Exercise-induced BMI declince were association with increased sperm motility in college students

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Abstract

The purpose of the study was to investigate the effect of short-term aerobic exercise on sperm parameters. Design: before-after studies. Methods: 7 studies with mean ages 19 (3 obesity and 4 normal weight) were recruited. Participates were performed a six-week aerobic exercise, exercise intensity remained at maximum heart rate of 75-80%, semen quality included semen volume, sperm concentration and sperm motility, waist circumference and BMI were also assessed. Results: After the completion of exercise program, sperm motility b was significantly increased, exercise-induced BMI declined-amplitude were significantly associated with increased sperm motility in normal weight male, but not in obese. Conclusions: Our study demonstrated that exercise-induced BMI declined-amplitude were significantly associated with increased sperm motility, this finding may be explained, at least in part, by an improvement of male reproductive health.

Keywords

Aerobic exercise; BMI; Sperm motility.

1. Introduction

It was well konwn that there were significant improve on sperm count, sperm density and sperm motility in higher-intersity runners group after 60-weeks exercise intervention, but not change ejaculate volume. In moderate-intensity groups, there were significant improve on sperm count, sperm density, but not change sperm motility or ejaculate volume. There were significant higher on sperm count, sperm density in moderate-intensity exercise than high-intensity exercise group[1]. All of above which suggestion that moderate-intensity exercise were preferred on improve sperm quality. A review paper by Jóźków, et al. (2016) shown that intensity of physical activity may affect sperm concentrations and count of motile, exercise in higher intensity with increased loads seems to be negative correlated with semen quality. However, recreational athletes, exercise has positive or neutral effect on semen quality[2].

Previous study shown that intense endurance exercise has associated with sperm parameters in male runners, there was significant low on sperm counts, sperm motility in male runners rather than control group, This seems to suggest that long-distance exercise is bad for reproductive health[3]. A randomized controlled study by Safarinejad, et al. **[**1]shown that over training by long-term treadmill exercise have a deleterious effect on reproduction health. The effect form bicycling on sperm quality was adverse. The men bicycling ≥ 5 hours / week was associated with lower sperm concentration compared with no regular exercise. A prospective cohort study [4] shown that semen parameters were associated with regular exercise no found. Interestingly, semen volume and sperm count was significant increase after short exercise in all subjects. The effect of semen volume was significant

increase 80% HR_{max}(Maximum heart rate) than 40% HR_{max}[5]. Obesity were associated with an increase risk of sperm DNA damage and low sperm motility[6].

Lifestyle changes (included exercise or physical activity) can improve sexual function of obese men was well known[7], however, there was litter known that whether or not possible to improve the quality of the semen in the obese population. Physical activity was known that strongly effect body composition, however, the effect of exercise on male semen parerment was uncertain[8 9]. Male reproduction cell level were effect by intensity and amount of exercise, therefore, we investigate the effect on semen parameters from six weeks aerobic exercise on normal weight and obesity male.

Organization of the Text

2. Materials and Methods

2.1 Study participants

A total of 7 male volunteers(4 normal weight and 3 obesity) were recruited for this study. Average age were 19-year-old and average weight 78.4 kg, the average waist circumference was 89.4 cm, all subjects were no habits of smoking, alcohol, volunteered to join the study, they were familiar with the potential risks and testing processes, test specification on this study. This study was minimally invasive， we were sure that the date was only used for scientific research.

2.2 Ethical approval

All procedures in this study involning huaman participants were in accordance with the Declaration of Helsinki and were approved by the ethics committee of Sichuan University of Arts and Science.

2.3 Exercise intervention

Participants completed 6 weeks of exercise intervention, 6 times per week and rest on Sunday. The exercise is composed of 20 push-ups and moderate intensity running 400 meters. The most suitable exercise heart rate (heart rate) = maximum heart rate of 75-80%, 8-10 minutes of warm-up exercise each time, the duration of each exercise duration is 60 minutes.

2.4 Laboratory methods:

BMI, body weight and Waist circumference were evaluated. Sperm count, percentage of sperm motility was evaluated. All subjects were requested to observe a 3 to 4day abstinence period before provide a semen sample, and the subjects were no performance heavy exercise. Semen samples were obtained at the second peoples hospital of Dazhou city, China. Sperm motility and count were analyzed using the World Health Organization(WHO) 2000 definition[10].

2.5 Data analysis

All data were represented by mean value and standard deviation. SPSS20.0 software was used for statistics. Independent sample T test was used in different groups before and after intervention, and paired T test was used for the same group before and after intervention. Any $P<0.05$ showed significant difference. Pearson correlation coefficient was used to represent the relationship between changed BMI and sperm motility (%) in all subjects, but not in normal weight groups or obesity group.

3. Results.

3.1 Characterization of the subjects:

The baseline and Post-Pre Characteristics of the subjects were provided in Table 1. There were significant difference on body weight ($p < 0.05$), Waist circumference ($p < 0.01$) and BMI($p < 0.05$) between normal weight group and obesity group. However, there was no significant difference on after of exercise intervention.

Table 1. Characteristics of the study subjects (mean ± S D)

Variance	Normal weight（4）	Obesity(3)	Pre (7)	Post (7)
Body weight(kg)	65.5±12.1*	95.7±9.8	78.4±7.2	77.7±7.7

Waist circumference(cm)	77.3±10.6**	105.7±4.5	89.4±6.5	87.3±6.1
BMI(kg/m2)	23.5±4.0*	31.4±1.8	26.9±2.0	26.1±2.0

*：Normal weight VS Obesity, P< 0.05；**：Normal weight VS Obesity, P< 0.01 .

3.2 Effect of exercise on sperm parameters

There was not significantly increased on total sperm count, sperm motility (%) and sperm motility a (%). However, sperm motility b (%) was significantly increased trend after exercise intervention (p = 0.06), although there was only seven subjects (Fig 1).

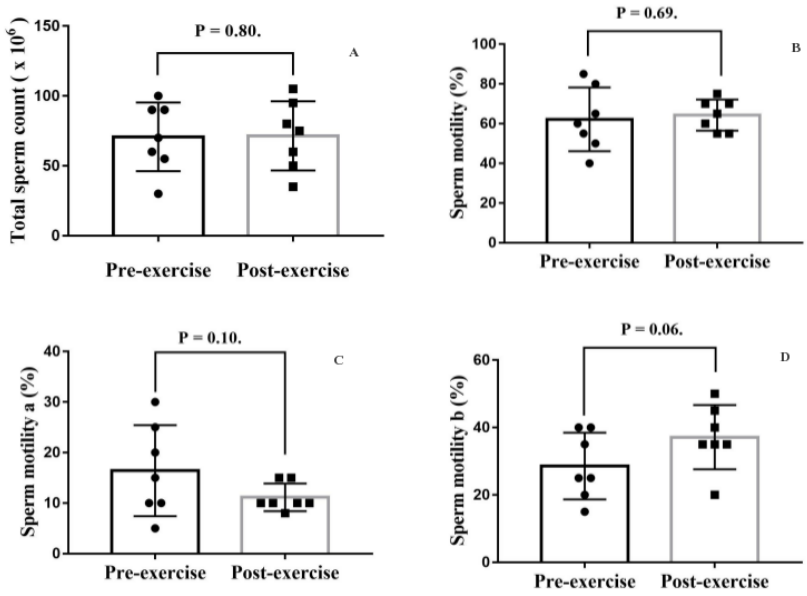

Figure 1. Compared of sperm parameters pre-post exercise in all subjects. A:There was no significant difference on total sperm count after post-exercise. B:There was no significant difference on sperm motility(%) after post-exercise. C: There was no significant difference on sperm motility a (%) after post-exercise. D:There was significant difference trend on sperm motility b (%) after post-exercise.

A significant correlation-trend was found between induced BMI# and sperm motility (%) (R^2=0.77, p = 0.12) in normal weight group, but not in obesity or all subjects (Fig.2).

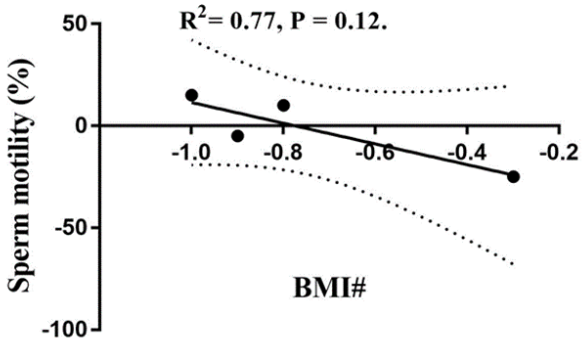

Figure 2. Exercise-induced BMI declined-amplitude was significantly associated with increased sperm motility in normal weight male.

4. Discussion

The present investigation is a longitudinal study of sperm count and motility in male. The results of this study demonstrate that short-exercise caused reduce in BMI and improve sperm motility in normal weight group, but not in obesity, or all subjects.

The previous study shown that moderate-intensity exercise were preferred on improve sperm quality[1]. In our study, we found that there was not significantly increased on total sperm count, sperm motility (%) and sperm motility a (%) after 6-week aerobic exercise. However, sperm motility b (%) was significantly increased after exercise intervention ($p = 0.06$), although there was only seven subjects. Sperm motility% was significantly altered after 12 and 24 weeks in moderate-intensity continuous exercise, high-intensity continuous exercise, high-intensity interval exercise and moderate-intensity interval exercise. At the 12 weeks, moderate-intensity continuous exercise changes of motility were significant greater than high-intensity interval exercise and no-exercise group[11].

The effect of exercise on alteration sperm parameters were controversial, Jensen, et al [12]found that the sperm volume and sperm motility were significantly fell during training in male marathon athletes, but not sperm count. Interestingly, high training were significantly improved the sperm count than low training. However, there was no significant difference on sperm volume and motility%. In our study, we found that short-exercise improved the sperm motility b%, but sperm motility a% and total sperm motility % in normal weight male, but no obesity subjects. The sperm count was no significantly alterated by six-week aerobic exercise, this complied with previous study by Jensen, et al [12]. Interestingly, a cross-sectional study[13] found that there was significant difference on semen parameters among physical activity groups, water polo and triahtletes. There was no significant difference on sperm volume, sperm concentration and total sperm count, %Type b velocity of triahtletes were lower than any other groups, but not %Type b velocity. There was no significant difference on sperm concentration, total sperm count and %Type b velocity, it suggested that sperm quality was inhibited by high-intensity exercise. Significant higher was found on total sperm progressive motility(%Type b velocity and %Type a+b velocity, not %Type a velocity) in physically active subjects than sedentary subjects[9]. However, In study by Eisenberg, et al (2014)[14]was no found relationship between physical activity and semen parameters. The possible mechanism of improve sperm quality was that moderate-intensity exercise result in a more proper environment for the sperm production processes[9].

The men in the highest quartile of moderate-to-vigorous activity (≥ 15 hours/week) had 73% higher sperm concentrations than men in the lowest quartile (≤ 5 hours/week)[15]. Interestingly, there was found that sperm concentrations and count were significant inversely associated with TV watching[16], The men in the highest quartile of TV watching (> 20 hours/week) had 44% lower sperm concentrations than men in the lowest quartile (0 hours/week). It seem suggested that in health men higher moderate- intensity exercise and less sedentary behavior were positive associated with semen quality. Even in sedentary obese adults, after a 16-week aerobic exercise, semen count, motility and morphology were significantly improved[17]. At the same time, the study shown that moderate-intensity continuous exercise was superior to high-intensity continuous exercise and high-intensity interval exercise in the improvements of male reproductive function[11]. Another short-time of 22 days at high altitudes-exercise (5900 m) caused significant reduction of sperm concentration, but no changed the count of sperm quality[18].

The study shown that sperm parameters showed linear decline with increasing BMI[14], in our study, we also found that a significant correlation-trend was found between induced BMI# and sperm motility (%) ($R^2 = 0.77$, $p = 0.12$) in normal weight group. However, but not in obesity subject or the whole subjects. It seems that we should pay enough attention on keeping health weight in order to maintain higher semen quality, or by weight loss to improve semen parameters.

5. Conclusion

Our study demonstrated that exercise-induced BMI declined-amplitude were significantly associated with increased sperm motility, this finding may be explained, at least in part, by an improvement of male reproductive health.

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