs per person (42). Total METs was calculated as the sum of vigorous, moderate, and light METs. Additionally, moderate-to-vigorous METs was calculated as the sum of those METs categories. For example, a man who spent 7 h/wk in vigorous, 2 h/wk in moderate, and 4 h/wk in light activities would accumulate 13 h/wk of total physical activity, 9 h/wk of moderate-to-vigorous activity, 42 MET-h/wk of vigorous activity (7 h at 6 METs), 9 MET-h/wk of moderate activities, 8 MET-h/wk of light activity, 51 MET-h/wk of moderate-to-vigorous physical activity, and 59 MET-h/wk, of total activity.

Semen Collection and Analysis

Men were asked to abstain from ejaculation for at least 48 hours before sample collection. However, if subjects had not abstained for that period of time, they were not excluded (n = 30). Abstinence time was recorded as the time between current and previous ejaculation as reported by the study subject. Men collected semen samples by masturbation at the clinic. Ejaculate volumes were estimated by specimen weight, assuming a semen density of 1.0 g/mL. Sperm concentration was evaluated by hemocytometer (Improved Neubauer; Hauser Scientific). Spermatozoa were classified as motile (progressive and nonprogressive) according to the World Health Organization criteria (43). Sperm morphology was assessed using strict criteria (44). Total sperm count (volume × sperm concentration) was also calculated. All semen analyses were performed by the same individual. An external quality control on semen analysis was carried out in collaboration with the University of Copenhagen's Department of Growth and Reproduction.

Statistical Analyses

Semen volume, sperm concentration, total sperm count, and percentage of morphologically normal sperm showed non-normal distributions and were transformed using the natural log (ln) before analysis. Men were divided into quartiles of physical activity. Men with the lowest physical activity category were considered as the reference group. Linear regression was used to examine the association of physical activity with semen quality parameters while adjusting for potential confounders. Tests for linear trend were performed using the median values of physical activity in each quartile as a continuous variable and semen parameters as the response variable. Confounding was assessed using a hybrid method that combines previous knowledge using directed acyclic graphs (45) and a statistical method on change in point estimates in which the potential covariate was not retained in final models, if it resulted in a change in the β-coefficient of <10%. The variables considered as potential