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DOES ISOTONIC EXERCISE AFFECT SPERM VITALITY IN HEALTHY MALES?- A ANALYTICAL STUDY.

Physiology

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ABSTRACT

Introduction: Isotonic exercise has a range of beneficial effect on the sperm vitality depending upon the intensity, duration of activity and fitness of the individual. But further research is required.

Methodology: Study was carried out in 90 subjects subdivided into Group A - sedentary healthy males (30), Group B- healthy males involved in regular isotonic exercises for last 1 year and Group C- healthy males who were involved in regular isotonic exercises for at least 5 years (30). Sperm vitality in all subjects was assessed using Eosin- Nigrosin staining method and was compared among 3 groups. The data was analyzed and compared using 1 way Anova and Bonferroni's multiple comparison test.

Results: Mean sperm vitality (%) was statistically significant in Group B (mean =78.4 ±4.14) as compared to Group A (mean =59.6 ± 15.47) and Group C (Mean =55.5 ± 14.51). There was no statistically significant difference in the mean sperm vitality (%) between Group A and Group C.

Conclusion: Short term moderate intensity isotonic exercises increase the sperm vitality. Long term moderate intensity isotonic exercise shows no significant effect on the sperm vitality.

KEYWORDS

Sperm vitality, isotonic exercise.

Introduction:

The American College of Sports Medicine and the American Heart Association recommend at least 30 minutes of moderate exercise on 5 days each week or at least 20 minutes of vigorous exercise on 3 days each week[1]. While exercise has been associated with many health benefits, including reduced risks of obesity, diabetes, cardiovascular disease, and some cancers[2], the relation between exercise and male fertility has not been well-studied. Physical activity has a range of effects on male reproductive function depending upon the intensity and duration of the activity and the fitness of the individual. In general, it appears that relatively short duration and moderate intensity exercise increases the serum testosterone levels, but there is debate as to what degree haemoconcentration, decreased clearance and/or increased synthesis are involved. It is clear from the promptness of the testosterone increment that the mechanism does not involve gonadotrophin stimulation of the testes. There is suppression of serum testosterone levels during and subsequent to more prolonged exercise (and to some extent in the hours following intense short term exercise).

In males where results seem more controversial, it has been observed that prolonged intensive exercise (and training) may lead to adverse effects on the physiological systems, particularly the reproductive system and fertility with alterations in reproductive hormone levels[2-12], atrophy of the testicular germinal epithelium and adverse effects on spermatogenesis[13-15] changes in semen parameters including abnormal sperm morphology[2,3,7,10,11,16] and reduced sperm motility.

Nevertheless, there are still many discrepancies in studies regarding the effect of exercise and physical activity on male fertility. Therefore, the aim of the present study is to study the impact of physical exercise on reproductive performance and fertility as well as to lay down a research platform that may help to standardize future studies on male fertility and exercise.

Material and methods:

Ethical approval regarding the study was obtained from the institutional ethics committee. The study was carried out between May and October 2017 in Pune.

In this analytical study, men in the age group of 18-35 years had to complete a self-administered questionnaire by providing information regarding their reproductive history and whether they routinely practice any physical activity or not. If they did, they were asked to fill the description, type, frequency, intensity and duration of the physical activities practiced.

Subjects doing isotonic exercises <60 minutes or >90 minutes; subjects doing regular isotonic exercises for < 4 days per week; subjects with history of any chronic disease, sexually transmitted diseases and reproductive disorders; subjects with history of use of any medications that could alter the hypothalamic-pituitary-gonadal (H-P-G) axis such as anabolic steroids and commercially available proteins supplements, ayurvedic and homeopathic muscle boosters, energy drinks; subjects with irregular eating patterns and history of depressive illness; subjects having occupation with exposure to toxic agents like pesticides or working under high temperature conditions; smokers and alcoholics; subjects having hydrocele, hernia; subjects with history of surgery for hernia repair, testicular trauma, hydrocele; subjects with signs of congenital, sex chromosomal abnormalities; subjects on treatment with drugs like phenothiaquines, anti hypertensive like Beta blockers, antiepileptics, antibacterials (sulfasalazine, nitrofurantoin), H_2 receptor antagonists (cimetidine) at least 3 month prior to study, were excluded from the present study.[17]

Certain anthropometric measurements (height and weight) necessary to calculate Body Mass Index (BMI) were also measured in subjects.

Based on history and clinical examination, ninety healthy age and BMI matched men were selected for the present study. All participants were explained about the nature of the study and informed consent regarding participation in study was obtained from them.

They were divided into 3 groups of 30 each as follows.

Table 1- Distribution of groups

Group	Criteria	Group size
Group A	Sedentary healthy males not involved in regular isotonic exercises.	30
Group B	Healthy males who were involved in regular isotonic exercises (weight lifting exercises for upper limbs, lower limbs and torso in a well-equipped gymnasium having standard weights and machines) 60-90 minutes daily, for 4-5 days per week, for last 1 year.	30
Group C	Healthy males in age group of 18-35 years who were involved in regular isotonic exercises (weight lifting exercises for upper limbs, lower limbs and torso in the same gymnasium as above) 60-90 minutes daily, for 4-5 days per week, for at least 5 years.	30

Semen samples were collected from participants in wide mouthed bottle after masturbation and after a recommended ejaculation abstinence of 3-4 days. Semen samples were allowed to completely liquefy (30-60 minutes at 37°C).

Sperm vitality was assessed using Eosin-Nigrosin staining method [EosinY stain (0.5% in aqueous NaCl), Nigrosin stain (10% in distilled water), liquid paraffin.] The staining was performed according to the World Health Organization (WHO) guidelines[15,16] and a blood film type smear was prepared with a focus on uniform distribution . These smear slides were air dried and examined under oil immersion (100 x objective) of a compound microscope. Sperms showing white heads were viable while those with dark pink or red heads were considered as nonviable. The results were expressed in percentage. Calculations and results were interpreted using Graph Pad Prism 5 statistical software (Table 2 and Table 3). One way Anova and Bonferroni's multiple comparison tests were used for Statistical analysis. The unused samples were discarded after treating them with 10% Sodium hypochlorite solution.

Results:

Table 2: Comparison of age, height, weight and BMI among participants

Parameter	Group A Mean ± SD	Group B Mean ± SD	Group C Mean ± SD	P value
Age (Y)	26.0 ± 4.9	27.9 ±4.9	25.7 ± 5.3	>0.05
Weight (Kg)	78.2 ± 4.4	77.4 ± 3.5	77.6 ± 4.6	>0.05
Height (m)	1.70 ± 0.05	1.70 ± 0.04	1.70 ± 0.05m	>0.05
BMI (Kg/m^2)	26.8 ± 2.4	26.6 ± 1.8	26.9 ± 2.1	>0.05

The difference in mean values of age, height, weight and BMI in all the groups was statistically insignificant.

Table 3: Sperm vitality (%) in all groups

Group	Sperm Vitality (%) Mean ± SD
A	59.6 ± 15.47
B	78.4 ± 4.14
C	55.5 ± 14.51

Table 4: Comparison of percentage mean values of sperm vitality in all groups

Bonferroni's Multiple Comparison Test	p value	Statistical significance
Group A vs Group B	< 0.05	Yes
Group A vs Group C	> 0.05	No
Group B vs Group C	< 0.05	Yes

On comparing the combined data sets of percentage mean values of sperm vitality between all 3 groups, significant correlations were found between Group A and Group B ($P<0.05$) and between Group B and Group C ($P<0.05$). No significant correlation was found between Group A and Group C.

Discussion:

The difference in mean values of age, height, weight and BMI in all the groups was statistically insignificant. This means all the groups were comparable with respect to age, height, weight and BMI. (Table 2)

The mean percentage values sperm vitality for Group A and B remained above the lower limit reference values proposed by the WHO[18] (> 58%) as compared to Group C whose values were slightly on the lower side although not statistically significant. (Table 3)

Significant differences were found in mean percentage values of sperm vitality between Group B (regular isotonic exercises for 1 year) as compared as group A (sedentary healthy individuals) and between Group B and Group C (regular isotonic exercises for 5 years or more). (Table 4)

The sperm vitality was better in Group B which signifies that relatively short duration and moderately intense isotonic exercise increases the serum testosterone levels while longer duration moderately intense isotonic exercises showed no significant increase in the sperm vitality neither it showed any detrimental effect on it. Thus short term moderate intensity isotonic exercises as reported in this study exert a positive effect on the sperm vitality of these men.

Vaamonde D et al (2012) also observed increased sperm vitality in physically active men.[19]

Guarnizo MC et al (2011) got similar results in a group of assisted reproduction patients classified according to their physical status.[20]

Conclusion:

It can therefore be concluded that short term moderate intensity isotonic exercise increases the sperm vitality. Long term moderate intensity isotonic exercise shows no significant effect on the sperm vitality. The findings are encouraging since they contribute to elucidate the proper intensity and frequency of physical activity which may exert a positive effect on semen quality or at least prevent its decline related to the practice of longer duration moderate intensity isotonic exercises. Future studies are required in defining the intensity and threshold of exercise to be considered as beneficial for semen quality.

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