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## Sexual Activity before Competition and Athletic Performance: A Systematic Review

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### ABSTRACT

**Objectives.** The purpose of the present study was to systematically evaluate the scientific evidence about the impact of pre-competition sexual activity on athletic performance. **Methods.** Using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement, PubMed, Scopus, ISI Web of Science, Cochrane Library, ProQuest, Physiotherapy Evidence Database (PEDro), and Google Scholar searches were performed with appropriate keywords without time and language restrictions for studies evaluating the impact of sexual activity on athletic performance. The titles and abstracts were reviewed by two independent reviewers. The methodological quality of the studies and the risk of bias were checked using the quality assessment tool of the Critical Appraisal Skills Program (CASP). **Results.** We found that most studies on this topic had low methodological quality. Out of the 456 articles retrieved in the search, only seven met the inclusion criteria of the review. In four of these studies, sexual activity 10–12 hours before competition did not alter short-term physiological testing results including maximum-effort grip strength test, hamstring flexibility, reaction time, aerobic power (stair-climbing exercise),  $VO_{2max}$  (treadmill and cycle ergometer test), sub-maximal graded-exercise test, muscular endurance, oxygen pulse, double product, testosterone, cortisol, blood glucose concentrations, and mental concentration. In one study, significantly higher differences were reported for post-maximal stress test heart rate at 5 and 10 minutes during two hours of recovery period after sexual intercourse, which disappeared when a maximal stress test was performed 10 hours after sexual activity. In another study immediately after sexual intercourse, 40% of long-distance athletes had difficulty during intensive loading, while in 90% of the addressed athletes, sexual activity 12 hours before the endurance test did not have an influence on performance. **Conclusion.** Based on mainly low-quality and heterogeneously designed studies, it can be concluded that having sex at least 10–12 hours before athletic events does not negatively influence physiological test results and possibly athletic performance. However, having sex immediately or a few hours before a competition has negative psychological or physiological effects on athletic performance.

**KEY WORDS:** *Sexual Behavior, Athletic Performance, Exercise, Coitus, Physiology.*

### INTRODUCTION

The topic of sexual activities prior to a competitive event is a popular subject among athletes and sportspersons. For many years, football coaches and Olympic athletes have

recommended sexual abstinence the night before competition. They believed that sexual abstinence increases frustration and aggressive behavior during a competitive event (1). In their

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opinion, having sex causes energy wastage and individuals who are sexually less active have higher testosterone levels (2). On the other hand, some athletes and authors suggest that sex before a competition may have an anti-anxiety and relaxing effect, and, in fact, depriving an athlete of a normal activity may cause guilt and loss of concentration. They believe that sexual activity may promote relaxation and positively affect performance (3, 4). Both US track star David Wottle and Canadian downhill skier Karin Lee Gardner attributed their Olympic success partially to their pre-race sex. Mohammad Ali had opposing views on this subject. He reported abstaining from sexual activity up six weeks before a match, claiming that this behavior increased his aggression (1). Also, there is not enough knowledge about the impact of masturbation and orgasm on athletic performance. Although no definite rule is established about the effect of sexual activity on athletic performance, the majority of young male football players in the US report practicing abstinence before an event, believing that sexual activity can impair their performance (5).

Considering that athletes are more sexually active than non-athletes (6, 7), the fact that sex could alter their performance by either physiological or psychological elements (1), and the controversy surrounding this topic, we decided to review the literature on whether pre-competition sex influences performance. Thus, the aim of the present study was to summarize original scientific articles studying the effect of sexual activity on athletic performance.

## MATERIALS AND METHODS

This systematic review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. PubMed, Scopus, ISI\_Web of Science, Cochrane Library, ProQuest, Physiotherapy Evidence Database (PEDro), and Google Scholar searches were performed using various combination of the keywords "sexual activity," "coitus," "sexual intercourse," "athletic performance," "exercise," "competition," "sport," and "physical activity" for relevant studies without time and language restrictions until April 2017. In addition, the references of identified publications were evaluated for additional suitable studies. Only

primary scientific studies that evaluated the effect of sexual activity on physical fitness and athletic performance in healthy adults were selected. Case reports, reviews, and editorials were not included but their reference lists were screened for relevant studies. The inclusion criteria were defined according to the PICO (Population, Intervention, Comparison, and Outcome) measures. First, two reviewers (authors) independently screened titles and abstracts for appropriate studies according to the inclusion criteria. Then, the full texts of the included papers were retrieved independently by the reviewers. The results were further evaluated by the third and fourth authors by an extraction form that includes study participants, study design, outcome measures, and results. In situations where the two reviewers could not agree, the other authors were consulted (Figure 1).

The quality evaluation of the studies was carried out using the checklist of the Critical Appraisal Skills Programme (CASP) (8). Each study was rated by two authors (Table 1). As the current scientific evidence about the effect of sexual activity on athletic performance is primarily based on low-quality and heterogeneously designed studies, the results must be interpreted cautiously.

## RESULTS

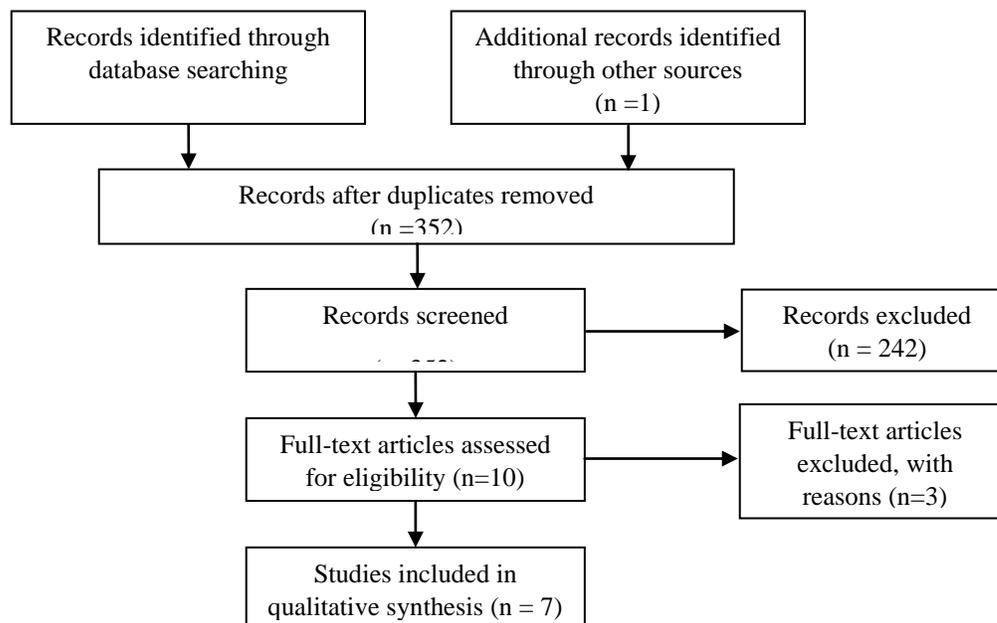
From among 456 studies reviewed to identify appropriate investigations, only seven met our criteria and were included in the present systematic review. Four studies examined the physiological and four the psychological aspects of sex before the event. One study addressed both the physiological and psychological aspects (Table 1).

### Physiological aspects

The studies performed by Sztajzel et al. (9), Boone et al., Johnson (10), and Vouyoukas (11) showed that having sex before physiological and biomedical tests ( $\geq 10$  hours) does not alter the test results. The physiological and biomedical tests and measures used in these studies were the maximum-effort grip strength test (Johnson), maximal graded cycle ergometer stress test elements, plasmatic testosterone amounts (Sztajzel et al.), maximal aerobic power

(maximal treadmill exercise), oxygen pulse, double product(an index of relative cardiac function, Boone et al.), aerobic capacity(sub-maximal graded-exercise test), grip strength, leg power(vertical jump test), reaction time(ruler

test), hamstring flexibility(the sit and reach test), muscular endurance(the push-up test), testosterone, cortisol, blood glucose concentrations, and blood pressure (Vouyoukas et al.).



**Figure 1.** Flow-chart of studies included in the systematic review according to Preferred Reporting Items for systematic Reviews and Meta-analyses (PRISMA) statement

The design of two studies (Sztajzel et al., Boone et al.) was randomized cross-over and two others (Johnson and Vouyoukas) used repeated measures.

Except for one female in Vouyoukas' study, all participants in these studies were male. They consisted of individuals with both physically active (Sztajzel et al. and Vouyoukas studies) and sedentary (Boone et al, Johnson and Vouyoukas) lifestyles.

Participants in the study by Sztajzel et al. included both team players (one soccer and seven hockey players), endurance athletes (three cyclists and two long-distance runners), and power athletes (two weight lifters). None of them were taking anabolic agents. In this study, significantly higher differences were reported for post-maximal stress test heart rate at five and ten minutes of the morning stress test during the two-hour recovery period after sexual intercourse. This disappeared when the maximal stress test was performed in the afternoon,

approximately 10 hours after sexual activity. The participants were 15 high-level male athletes aged between  $29 \pm 6$  years. Sexual intercourse, consisting of coitus with ejaculation performed obligatorily with the wife or usual partner, took place in the privacy of the athletes' own home, free from observers, approximately at 6 a.m. The duration of sex ranged from 15 to 30 minutes. The subjects were required to abstain from sexual intercourse for at least 24 hours before the study. Subgroup analysis of data in the two groups (team player and endurance athletes) revealed no significant changes except for lower post-effort HR values at three, five, and 10 minutes in the endurance athletes during the afternoon of the day with sexual intercourse, relative to the day without sexual intercourse. These findings were not observed in the team player group. No significant changes were reported between the two groups (9).

One study (Vouyoukas study) addressed the quality of sex before competition and found a

strong, negative correlation between systolic blood pressure on the morning following the sexual activity (before physiological testing) and orgasm rating: notably with the emotional

intimacy component (11). The sexual intercourse characteristics including type and time of sex and time of physiological testing were not mentioned in the study.

**Table1. Summary of the primary studies evaluating the effect of sexual activity on physical fitness and athletic performance measures and their quality evaluation scores**

Author, year	subjects	Design of studies	Main outcome(s)	Main results	Scores 1: STRONG 2: MODERATE 3: WEAK
Sztajzel et al,2000(9)	High level male athletes aged 20-40 years	randomized cross-over	Aerobic capacity, mental concentration	No test results alteration significantly 10 hours after sex, no negative effect on the athletes' mental concentration 6 hours after sex	2
Boone et al,1995(12)	11 sedentary males	randomized cross-over	maximal aerobic power	No change in test results after having sex 12 hours prior to the test	3
Johnson,1968(10)	14 married male, former athletes	Repeated measure	Strength Power	No change in test results following coitus the previous night	3
Anderson et al,2001(13)	61 men and 14 women runners	Cross sectional	Activities in the 48 hours prior to the marathon race and race performance	Sexual activity was not related to athletes relative running performance	3
Vouyoukas,2011(11)	Physically active and sedentary males and one female	Repeated measure	Aerobic capacity, strength power, flexibility, muscular endurance,	No change in test results after having sex the night before the test	3
Pupišet al,2010(14)	62 long-distance elite athletes, Mean age 32 years	Cross sectional	Subjects' feelings about exercise and its intensity	90% of athletes believed that having sex 12 hours before endurance performance did not influence their performance	3
Fisher, 1997(5)	83 varsity football players,73 varsity baseball players, 27 varsity track men, and 36 non-athlete male	Cross-sectional	Abstention from sex prior to the game and athletes' attitude about it	Football players, more than baseball players, believed that abstention from sex helped their performance	3

### Psychological aspects

Studies performed by Sztajzel *et al.* (9), Pupiš *et al.* (14), Anderson *et al.* (13), and Fisher (5) addressed the psychological aspects of sexual activity before competition. In a randomized cross-over study, Sztajzel *et al.* did a one-hour exercise stress test joined to an arithmetic mental concentration test in 15 high-level male athletes, six hours after sexual intercourse. He found that sexual activity had no negative effect on the athletes' mental concentration (9). Sexual intercourse characteristics were the same as mentioned before in physiological aspects.

Pupiš *et al.* focused on problems of the perception of sexual activity before physical loading on long-distance athletes. This study was conducted with 62 long-distance elite runners aged between  $32 \pm 8$  years. The samples completed a questionnaire diary to track their feelings about sexual relations within six weeks. The authors found that immediately after sexual intercourse, 40% of the athletes had negative feelings during intensive loading. At the aerobic loading, it did not influence the performance. More than 90% of the addressed athletes believed that having sex 12 hours before endurance performance did not influence their performance(14). The pre-competition arousal level of athletes and sexual intercourse characteristics, including type and time of sex and partner type (usual or unusual), were not mentioned in the study.

Anderson *et al.* examined the relationship between marathon runners' performance and sexual activity plus four other health-related behaviors in the 48 hours preceding a marathon race. In this study, each runner was asked to complete a questionnaire that included questions about their activities in the 48 hours prior to the marathon race and their race performance. The respondent sample included 61 men and 14 women who had been running regularly for an average of 12.5 years. The participants' age ranged from 17 to 65 years, with an average of 41.44 years (SD = 10.09). The results showed that sexual activity was not related to their relative running performance(13). Again, the pre-competition arousal level of athletes and sexual intercourse characteristics were not mentioned in the study.

In Fisher's study, football players were more likely to abstain from sex 24 hours before a game compared to baseball players. Also, they believed that abstention from sex helped their performance, more than baseball players did (5).

### DISCUSSION

According to the results of the studies concentrated on the physiological effects of pre-competition sex, it may be concluded that pre-competition sex would not affect performance if it is done 10 hours or more before the event. The metabolic equivalency of sex in married healthy men ranges from 1.7 METs to 3.3 METs (depending on the type of sexual activity(15) which is equivalent to a mild-to-moderate-intensity physical activity(16)). Hence, it has generally been estimated that the energy expended during normal sexual activity between married partners is equivalent to walking up one or two flights of stairs(17). Thus, it seems reasonable that having sex the previous night(10 hours or more before testing) would not affect laboratory physiological performance tests in healthy people(athletes or non-athletes).

Although no significant alteration was observed in the mentioned studies, it is important to consider the differences in individual response to sexual activity. It can depend on several variables such as the time of day, frequency and duration of sex, manners of the participants between data collection period, diet, fatigue, stress, the sexual partner, and the environment. Heart rate and blood pressure measures are different if sexual activity is taken place with a partner of ten years, compared to a new partner or in different setting(1).

As mentioned by Sztajzel *et al.*, having sex two hours before a maximal stress test may have a negative effect on the recovery period of athletes and possibly their performance.

The higher post-exercise HR values during early recovery phase, which is under parasympathetic control(18), suggest that the recovery capacity may be affected(9). As some studies have demonstrated that a delayed decrease in HR after exercise would be a powerful and independent predictor of all cause mortality in patients or in general population(19-21), this finding is important for athletes,

particularly for those who participate in multiple events over a short period of time in which optimum recovery after one competition is important for their next performance.

Also, Sztajzel *et al.* found significantly lower post-effort HR values at three, five, and 10 minutes in the endurance athletes during the afternoon of the day with sexual intercourse, relative to the day without (9). As this was not observed in team player athletes, it may be the result of increased parasympathetic activity in endurance athletes(22, 23). With larger sample sizes, the difference between the two groups may become significant. Also, it may be interpreted as the effect of sexual activity on athletes' cardiovascular and autonomic functions. It has been shown that sexual intercourse (specifically penile–vaginal intercourse, but not other sexual behaviors) is associated with better parasympathetic tone(24). Also, this finding can have psychological implications, which are based on the positive effects of penile–vaginal intercourse on psychological function(24-26) and possibly athletic performance. As the type of sexual intercourse was not mentioned by Sztajzel *et al.*, it is recommended that more detailed description of the quality of sex be emphasized in the future studies.

The results of the Vouyoukas study (negative correlation between systolic blood pressure on the morning following sexual activity before physiological testing, and orgasm rating) may be important for athletic performance in the short term. As hypertension and its medications can impair athletic performance(27, 28), the amount of statistically and clinically significant rise in systolic blood pressure is important. Although the results of this study showed no significant change in the test results in spite of statically and clinically significant changes in the systolic blood pressure, it can probably be interpreted as a near-normal recording of all of these systolic blood pressures(below 140 mm-Hg) before testing and the low sample size of the study(eight persons). It may be that in larger sample sizes and with higher baseline blood pressures, different results are obtained. Also, this study supports the relationship between the quality of sex and long-term athletic performance; even a small increase in blood pressure and abnormal diurnal variation of it can

in the long term have negative effects on health(29, 30) and consequently on athletic performance.

The results of the studies that addressed the psychological effects of pre-competition sex partially support the results of the studies that focused on the physiological effects of sex on athletic performance. Again, having sex immediately before a competition can induce a negative feeling in 40% of endurance athletes during intensive loading, whereas a gap of 12 hours or more (48 hours, Anderson *et al.*) before the event did not influence the majority of the athletes. These studies addressed the subjective feeling of athletes about the effect of sex on their performance, but in the study of Sztajzel *et al.* this effect was measured objectively. They used mental concentration testing six hours after sexual activity. No negative effect was found in the test results. In a recent systematic review about this topic, it has been concluded that data does not support the negative effects of sex before a competition (31), but in this review some important data from Vouyoukas, Pupiš *et al.*, and Sztajzel *et al.* studies about the negative effects of sex on athletic performance were neglected or not considered properly.

The subjective effects of pre-competition sex in these studies may be interpreted according to the current inverted U-sport psychology hypothesis. This hypothesis predicts that performance improves with increases in arousal/anxiety until a peak is reached, after which further arousal/ anxiety leads to a deterioration in performance(32). Having sex immediately before a competition changes the level of anxiety, which impairs performance in selected individuals. Indeed, for some athletes who are too nervous before an event, sexual activity can have a relaxing effect. In other words, according to this hypothesis, the performance of some athletes will enhance with sex before the competition and the performance of others will be hindered, which is dependent on the effect of sex on their arousal (1) and also the type of sport. In some sports, such as shooting and archery, mental concentration and self-control are more important than sports in which good athletic performance requires high aggression and frustration such as combat sports. Having pre-competition sex with the usual

partner before a contact sport in an athlete whose pre-competition arousal level is already low may negatively influence his/her performance, while the same act before concentration-requiring sports in an athlete whose pre-competition arousal level is very high has positive effects on the performance of the athlete.

### CONCLUSION

It is obvious that there is scarcity in high-quality randomized studies and sample sizes to conclude evidence-based results about the effect of sexual activity on athletic performance. Topics that need attention in further research include the effect of sex on the performance of endurance versus power athletes, psychological effects of sex on athletes based on their pre-competition arousal levels and the type of sport, the effect of sex on the performance of male versus female athletes, and the effect of sex on the recovery of athletes. In addition, it is important to consider sexual intercourse characteristics including type and time of sex, orgasm rating, and partner type (usual or unusual), and other previously-mentioned individual variations that may affect test results.

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**Conflict of Interest Statement:** There are no commercial or financial relationships that could be considered as a possible conflict of interest.

### APPLICABLE REMARKS

- The available data about the impact of sexual activity on athletic performance are majorly low-quality and heterogeneous data.
- Based on physiological testing results, it does not seem that having sex at least 10–12 hours before a competition has negative effects on athletic performance, provided the sexual activity of the athlete does not affect other performance-related factors such as enough sleep and adequate nutrition.
- Sexual activity immediately or a few hours before a competition may have negative psychological or physiological effects on athletic performance.

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