Response of semen parameters to three training modalities

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Objective: To investigate the effect of different training modalities on various markers of semen quality.
Design: Crossover study.
Setting: Medical school.
Patient(s): Forty-five men participated voluntarily in the study, being allocated into three groups according to their sports practice.
Intervention(s): None.
Main Outcome Measure(s): Sperm parameters (volume, liquefaction time, pH, viscosity, sperm count, motility, and morphology).
Result(s): Sperm concentration; total sperm number; type "a," "b," and "d" velocity; and morphology were significantly different among the practitioners of the three different training modalities. Morphology was the parameter showing the greatest difference, even reaching clinical relevance for the triathlete group (4.7%, poor prognosis pattern). In addition, these parameters tended to decrease as training requirements increased.
Conclusion(s): There are differences in the seminal profiles of individuals exercising in different modalities. The differences are more marked as intensity and volume of exercise increase, especially for morphology. These variables ought to be carefully analyzed and taken into account when designing a training protocol, especially with higher-level athletes, so that reproductive function is not compromised. (Fertil Steril® 2009;92:1941–6. ©2009 by American Society for Reproductive Medicine.)

Key Words: Male infertility, seminal profile, water polo, triathlon, physically active, training, sports

The last few decades have seen a rising demand for sports activities. Physical exercise is promoted as a panacea for fitness, health, stress reduction, and life quality improvement, a matter of great importance in today's society (1). Despite this increased interest, not having an adequate knowledge of how to perform these activities might, on occasion, lead to the appearance of negative side effects (e.g., lesions, pathologies). For example, a trend toward a decline in reproductive function has been reported not only in women but also in men as expressed by the analysis of the semen (2–5). A number of studies reported on the relevance and effects of physical exercise on reproductive function. This association has been assessed mainly in women because of unequivocal symptoms such as delayed menarche, oligomenorrhea, and amenorrhea (6–8) especially in runners (9, 10), gymnasts (11), and ballet dancers (12).

Alterations in the reproductive function of male athletes have also been reported (3, 13). Early investigations pointed to exercise volume as the variable most affecting reproduction, thus hypothesizing a volume threshold for reproductive disorders (14, 15). Other authors have suggested that exercise intensity is equally deleterious to, or even more so than, volume on reproductive function (16, 17). Other parameters inherent in any specific exercise modality can be harmful to the reproductive system, such as bike saddles because of friction (18). We hypothesized that the continued practice of different sports modalities, because of their inherent characteristics (volume and/or training intensity, different energy requirements), can result in differences in the practitioners' seminal profiles. Thus, it was the aim of the present study to analyze the semen profiles of three male populations with different types and levels of physical activity.

MATERIALS AND METHODS

Subjects

The study was approved by the Institutional Review Board of the University of Córdoba, and informed consent was obtained from all participants. Healthy white men volunteered

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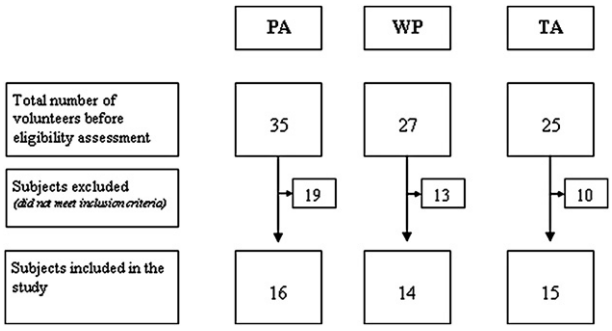
FIGURE 1

Flow diagram of participants. PA = physically active subjects; WP = water polo players; TA = triathletes.



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to participate in the study. A physician reviewed their medical histories, ruling out possible reproductive alterations or childhood illnesses that could interfere with semen production (e.g., mumps, measles, varicocele, trauma to the genital area). The volunteers had no previous known infertility or hypothalamic-pituitary problems, although in most cases they had not fathered children. Exclusion criteria included, therefore, surgery or conditions that could impair reproduction, varicocele, and use of steroid hormones. Other factors that could interfere with the semen parameters were evaluated; such factors included diet, coffee, cigarette smoking, and alcohol consumption (evaluated through a 7-day qualitative and quantitative questionnaire), as well as possible occupational activities thought to exert a negative impact on semen quality, such as exposure to pesticides or paints or sitting for long hours in transportation means.

The inclusion criteria were related to exercise and to reproductive health, expressed as the following: not having any of the aforementioned exclusion criteria, practicing a minimum of 3 h/wk, and having a maximum oxygen uptake of at least 40 mL/min per kilogram. A total of 45 subjects participated in the study. According to their own practice and training characteristics subjects were allocated to one of the following three groups: physically active subjects, water polo players, and triathletes (Fig. 1).

The first group was composed of physically active subjects (n = 16) who did not practice any systematic resistance and power training but exercised three times a week, for 1 hour each session. The subjects in this group practiced several sports (basketball, soccer, tennis, paddle ball) and participated in local university competitions (nonprofessional). The second group was composed of water polo players (n = 14). The subjects in this group were champions of the "provincial" league for the 2004 to 2005 season and had a more demanding training load, performing a total of five training sessions a week with 90 minutes duration each. The third group was composed of triathletes (n = 15). The subjects in this group were elite triathletes and participated in the "Ironman" competition. Their total weekly training volume was distributed as follows for each of the three disciplines (running [49.4 ± 7.4 km], cycling [330.8 ± 56.0 km], and swimming [11.3 ± 3.0 km]). The Ironman competition included 3.8 km of swimming, 180 km of biking, and 42.2 km of running. The characteristics of the subjects with regard to their backgrounds and morphofunctional and training status are given in Table 1.

TABLE 1

Subjects' demographics.

	Physically Active	Water Polo	Triathletes
Subjects	16	14	15
Age (years)	19.0 ± 1.8[a,b]	25.5 ± 3.2[b,c]	33.1 ± 3.5[a,c]
Weight (kg)	73.1 ± 8.3[a]	79.9 ± 10.7[b,c]	74.5 ± 7.6[a]
Height (cm)	175.9 ± 4.2[a]	180.1 ± 5.2[b,c]	175.3 ± 3.7[a]
Body fat (%)	15.6 ± 3.0[a,b]	13.2 ± 3.5[b,c]	7.0 ± 2.9[a,c]
VO2max (ml/min/kg)	45.2 ± 4.2[a,b]	54.2 ± 4.9[b,c]	64.0 ± 5.1[a,c]
Years of training	1.6 ± 0.7[a,b]	4.0 ± 1.1[b,c]	8.1 ± 3.2[a,c]
Number of sessions/Week	3.3 ± 0.4[a,b]	5.0 ± 0.0[b,c]	9.9 ± 1.8[a,c]
Duration of session (min)	60.0 ± 0.0[a,b]	90.0 ± 0.0[b,c]	122.6 ± 62.7[a,c,d]
Sports category	Local	Regional	International

Note: Values given as mean ± SD. Vo_2max = maxmum oxygen uptake.
[a] Significant differences ($p < 0.05$) compared to water polo players
[b] Significant differences ($p < 0.05$) compared to triathletes
[c] Significant differences ($p < 0.05$) compared to physically active subjects
[d] Mean of all sessions (cycling, swimming, running)

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