



## Comparison Of Impact Of Resistance Training On Prolactin, Luteinizing Hormone And Follicle Stimulating Hormone Levels Along With Anxiety Among Adult Female Collegiate Athletes A Review Study

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### Abstract:

**Introduction:** Both athletes and non-athletes are continuously looking for creative and competitive new ways to improve their health and maximize their physical performance in the fields of athletic performance and exercise. Research from the past ten years has demonstrated that long-term exposure to endurance exercise can affect how human's reproductive hormonal and physiological systems function. Modern technology advancements have altered society as a whole, including the world of sports. With these modifications, coaches and trainers in the sports industry have begun to collaborate with scientists to safeguard or enhance the performance of their athletes.

**Purpose:** The main aim of the study is to find out the effect of resistance training on follicle stimulating hormone, prolactin and luteinizing hormone levels along with anxiety in adult female Collegiate athletes.

**Methodology:** 5 to 46 Subjects both male and female were taken in all the studies reviewed. This review study extracted articles from online databases such as Pub Med, Pedro, Scopus and the various search engines such as research gate with the following: 'female collegiate athletes', 'resistance training', 'hormonal changes', 'anxiety'.

**Results:** Resistance training has been shown to reduce hormonal imbalance and anxiety. A study that looked at different hormones in female athletes competing showed that the stress of competition had an impact on hormonal status. These results imply that hormone changes during competition reflect both physical and emotional stress.

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### Introduction

Modern technology advancements have altered society as a whole, including the world of sports. With these modifications, coaches and trainers in the sports industry have begun to collaborate with scientists to safeguard or enhance the performance of their athletes. As a result, they revised or updated the training methods they

used in light of the information gleaned from the tests and measurements they had conducted. It is intended to sustain and enhance the athletes' present performance and achieve success on the basis of all these cutting-edge and novel modifications. It's critical to focus on the under given aspects of resistance training for women:

Prolonged response to the exercising environment might result from dynamic resistance training. An increase in maximal oxygen intake causes elevation in aerobic metabolism and a decline in lactate activity, which avoids the beginning of fatigue and creates coordination saves as the establishment of neuromuscular execution. These techniques significantly increase the capacity of female athletes to respond to training demands for strength fitness.

The pituitary gland releases two important hormones, luteinizing hormone or LH, and follicle-stimulating hormone (FSH), which work together to regulate activities in female's reproductive system. Both of them are pulsatile released into the circulatory system. The average female experiences 2 to 4 LH and FSH pulses during a period of 6 to 8 hours, however the magnitudes of the LH pulses are much greater than FSH .

Hormone concentrations have been studied, which refer to the levels of hormones prior to and following an exercise regimen and an athletic exertion, or during various stages of a training season, found that prolonged heavy endurance training causes a decrease in the fasting levels of prolactin, cortisol, and T.

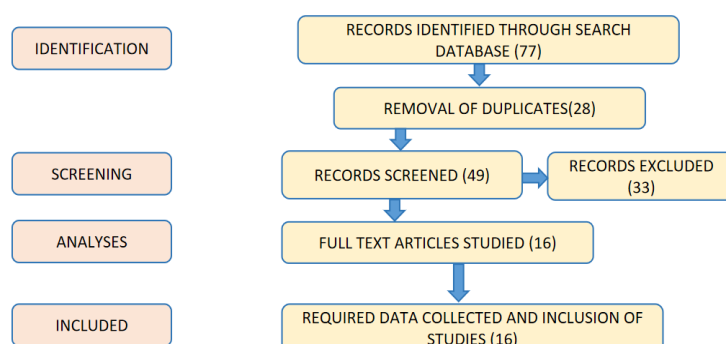
Additionally, maintaining and controlling your equilibrium and mental well-being is crucial for your ability to perform and overall wellbeing. Anxiety has both physical and cognitive components. The mental as well as emotional component that is related to the athlete's mental processes and ideas is anxiety. These include stress, anxiety, pessimism, and thinking about unimportant details or chores. The same topics covered previously are the main focus of this investigation.

## METHODOLOGY

The inclusion of studies was focused on the researches which are consisting of real data and original results. The studies included more than 40 healthy subjects with age group 18-25 and at least 2 years in sports.

**Table 1:** Inclusion Criteria of the Review study

Sr. No.	Variables of Consideration	Criteria
1.	Age group	18-25
2.	Gender	female
3.	Experience in sports	Yes
4.	Time period in sports	2 year
5.	Population	>40



**Figure 1:** PRISMA flow chart of Search of literature

The quality Assessment was done according to the criteria fixed by the above table and the original results.

Words like :‘Female collegiate athletes’, ‘resistance training’, ‘hormonal changes’, ‘anxiety’ have been linked to the search in online databases like Pub Med, Pedro, Scopus and the various search engines such as research gate. While studying articles different questions were arised,which will help to improve the extraction of vital information. The questions arised are:

- Q1. What are the role of various hormones in female’s body?
- Q2. What are the impacts of different exercise on various hormones?
- Q3. How anxiety can create impact on athlete’s mental health and performance?
- Q4. What are the impact of resistance training in athelete’s performance?

## REVIEW OF LITERATURE

Review of literature will give an overview of all the articles studied, with their methods and out come measures throughout the database.From this part, a summary of approaches and different literature comes into front that have been previously accepted regarding female hormones ( prolactin, luteinizing hormone and follicle stimulating hormone ) levels along with anxiety in young female athletes.

- Q1. What are the role of various hormones in female’s body?

The pituitary gland releases two important hormones, luteinizing hormone or LH, and follicle-stimulating hormone (FSH), which work together to regulate activities in female’s reproductive system. Both of them are pulsatile released into the circulatory system.The average female experiences 2 to 4 LH and FSH pulses during a period of 6 to 8 hours, however the magnitudes of the LH pulses are much greater than FSH .Prolactin is primarily created via lactotroph cells in pituitary gland, where it accumulates and transferred into the blood. Prolactin is a very important hormone that regulates reproductive health. There is evidence that intense daily training causes a frequent considerable rise in prolactin in sporty women, which might be one of the leading causes of menstruation disorder.

Author (Year & Place)	Title	Methodology	Subject	Results
Aizawa et al (2006). (JAPAN)	Pituitary, adrenal, and gonadal hormone changes in female soccer players during competition.	Experimental study	9	Show changes of blood hormone levels during competitive period
Ralph Hale et al (1983), (Hawaii)	A marathon: The immediate influence on female athlete's LH, FSH, prolactin, testosterone, and cortisol counts.	Experimental study	44	The average FSH and LH values in postmenopausal women's control specimens were equally elevated (74.16 mIU/ml and 31.32 mIU/ml, respectively). Readings in postmenopausal female fell by 16.68 mIU/ml, a 36.22%. In pre menopausal women older than 40, the mean decline was 5.73 mIU/ml. Water polo players' FSH levels declined by 1.8 mIU/ml between pre- and post-practice samples (from 11.78 to 9.16 mIU/ml); LH levels averaged 13.02 mIU/ml before practice and 12.01 mIU/ml after practice.

Arce J. C et al New Britain (1993).	Subclinical changes in hormone as well as semen values in athletes.	Cross-sectional study.	28	The three group's serum levels of FSH, PRL, LH and E2 did not significantly differ from one another. Additionally, there were no discernible changes in the three groups' mean 24-hour urine LH excretion.
Mesaki et al Japan (1987).	Hormonal alterations in athletic women with prolonged activity.	Experimental study	5	Exercise had no discernible effect on progesterone levels. In both periods, FSH marginally rose. However, both the follicular and luteal phases of LH exhibited a small rise. Prolactin, on the other hand, increased consistently and significantly during both periods of exercise.

Q2. What are the impacts of different training on various hormones?

**According to Hannele Ronkainen ,et.al,** Excessive physical activity can cause endocrinological issues, including delayed menarche, oligomenorrhea, amenorrhea, and luteal phase insufficiency. Some researchers, although not all, have discovered that running affects menstruation by prolonging the menstrual cycle.

**According to Bonen, et.al,** Exercise did not influence plasma LH concentrations (n=4), as there were significant variances between individuals. Exercise substantially elevated plasma FSH levels (P < 0.005). This suggests that the rate of hormone production, release, or breakdown varies during activity.

**According to Deuster , et.al,** All plasma minerals, related proteins, and hormones including C and Prl showed significant increases following the race. No significant increases in ECu, E2, FSH, or LH were detected.

Author (Year & Place)	Title	Methodology	Subject	Results
Hannele Ronkainen et al (1985), (USA)	Depressed luteinizing hormone, fsh and prl responses to lh-releasing hormone, thyrotropin-releasing hormone, and metoclopramide testing in endurance runners during the extreme-training sessions.	Experimental study	42	LH, FSH, and PRL baseline levels did not differ between the joggers and their controls. The runners' mean FSH and LH reaction to LH-RH were substantially lower than those of their control's, and their mean Prolactin reaction to Metoclopramide, 20 minutes post the Metoclopramide injection were significantly lower than those of their controls.
Bonen et al Netherlands (1987)	Responses of pituitary, ovarian, and adrenal hormones to marathon running.	Experimental study	5	The findings show that whereas LH levels did not increase during exercise, FSH levels did. This second hormone seems to have a stronger relationship with exercise intensity as measured by increases in blood lactate levels.
Deuster et al (1991).	Exercise-generated changes in blood minerals, related to	Experimental study	38	All plasma minerals, related proteins, the hormones C and Prl; all showed significant post-race increases, whereas

	proteins and hormones in female athletes.			EZn showed a decline. The levels of ECu, E2, FSH, or LH did not vary significantly.
Thomas Boyden et al (1982)	Women Runner's Prolactin Responses, Menstrual cycles, as well as the composition of the body.	Experimental study	14	The mean (SEM) total weight of the subjects was unchanged, although they did get substantially thinner. Besides amenorrhea, 13 women had menstrual irregularities, mostly oligomenorrhea. The mean (SEM) total PRL reactions to TRH stimulation elevated from 5002±462 mg/ml/min at starting to 5748± 609 ng/ml/min at A30 and 6535±552 ng/ml/min at A50, and these results differed evidently (F = 4.01; P 0.04).
Karkoulias et al (2008)	Non-elite athlete's hormonal reactions to marathon running.	Experimental study	11	One hour after the marathon, the plasma cortisol concentration increased while the value of testosterone (total and free) decreased. One week later, both returned to baseline. Prolactin levels followed the same pattern as cortisol levels.
Krcmarova et al Slovakia (2018)	The impact of a progressive 12-week power training program on strength, functional ability, metabolic markers, and blood levels of hormones in healthy elderly female: evening vs.morning training	Experimental study	31	No further notable inflammatory or biochemical indicators showed increases or declines. Similar to this, only ESTR (±1619%, p 0.05) in M showed a substantial change in hormone levels.

### Q3. How anxiety can create impact on athlete's mental health and performance?

Anxiety refers to the emotional or mental component that affects the athlete's psychological operations and ideas. Worry, nervousness, negative thoughts, and concentration on unrelated information or tasks are some examples.

**According to Patel MD, et.al,** Anxiety disorders affect 6% to 20% of teenagers, and the prevalence is substantially higher when anxiety symptoms do not match the criteria for a particular anxiety disorder. Females are more likely to be affected. Sport involvement is found to be no more stressful for most young athletes (usually 13 - 24 years old, i.e., student age groups) than many other activities in daily student or professional life overall where competition is included and performance is assessed.

**According to Correia, et.al,** There were significant disparities within male and female athletes, as well as between solo and team sports. Female and individual athletes showed more signs in general athletic anxiety. The findings of this study revealed that athletes perceive anxiety differently depending on their sex and sport.

*According to L Ford , et.al, 2022*, anxiety is defined as "a uncomfortable state of mind in response to experienced stress regarding the performance of an obligation under pressure" and How anxiety influences various sport-related performance areas, such as injury incidence, rehabilitation, and return to activity.

Q4. What are the impact of resistance training in athlete's performance?

*According to Saamia Sunble , et.al, 2022*, Periodized resistance training considerably improves sprinting speed ( $p = 0.01$ ), agility ( $p=0.001$ ) and power of lower limb ( $p=0.001$ ) but had no significant improvement in power of upper limb ( $p=0.89$ ).

*According to Naoki Horii , et.al, (2020)*, that Athletes had decreased amounts of serum DHEA, free testosterone, and DHT compared to non-athletes ,also Combining Dioscorea esculenta with resistance exercise led to increased fat-free mass in the arms. The study found that combining Dioscorea esculenta with resistance training enhances muscular growth and strength in athletes.

Author (Year & Place)	Title	Methodology	Subject	Results
Saamia Sunble et al Pakistan (2022).	Impact of Periodized Strength Training upon Domestic Female Cricket Players' Sprinting Speed, Agility, and Power	Experimental study	46	Sprinting speed was greatly increased ( $p = 0.01$ ) by periodized resistance training. This study came to the conclusion that periodized resistance training enhances the lower limb's sprinting speed, agility, and power.
Naoki Horii et al (JAPAN), (2020)	The impact of Dioscorea esculenta supplementation in conjunction with resistance training on muscular growth and strength in sprint athletes	Cross sectional study and Experimental study	30 and 15	In (experiment 1), athletes had significantly lower blood levels of DHEA, free testosterone, and DHT than non-athletes ( $p < 0.001$ , $p = 0.026$ , and $p = 0.012$ , respectively). In (experiment 2), there was not a significant difference in weight, height, body fat percentage, triglyceride level, or total cholesterol levels prior to and following the intervention within the power training with placebo group and the resistance training with Dioscorea esculenta group.

## Discussion

The effects of the aforementioned hormone are felt by almost all female athletes. It is also in records that with increase in level of prolactin ,there is decreased secretion of luteinizing hormone and follicle stimulating hormone and amenorrhea. As per above mentioned reasons, now it is important to evaluate, elaborate and study the changes in various female hormones in athletes in different training states.

Additionally, maintaining and controlling your stability and mental health is crucial for your performance and overall well-being .Anxiety has both physical and cognitive components. The mental and emotional component that is related to the athlete's psychological functions and ideas is anxiety. These include stress, anxiety, pessimism, and thinking about unimportant details or chores. The same topics that were previously explored are the subject of this investigation.

These elements work together to define performance and have an influence on it.



The identical observation is included in the results table up above. The afflicted group was primarily between 25 and 30 years old. We have discussed the impacts of resistance training on FSH, Prl and LH as well as anxiety in adult female college athletes in this research.

## Conclusions

Above literature can summarize the importance of hormones pre and post exercise in female athletes. Also, impact of resistance training and how it can affect and enhance the performance in athletes with this it can also be seen that how the anxiety factor can affect the performance in a certain way during and after the sports.

As far as evidences are studied, there were no particular study showing the comparison of impact of resistance training on follicle stimulating hormone, prolactin and luteinizing hormone levels along with anxiety in adult female Collegiate athletes.

Hence, there should be proper and effective measures which are to be taken in consideration while giving the training and how to manage the stress and anxiety among female athletes.

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