The Influence of Hormonal Contraceptives on the Development of Muscle Strength

BSc (Hons) Sport and Exercise Rehabilitation

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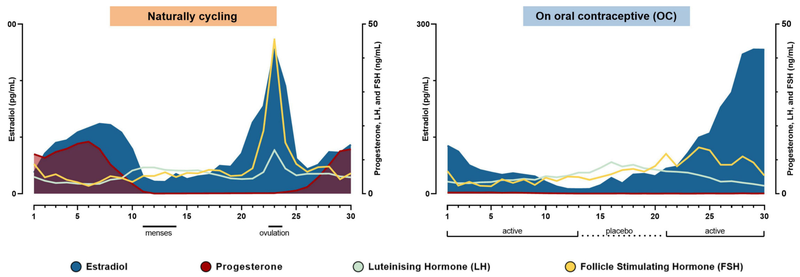
1. Introduction

Hormonal contraceptives (HC) are increasingly popular among women (Randell *et al.*, 2021), with approximately 874 million women worldwide using modern methods of contraception (UN 2022). There is various forms of HC, including implants, injections, pills, and skin patches. Combined contraceptives (COCs) contain both synthetic estrogen and progesterone, and Progesterone only contraceptives contain progesterone alone (Burrows and Peters, 2012). Hormonal contraceptives are primarily used for fertility control, influencing the hormonal regulation of the female reproductive system (Cooper *et al.*, 2022), but also commonly used to relieve painful symptoms during the menstrual cycle or to manipulate menstruation timing and eliminate menstruation bleeding (Elliott-Sale *et al.*, 2020).

Despite the increased participation of women in sports, females remain underrepresented in research (Emmonds *et al.*, 2019). Current knowledge of the influence of the menstrual cycle and the use of various hormonal contraceptives on physical and cognitive performances is insufficient and inconclusive (Castanier *et al.*, 2021)

Hormonal contraceptives not only ensure a consistent menstrual cycle by controlling female hormone levels (Burrows and Peters, 2007), but may also affect muscles, tendons, and ligaments properties (Konopka *et al.*, 2019). However, the effects of hormonal contraceptives on physical performance are still poorly understood (Elliott-Sale *et al.*, 2020).



2. Rationale

To the author's knowledge, there is an insufficient number of studies examining the effects of female hormones and different type of hormonal contraceptives on RFD. Moreover, there is no research investigate effect of hormonal contraceptives on Rate of force Development, in hip abductor muscle. Base on existing knowledge that female hormones affect ligament and tendon properties as well as a neuromuscular function, it can by hypothesized that there might be a difference in Rate of Force Production between hormonal contraceptives user and females with normal menstrual cycle. Therefore, this study aims to determine the differences in Rate of Force Development, between recreational active female, use hormonal contraceptives or have a normal menstrual cycle.

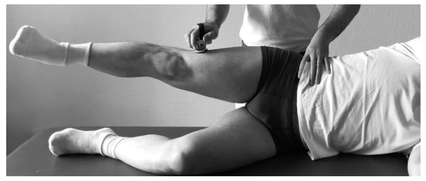
3. Methods

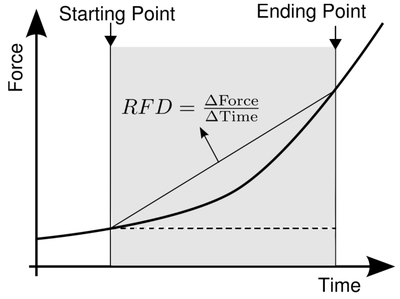
Study Design

- 18 female, relatively active , age 18-45, 9 hormonal contraceptives users (HCO) (5 combined contraceptives and 4 progesterone only), 8 and normal menstrual cycle (MC) with regular menstrual cycle.
- Recruitment via social media, Newcastle college teams, and email.
- Participants categorized into HCO and MC groups.
- Laboratory visits conducted to collect descriptive data.
- Participants conducted two familiarization attempts before testing.
- Test conducted in Newcastle College sports laboratory, Lifestyle Academy, Sport and Exercise Department.
- Risk assessment conducted to minimize potential harm.
- Participants advised to refrain from caffeine, heavy-resistance, and high-velocity training 48 hours before test.
- Hip abductor Rate of Force development measure with handheld dynamometer (Lafayette instrument, model 00165)

Protocole

- Participants were in a side-lying position with their test leg facing upwards, and a pillow was placed between their lower extremities for stability.
- The dynamometer was secured with a non-elastic strap, 5 cm proximal to the lateral knee joint line, and the subject pushed for 5 seconds before relaxing.
- Participants performed three valid maximal muscle contractions every 60 s, and the average of three attempts was used in the analyses.
- RFD = ΔForce/ΔTime.
- Data was analysed with IBM SPSS Statistics 29.0.2.0
- To compared Means Independent- Sample T test were used.
- The level of significance was set as p<0.05





Participants

Descriptives

		N	Mean ±
Age [years]	Combined contraceptives	5	23.6 ± 6.8
	Progesterone only contraceptives	4	19.3 ± 0.5
	Menstrual Cycle	8	25.9 ± 8.7
Weight [kg]	Combined contraceptives	5	57.2 ± 7.0
	Progesterone only contraceptives	4	73.6 ± 6.4
	Menstrual Cycle	8	68.6 ± 19.6
Hights [cm]	Combined contraceptives	5	168.2 ± 8.2
	Progesterone only contraceptives	4	166.3 ± 4.6
	Menstrual Cycle	8	168.8 ± 8.1

4. Results

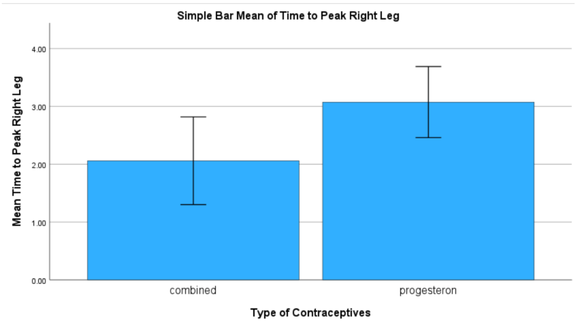
Group Statistics

Variable	Group	N	Mean ± SD
Peak Force Right Leg	HCO	9	36 ± 10.6
	MC	8	30.1 ± 10.3
Peak Force Left Leg	HCO	9	36 ± 9.5
	MC	8	31.5 ± 12.5
Time to Peak Right Leg	HCO	9	2.5 ±0.7
	MC	8	2.6 ± 0.9
Time to Peak Left Leg	HCO	9	2.5 ± 0.4
	MC	8	2.6 ± 0.7
RFD Right Leg	HCO	9	155.3 ± 75.8
	MC	8	132.7 ± 78
RFD Left Leg	HCO	9	148.1 ± 73
	MC	8	124.7± 62

Group Statistics

Variable	Type of Contraceptives	N	Mean ± SD
Peak Force Right Leg	Combined	5	40.3 ± 12
	Progesterone only	4	30.7 ± 6.4
Peak Force Left Leg	Combined	5	37.3 ± 12.3
	Progesterone only	4	34 ± 5.5
Time to Peak Right Leg	Combined	5	2.1 ± 0.6*
	Progesterone only	4	3.1 ± 0.4
Time to Peak Left Leg	Combined	5	2.5 ± 0.6
	Progesterone only	4	2.5 ± 0.3
RFD Right Leg	Combined	5	196.8 ± 78.2
	Progesterone only	4	103.4 ± 26.7
RFD Left Leg	Combined	5	158.2 ± 99.3
	Progesterone only	4	135.4 ± 24

**p=0.024*



5. Conclusion

- The difference in peak force, time to peak, RFD, between HCO and MC was detected. However, there was not significance difference between both groups.
- The difference in peak force, time to peak, RFD, between Combined contraceptives (estrogen and progesterone) and Progesterone only Contraceptives, was detected, where time to peak, right leg, was significance longer within progesterone only users (MD ± SD -1.02, p=0.024).
- There appears to be no statistically significant difference in the tested parameters between HCO and MC. However, a statistically significant difference in time to peak between Combined Contraceptives and Progesterone only may suggest that progesterone only contraceptives may influence strength development in a different way than contraceptives containing estrogen and progesterone. Therefore, further research examining the effects of progesterone only contraceptives is needed.
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6. Reference

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