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# Anticipatory Testosterone Response to Competition in Female Collegiate Endurance Athletes

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## Background

Testosterone is naturally occurring hormone in both the female and male bodies, however, it has also been used in the form of anabolic steroids<sup>1</sup>. In addition to increases in muscle mass and strength, individuals who take anabolic steroids often experience dramatic rises in aggressive behavior<sup>2</sup>. Increases in natural circulating testosterone has also been shown to increase aggression in women<sup>4,5</sup>. This increase in aggression could facilitate an increase in competitiveness (a type of aggression) in athletic competition. A relatively new concept, coined "anticipatory testosterone," is defined as when an athlete experiences an increase in circulating testosterone before he/she participates in an athletic competition<sup>3</sup>. Because of circulating testosterone's role in competitive aggression, the amount of circulating testosterone in an athlete's body prior to competition could indicate the level of competitiveness that the athlete is feeling at that point in time.

## Purpose

This study was designed to examine the relationship between competitive aggression and an anticipatory circulating testosterone in female endurance athletes in a simulated distance race.



Figure 1. Blood draw from antecubital vein



Figure 2. A subject running the 1200 meter leg of the distance medley relay.

## Results

Subject #	Height (cm)	Weight (kg)	Age (years)	Oral Contraceptive	Menstrual Cycle (day)
1	167.6	61.2	20.0	yes	6.0
2	175.3	72.7	20.0	no	5.0
3	171.5	55.8	20.0	yes	6.0
4	162.6	49.0	23.0	yes	6.0
5	177.7	72.6	21.0	yes	26.0
6	160.0	55.8	19.0	no	16.0
7	167.6	63.5	21.0	yes	unknown
8	180.3	72.5	21.0	yes	7.0
9	172.7	66.7	21.0	no	31.0
10	165.1	62.6	21.0	no	24.0
11	162.6	59.9	20.0	no	23.0
12	165.1	57.6	21.0	no	38.0
mean	169.0	62.5	20.7		17.1
SD	6.5	7.6	1.0		11.3

Table 1. Subject demographic data. Menstrual cycle day is relative to 1=first day of menstruation.

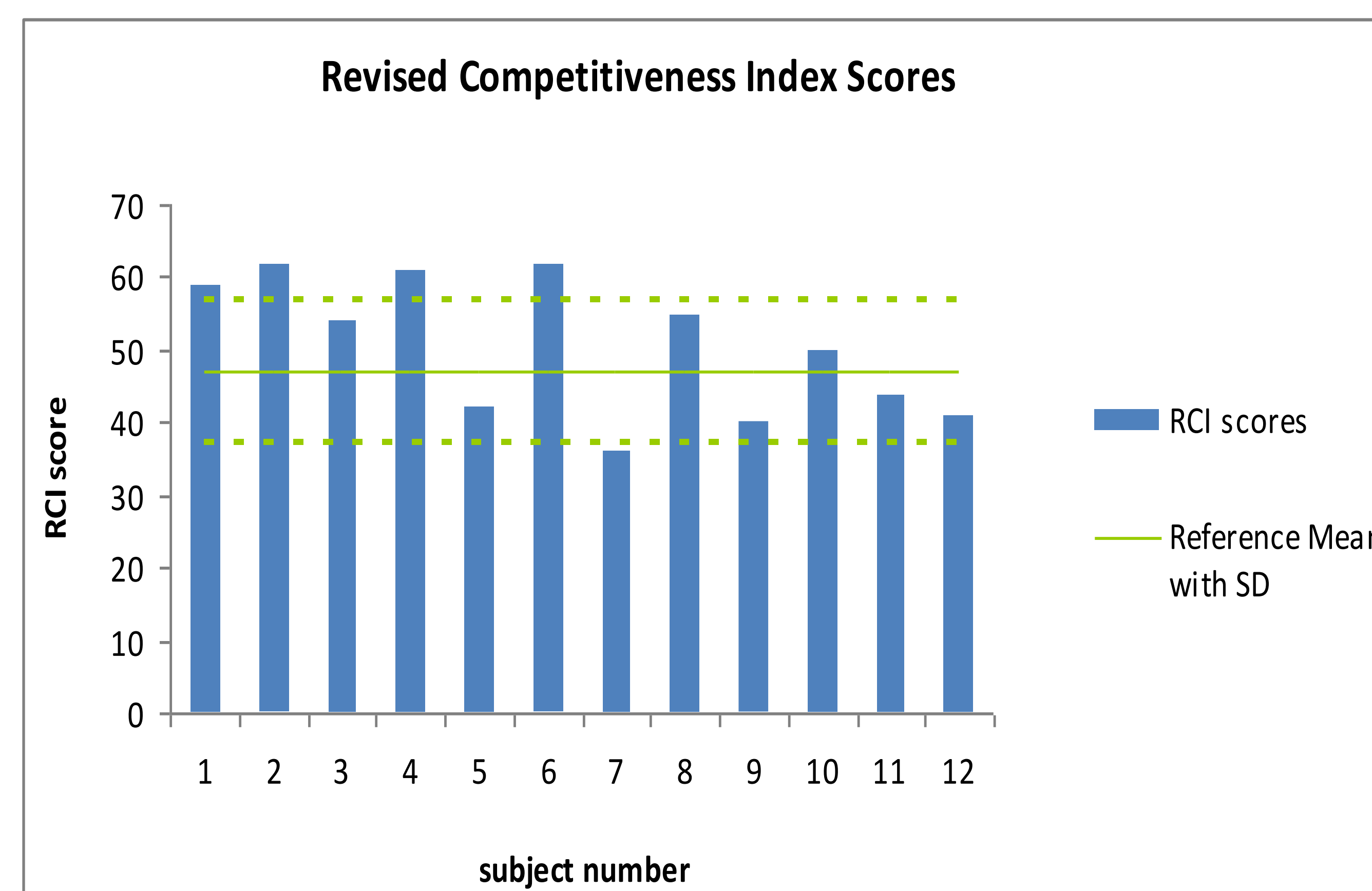


Figure 3. RCI scores ( $50.5 \pm 9.6$ ) of subjects compared to a reference mean<sup>6</sup>. The scores are on a scale of 0-70. Most subjects scored within the standard deviation of the average, but their average was higher.

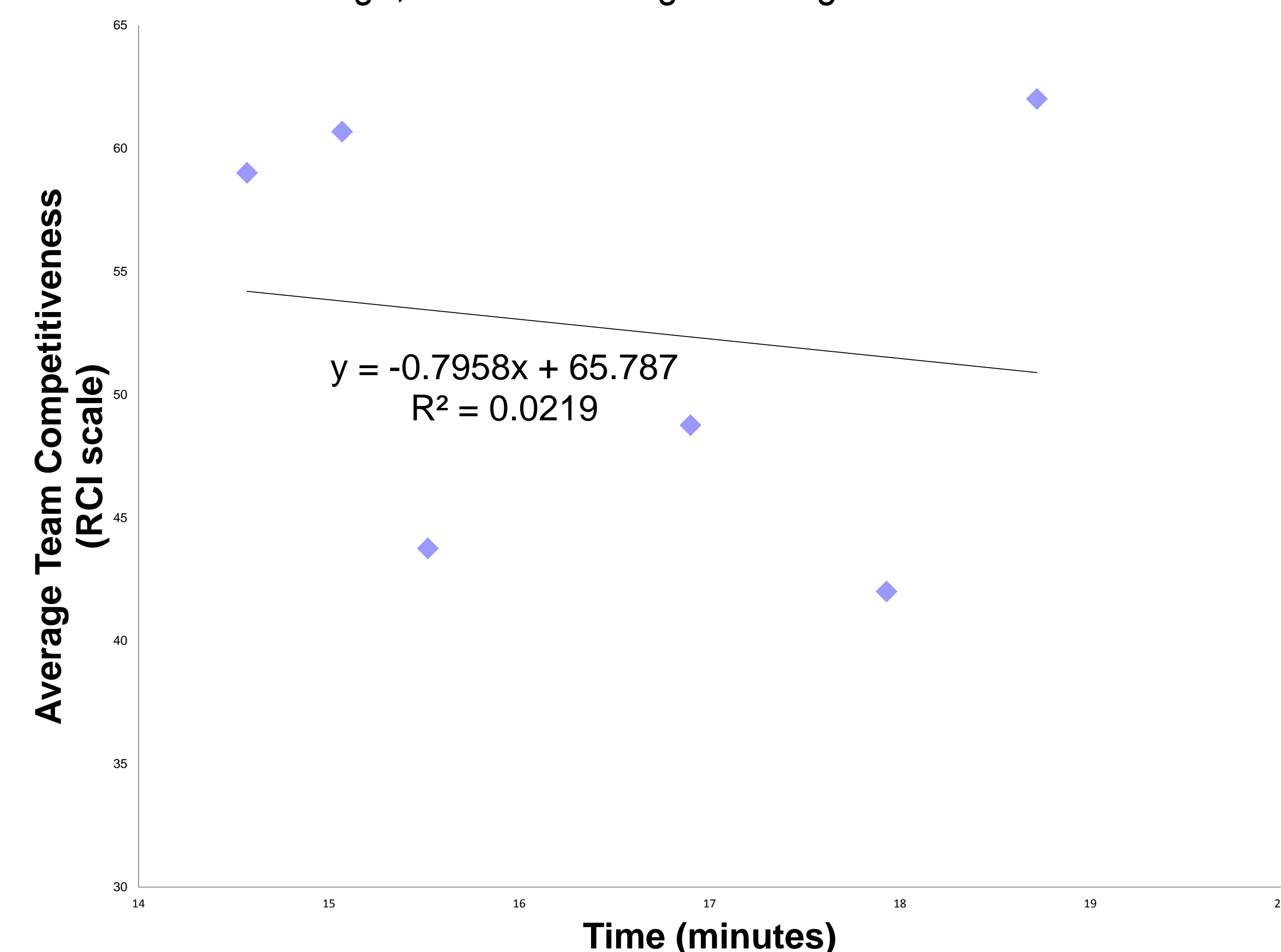


Figure 4. Race completion time was very weakly correlated ( $r=-0.14$ ) to competitiveness. This differs from other research which found significant correlations between competitiveness and confidence and race time ( $r=-.57$ ) although they used a different test for competitiveness<sup>7</sup>.

## Materials and Methods

### Subjects

Twelve apparently healthy female endurance athletes with at least 1 season of Cross-Country or Track and Field competitive experience. (see table 1).

### Testing Protocol

**Testing days:** Protocol was split into two days per testing cycle: resting sample collection and race days.

#### Resting Sample Collection:

- Subjects did not exercise
- Blood sample taken 24 hours prior to the race
- ~8mL was taken from the antecubital vein (see figure 1)

#### Race Day (see figure 2):

- Subjects were split into two DMR teams
- A 15-min pre-race blood sample was taken (~8mL)
- Subjects completed a DMR race (a relay split into legs of 1200, 400, 800, and 1600 meters, respectively)/
- The Revised Competitiveness Index (RCI) test was given immediately post-race.

#### Revised Competitiveness Index (RCI)

- Fourteen question self-assessment survey
- Each question is scored on a scale from 1-5 (5=highly competitive).

#### Serum Collection:

- Blood was allowed to clot and then centrifuged at 10 degrees C until separated (~20min at 4000 rpm)
- Serum was removed and aliquoted into microcentrifuge tubes
- Stored at 70degrees C.

#### Continued Research:

- Serum will be analyzed in duplicate to determine circulating testosterone concentration. Pearson's correlation will be used to examine the relationship between pre-race T concentrations and RCI scores

## Conclusion

The majority of the RCI scores found in the current study were within one standard deviation of the accepted mean (see figure 3). In addition, there was no correlation between race completion time and competitiveness score ( $r=-0.14$ ) (see figure 4).

## References

1. Women's Health Program, Monash University. (2010). Testosterone and androgens in women. *Monash.edu*. Spet. 2011. Retrieved from <http://womenshealth.med.monash.edu.au>
2. Archer J, Birring SS, Frederick C, Wu W. The association between testosterone and aggression among young men: empirical findings and a meta-analysis. *Aggressive Behavior*. 1998; 24(6): 411-420.
3. Bateup HS, Booth A, Shirtcliff EA, & Granger DA. Testosterone, cortisol, and women's competition. *Evolution and Human Behavior*. 2002; 23(3): 181-192.
4. Cashdan E. Hormones and competitive aggression in women. *Aggressive Behavior*. 2003;29: 107-115.
5. Hamilton LD, van Anders SM, Cox DN, Watson NV. The effect of competition on salivary testosterone in elite female athletes. *International Journal of Sports Physiology and Performance*. 2009;4:538-542.
6. Houston JM. The Revised Competitiveness Index: Administration and scoring instructions. Rollins College.
7. Martin JJ, Gill DL. The relationships among competitive orientation, sport-confidence, self-efficacy, anxiety, and performance. *Journal of Sport and Exercise Physiology*. 1991; 13: 149-159.

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