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ORIGINAL ARTICLE

Contraceptive practices and contraceptive counselling in high-performance Portuguese athletes

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ABSTRACT

We present an observational, prospective, descriptive study of answers collected through an online self-assessment questionnaire in High Performance Portuguese Athletes aged 18 years old or over. The main objective was to evaluate contraceptive practices, menstrual patterns and contraceptive counselling in these athletes. Overall, 115 women aged between 18 and 39 years were studied, from 18 different sports. In our sample, most athletes used some type of contraception. Most believed that they had a better performance after menstruation and that starting contraception did not interfere with their performance. However, a high number of athletes believes that contraceptives are contraindicated for sports.

Keywords: Sport medicine, Performance analysis of sport, Amenorrhea, Sports health, Sports performance, Contraception.

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INTRODUCTION

During the last decades there has been an increase in the number of women practicing elite sports. The rate of women competing in the Olympic Games has increased from less than 10% at the start of the modern Olympic Games in 1894 to almost 49% in Tokyo 2020 (Committee., 2021). This can be related to the emancipation of women during the 20th century and the development and investment in women's professional sport (International Working Group on Women and Sport, 2007) (Forsyth J, 2018). However, scientific research has not grown in parallel with the exponential increase in female participation, and many of the studies carried out in men should not be extrapolated directly to women, given the anatomical, physiological and endocrinological differences between the sexes (Costello JT, 2014) (Emmonds S, 2019) (Forsyth J, 2018) (Sheel, 2016) (McNulty KL, 2020) (Carole Castanier, 2021).

The menstrual cycle can be different in elite athletes. Studies have shown controversial results regarding the hormonal effects of the menstrual cycle on sports performance, and most are based on small samples (Burrows M, 2007). Multiple mechanisms have been suggested. During the normal cycle (McNulty KL, 2020) oestrogens can promote an anabolic effect on the skeletal muscle, on cellular glycogen storage increase and on fat utilization increase (Baltgalvis KA, 2010) (Lowe DA, 2010) (Isacco L, 2017) while progesterone can act centrally at hypothalamic sites and at the peripheral level by chemosensitivity during the luteal phase (Behan M, 2003) (Bayliss & Millhorn, 1992), with an effect on the ventilatory drive (Duke, JW., 2017), by stimulating hyperventilation at rest and during exercise. Additionally, both oestrogens and progesterone act as neurosteroids, that can cross the blood-brain barrier and thus promote effects on maximal neuromuscular performance (Tenan, MS., 2017).

On the other hand, even in female athletes with regular cycles, the follicular phase can be prolonged with a shortened or absent luteal phase, secondary to a Luteinizing Hormone (LH) deficit that induces insufficient progesterone production (De Souza, 2003). Additionally, a significant number of athletes present cycle changes that vary between oligomenorrhea and amenorrhea. The reason for amenorrhea is probably multifactorial, being directly linked to the high load of physical exercise and/or insufficient food intake. The so-called Relative Energy Deficiency in Sport (RED-S) suggests that menstrual irregularities presented by athletes are not due to sport itself, but a consequence of an energy imbalance between what they consume and what they spend during training and competitions. In this way, secondary amenorrhea is not considered physiological and must be addressed and treated (Mountjoy M, 2018). Factors that may contribute are: 1) excessive secretion of endorphins, including high opioid tone that inhibits the hypothalamic-pituitary-gonadal axis; 2) insufficient fat mass to prevent the transformation of androgens into oestrogens with a parallel decrease in leptin; and 3) excessive prolactin secretion (Carole Castanier, 2021). Menstrual dysfunction in female athletes and late onset of menarche in adolescents have been associated with low Body Mass Index (BMI), which can be modulated by training (Brook, E., 2019) (Thein-Nissenbaum & Hammer, 2017). Most studies have reported significantly lower free fat mass in female athletes with amenorrhea compared to women with normal menstrual cycles (Tornberg, et al., 2017) (Ackerman KE, 2012) (Carlberg KA, 1983).

In amenorrheic athletes, a study has showed that athletes with an energy deficit had a regression in their velocity performance when compared to athletes with a normal menstrual cycle (Vanheest JL, 2014). However, no variations in jumping or speed abilities was found (Julian R, 2017) (Tounsi M, 2018).

The use of hormonal contraception (HC) among female athletes seems to be similar to that of the general population (Burrows M, 2007), between 47-57% (Martin D, 2018) (Larsen B, 2020) (Oxfeldt M, 2020) and up to 50% of elite athletes use oral contraceptives (OC) (Hagmar M, 2009).

HC has been an option for some athletes who want to avoid adverse effects related with eumenorrheic cycles, such as pelvic pain, oedema, headache, hypermenorrhoea or to eliminate an unpredictable menstruation. The athletic population has reported to strategically manipulate the time of withdrawal bleeding that occurs during the 7-day break (Martin D, 2018) (Schaumberg MA, 2017).

Despite the high use of HC in the athlete population (Martin D, 2018), its effects and implications on sports performance, namely on muscular function, aerobic and anaerobic capacity, are poorly understood, inconsistent and controversial (Sarwar R, 1996) (Rechichi C, 1996) (Giacomoni M, 2000). Considering that the fluctuation of steroid hormones can be a factor that interferes with performance and exercise capacity, it is imperative to understand the effect of administration of different types of HC (Burrows M, 2007). Some authors have shown that OC resulted in reduced peak exercise capacity and decreased maximal oxygen uptake when compared to non-hormonal contraceptives (Casazza GA, 2002) (Lebrun CM, 2003). No differences in maximal force-generating or jumping ability were seen with the use of combined oral contraceptives (COC) (Lebrun CM, 2003) (Julian R, 2017) (Tounsi M, 2018) (Thompson B, 2020) (Myllyaho, et al., 2021).

A 2020 meta-analysis concluded that COC users, compared to eumenorrheic women, present a slightly lower sports performance (Elliot-Sale KJ, 2020). In fact, the endogenous hormone profile of COC users is comparable to the profile observed during the early follicular phase of the menstrual cycle (Elliott KJ, 2005). An analysis indicated that sports performance was relatively consistent across the cycle under HC (Elliot-Sale KJ, 2020). The endogenous hormonal profile is primarily responsible for sports performance compared to exogenous hormone supplementation (Elliot-Sale KJ, 2020).

The World Anti-Doping Agency (WADA) has officially implemented the Athlete Biological Passport since 2009 to monitor certain biomarkers over time (Available online, n.d.). Hormonal contraceptives can have a major impact on the female steroid profile, so their use should always be questioned in the doping control forms (Schulze JJ, 2014). The ratio of Testosterone/Epitestosterone glucuronides makes possible to distinguish between exogenous and endogenous testosterone, with epitestosterone being one of the most fluctuating biomarkers (Mullen, et al., 2016) (Schulze, et al., 2021).

Objective

The main objective of this study was to evaluate the contraceptive practices of high-performance female athletes. The secondary objectives were to assess menstrual patterns and contraceptive effects that could possibly change the athletes' physical performance and to evaluate the type of contraception counselling given to these athletes.

METHODS AND MATERIALS

This was an observational, prospective and descriptive study of answers collected through an online questionnaire completed between May and October 2021 among Portuguese Elite Athletes aged 18 or over. The questionnaire was anonymous and confidential and was carried out through a link sent by email through the different Sports Federations of Portugal: Athletics, Badminton, Basketball, Canoeing, Gymnastics, Handball, Judo, Karate, Orienteering, Padel, Roller Hockey, Skating, Football, Swimming, Tennis, Triathlon and Volleyball.

The questionnaire was divided into 5 sections: 1) individual characteristics and menstrual pattern of the Athlete, 2) type of sports practice, 3) contraceptive use and the perception of its effects, 4) contraception and physical performance, and 5) contraceptive counselling. The following were evaluated: age, weight, height, age at menarche, duration and regularity of menstruation, previous amenorrhea (defined as absence of menstruation not associated with contraceptives or pregnancy for more than 6 months), degree of dysmenorrhea and parity. In section 2, sports habits were questioned: sports modality, weekly training hours and age at which sports practicing started. Regarding contraceptive practices (section 3), questions were asked about the contraceptive methods used, duration of use, reason for starting contraception and any beneficial or adverse effects felt. In section 4, the questions were about whether menstruation or the initiation of contraception affected the athletes' physical performance. Finally, we addressed issues related to contraceptive counselling during sports practice.

A descriptive analysis of the data was performed, with tables of absolute and relative frequencies. All questionnaires received were used, excluding 7 (1 no consent, 6 under 18 years old).

RESULTS

Individual characteristics and menstrual pattern of the athlete

A total of 115 women aged between 18 and 39 years were studied (Table 1), with a mean age of 22.2 (SD ± 4.03) years. Only 2 women were not nulliparous (1.7%). The athletes' height varied between 153 and 193cm, with a mean of 168.5cm (SD ± 8.09), while the athletes' weight ranged between 43 and 120 kg, with an average of 63.7 kg (SD ± 11.05). The mean BMI was 21.86 kg/m^2, with a minimum value of 16 and a maximum of 41 (SD ± 2.96; median 20).

Table 1. The individual characteristics of the athletes.

	Minimum	Maximum	Median	Mean	Standard Deviation
Age (years)	18	39	21	22.2	4.03
Height (cm)	153	193	168	168.5	8.09
Weight (kg)	43	120	62	63.7	11.05
BMI	16	41	20	21.86	2.96
Menarche age	10	18	13	13.04	1.38

Literary qualifications were College Education (n = 57; 49.6%), High-School (n = 55; 47.8%); 3rd cycle of schooling (n = 1; 0.9%).

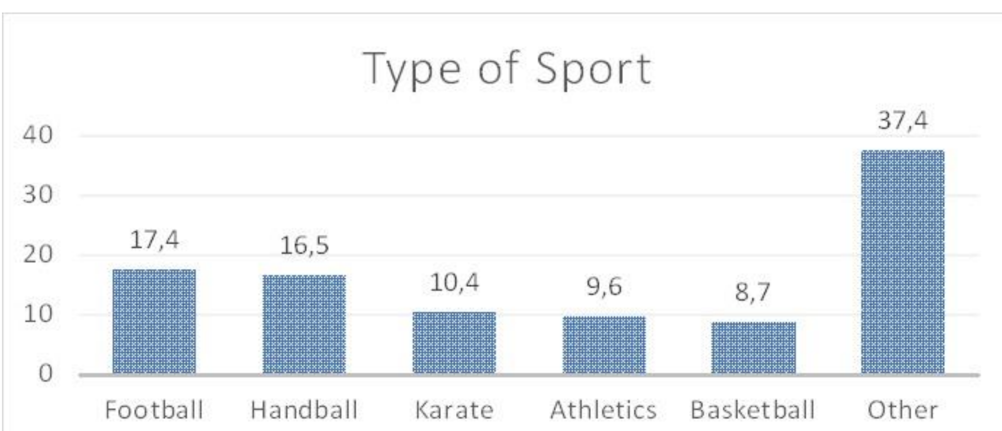


Figure 1. Distribution of athletes by modalities (%).

Most athletes practiced individual sports (n = 59, 51%). The modalities of the athletes studied were football (n = 20; 17.4%); handball (n = 19; 16.5%), karate (n = 12; 10.4%), athletics (n = 11; 9.6%), basketball (n = 10; 8.7%) and others (skating n = 8; volleyball n = 7, judo n = 6, gymnastics n = 5, badminton n = 4, canoeing n = 3, padel n = 3, roller hockey n = 2, swimming n = 2, orienteering n = 1, tennis n =1 and triathlon n = 1) (Figure 1).

Age at menarche ranged between 10 and 18 years, with a mean of 13.04 (SD ± 1.38). 14 athletes (12.2%) had menarche with 15 years old or above. The mean duration of menstruation was 5.02 days (SD ± 3.27). The maximum interval without menstruating was 48 months, mean of 3.48 (SD ± 6.38; median 2).

Overall, 15 athletes (13%) had irregular cycles. Of these, 40% (n = 6) had a BMI ≤ 20kg/m^2. On the other hand, 12 reported having had periods of amenorrhea (10.4%), half (n = 6) of them had a BMI ≤ 20kg/m^2.

In this sample, 17 women (14.8%) play sports where the fat mass is usually low (gymnastics, athletics and triathlon). In this group, 17.6% (n = 3) did not have regular cycles (vs. 12.1%; n = 12/98) and 29.4% (n = 5) had had at least one episode of amenorrhea (vs. 7.1% n = 7/98).

Dysmenorrhea was classified between 0 and 10. The mean was 3.14 (SD ± 2.48).

Sports practice

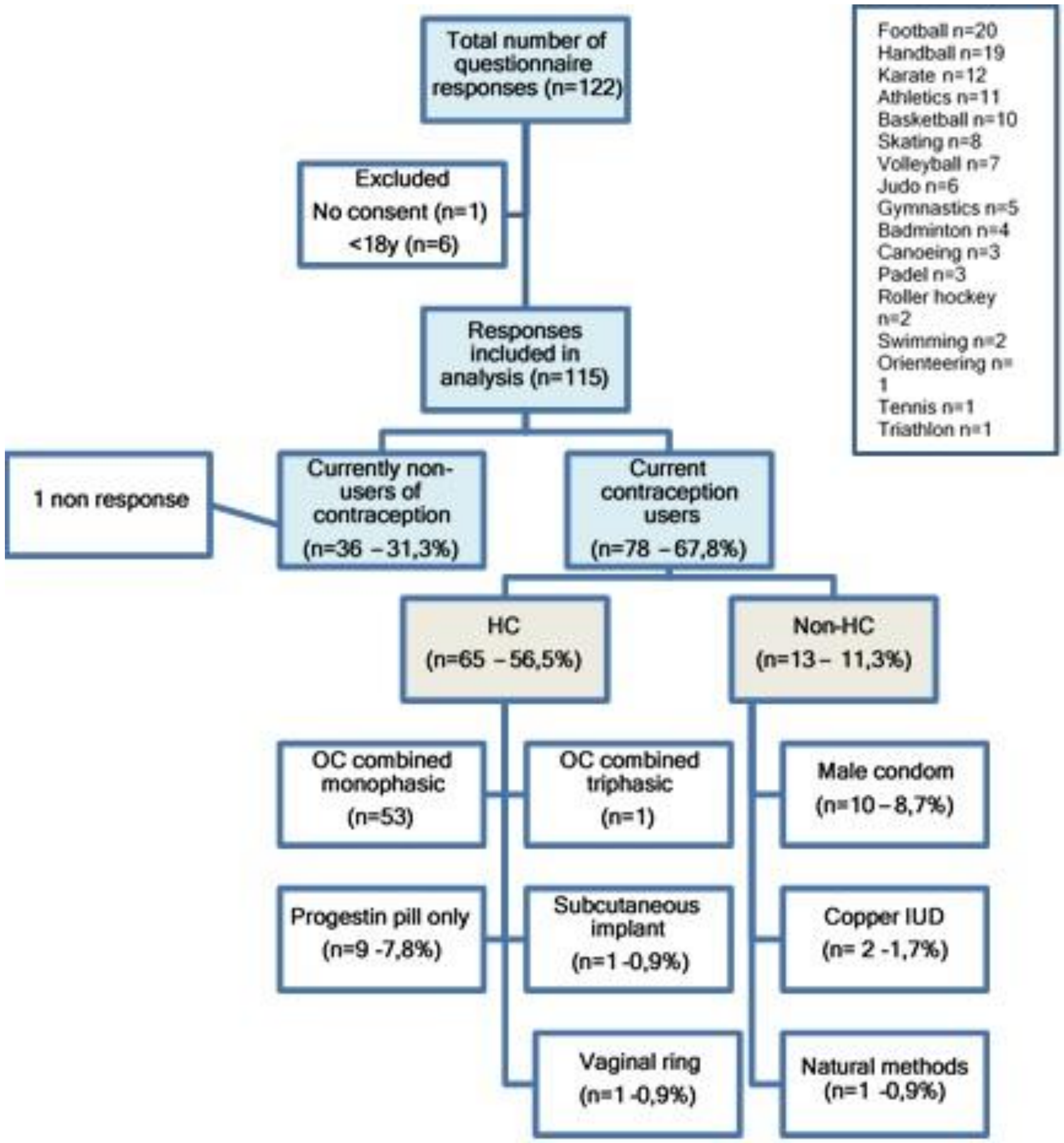
The average number of weekly hours of training was 12.35 (SD ± 7.19; median 12). 36.5% of the athletes trained 6 days a week (n = 42), followed by 5 (n = 25; 21.7%), 4 (n = 18; 15.7%), 7 (n = 16; 13 .9%), 3 (n = 12; 10.4%) and 2 athletes trained only 2 days a week (1.7%). On average, athletes were practicing the elite sport for 9.1 years (SD ± 4.8, median 8). Training was classified as resistance, strength, speed, flexibility or mixed training. Mixed training was the most frequent (n = 87; 75.7%), followed by resistance training (n = 13; 11.3%), strength (n = 10; 8.7%), speed (n = 4; 3.5%) and flexibility (n = 1; 0.9%).

Contraceptive use and its effects

We found that 67.8% (n = 78) of the athletes used a contraceptive method, 65 of which (83.3%) used hormonal contraception, 10 used a male condom, 2 a copper intrauterine device and 1 natural methods (Figure 2). None of the athletes used the Levonorgestrel Intrauterine System.

The use of hormonal contraception was distributed as follows: 53 monophasic combined pill (2 in continuous administration), 1 triphasic, 1 vaginal ring, 9 pill with progestin only, and 1 subcutaneous implant of Etonogestrel. In the case of combined pills, the Etinilestradiol dosage ranged from 0.02 to 0.03 mcg and the progestin was: Gestodene (n = 22), Drospirenone (n = 11), Dienogeste (n = 13), Chloromadinone (n = 3), Levonorgestrel (n = 1) and Nomegestrol Acetate (n = 1).

The main reason for starting contraception was to avoid pregnancy (n = 36; 45.6%), followed by acne treatment (n = 15; 19%), dysmenorrhea control (n = 12; 15.1%), menstrual cycle regulation (n = 7; 8.9%), menstrual cycle monitoring for competitions (n = 2; 2.5%), to reduce menstrual flow (n = 2; 2.5%), treatment of anaemia (n = 1; 1.3%) and treatment of polycystic ovarian syndrome (n = 1; 1.3%) (Figure 3).



Note. IUD, Intrauterine Device; OC, Oral Contraceptive; HC, Hormonal Contraception.

Figure 2. The prevalence of type and delivery method of contraceptives used and the prevalence of non-contraception use.

The mean duration of contraceptive use was 43.9 months (SD ± 54.6; median 24). Overall, around 80% of the athletes reported changes with contraception: reduced or absence menstruation (n = 36; 45.6%), reduction in dysmenorrhea (n = 29; 36.7%), improvement of acne (n = 16; 20, 3%), weight gain (n = 9; 11.4%), increased dysmenorrhea (n = 6; 7.6%), onset of headache (n = 2), increased amount of menstruation (n = 1; 1.3%), and breast tenderness (n = 1; 1.3%).

Around 20% of the athletes (n = 23/115) had already stopped taking a contraceptive method, mostly because of body weight gain (n = 4), mood changes (n = 2), feeling of a lower sports performance (n = 2), pregnancy or pregnancy attempt (n = 2), menstrual irregularities or spotting (n = 2), and other unspecified changes (n = 7).

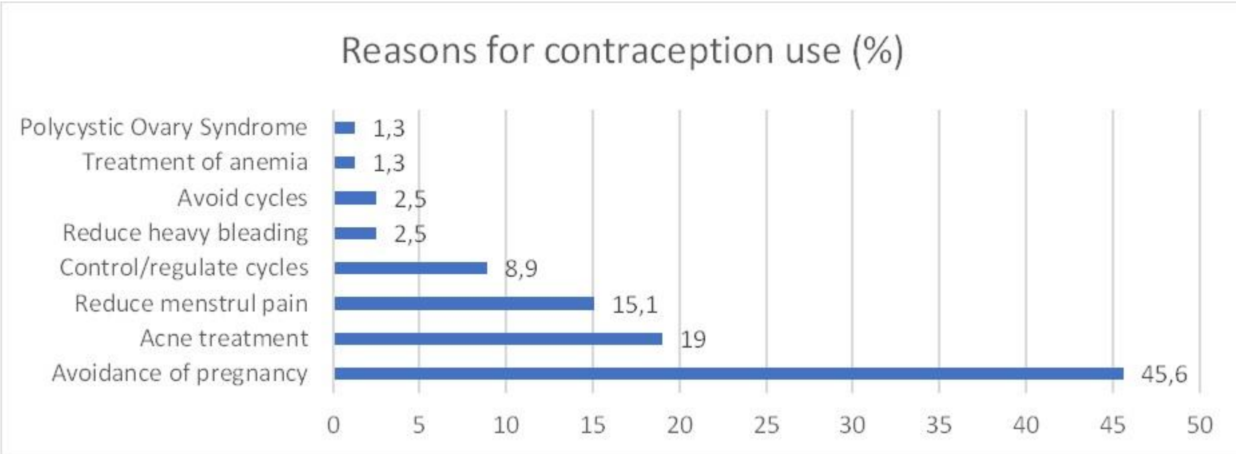


Figure 3. Reasons for contraception use in current users (%), (n = 78 – 2 non responders).

Contraception and physical performance

51.3% of the athletes felt that menstruation did not interfere with their sports practice (n = 59/115), 42.6% reported a negative interference (n = 49/115) and 5.2% a positive interference (n = 6 /115). 56.5% of the athletes reported that physical performance changes throughout the menstrual cycle (n = 65), 24.3% (n = 28) reported that it might change and 19.1% (n = 22) reported that it does not (Figure 4) Of those who reported that performance changed throughout the menstrual cycle, most felt a higher performance after menstruation (n = 40/65; 61.5%), followed by greater performance before menstruation (n = 14/65; 21.5%) and finally during menstruation (n = 12/65; 18.4%) (Figure 4). On the other hand, the time of the menstrual cycle in which athletes feel most tired is during menstruation (n = 59/115; 51.3%), followed by the days before menstruation (n = 28/115; 24.3 %). 23.5% (n = 27/115) of the athletes reported that fatigue was not phase related. Regarding the interference of the beginning of contraception with sports performance: most athletes (n = 59/79; 74.6%) reported that it did not affect their sports performance, 9 revealed that it was positively related (11.4%), and only 4 had a negative perception (5.1%) (3 did not respond).

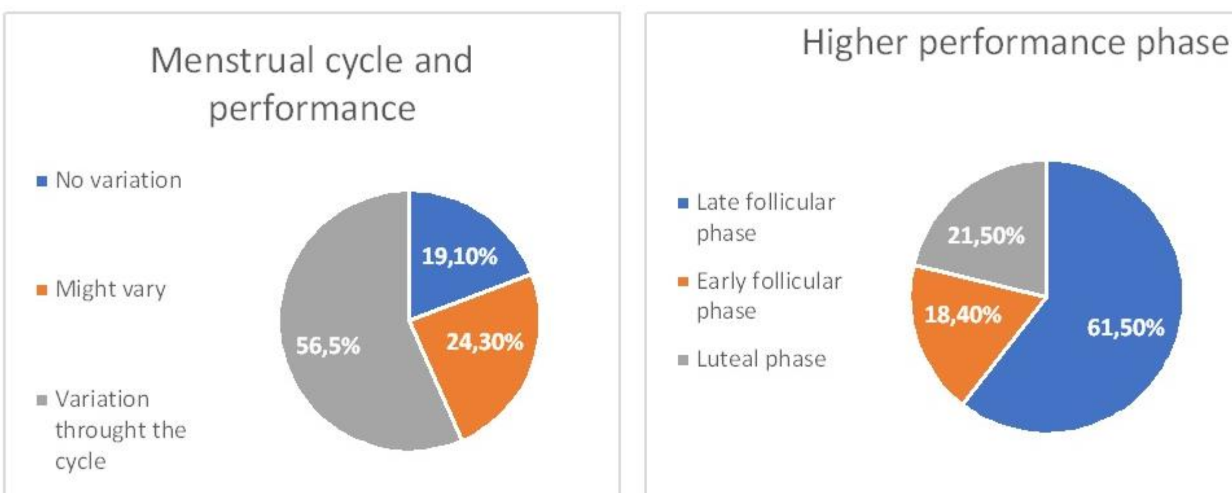


Figure 4. Percentage respondents for changes of performance throughout menstrual cycle and better menstrual phase for greater performance.

Near 27% (n = 31) answered that contraceptives were contraindicated for practicing sports and almost half (n = 55; 47.8%) said that they did not know. 25.2% of athletes (n = 29) reported that contraceptives do not cause any changes.

Contraceptive counselling

51.3% of the athletes (n = 59) didn't have any contraceptive advice, 32.2% (n = 37) received some kind of and 16.5% (n = 19) did not remember. Of the athletes who received counselling, most were given by a gynaecologist (n = 23), followed by a family doctor (n = 5), friends (n = 3), family (n = 3), Federation doctor (n = 1), coach (n = 1) or other (n = 1). Most athletes never discussed the topic "*contraception*" with their coach (n = 92; 80% vs. n = 19; 16.5%). Most coaches were male (n = 93; 80.1%).

DISCUSSION

The main goal of this study was to evaluate the contraceptive practices and contraceptive advice of high-performance female athletes. It was also sought to assess menstrual patterns and to relate the effects of contraceptives to possible changes in the athletes' physical performance. The study was based on an anonymous survey that was sent to high-performance athletes through Portuguese Sports Federations. All data was provided by the athletes, reflecting their personal perceptions and experiences. The results were compared with data from the literature. There are other studies that also used questionnaires to investigate changes in performance and negative effects related to the menstrual cycle and they have reported consistent results (Martin D, 2018) (Kishali NF, 2006) (Brown N, 2021) (Bruinvels, et al., 2021). In 2019, the number of high-performance women practitioners in Portugal was 257 (Lima, 2021). Our study managed to collect a total of 115 responses, which may represent a significant and representative sample of high-performance athletes in Portugal. We found that 87% of the athletes menstruate regularly, a similar result found in the study by Mendes Coutinho et al (83%). (Coutinho F, 2021). We found that around 10% of the athletes reported having had amenorrhea and this rate was slightly higher than the prevalence of oligomenorrhea/amenorrhea in the general population, which is between 2 to 5% (Nattiv A, 1994) (Oxfeldt M, 2020) (Torstveit MK, 2005). In athletes, the prevalence of these changes, particularly of amenorrhea, can vary between 3.4 and 70%, with the highest prevalence being seen in sports where the fat mass is low, such as gymnastics or long-distance running (Nattiv A, 1994). (Oxfeldt M, 2020) (Torstveit MK, 2005). A study based on an online questionnaire in a similar sample concluded that athletes with low energy reserves had a higher risk of menstrual dysfunction and lower physical performance (Ackerman, et al., 2019). In our study, 17 athletes were practicing sports where the fat mass is low (gymnastics, athletics and triathlon). Of these, three did not menstruate every month (17.6%) and five reported previous episodes of amenorrhea (29.4%). These rates are slightly higher than the frequency found for all athletes included in the study (17.6% vs. 13%; 29.4% vs. 7.1%, respectively).

We also found that less than half of the women who did not menstruate every month were underweight, which suggests that BMI does not appear to be the only factor responsible for menstrual irregularities. It was found that 12.2% of athletes had late menarche (> 14 years), a rate comparable to a Portuguese study carried out with non-athlete adolescents (12.2% vs. 11.8%) (Marques, 2017). More than half of the athletes reported that physical performance changes during the menstrual cycle. The results of a systematic review and meta-analysis indicated that sports performance may be trivially reduced during the early follicular face (from the 1st to the 5th day of the menstrual cycle), compared to the other phases (McNulty KL, 2020); the results obtained in our study are in agreement, given that only 18.4% of the athletes reported better sports performance during menstruation and that half felt that the menstruation phase is the time in which they felt most tired (51.3%). These results are similar to the study by Coutinho et al. where they reported that about

40% of the athletes felt they had less energy during menses (Coutinho F, 2021). However, Solli et al. reported that most athletes perceive the days before menstruation as the worst phase of the menstrual cycle for performance (Solli GS, 2020). These interpretations should be cautious, since they are the results of a subjective feeling of the athletes and therefore, given the limited evidence, no general recommendations can be made about sports performance throughout the menstrual cycle (McNulty KL, 2020).

Solli et al. reported that the time after menstruation was when the athletes reported the best performance and fitness (Solli GS, 2020), while Bambaeichi et al (E Bambaeichi, 2004) found that the ovulatory phase was the best. Our study was in agreement with these data, in which more than half of the women (61.5%) reported higher performance after menstruation.

Nonetheless, other studies did not find any changes in performance between menstrual cycle phases (Casazza GA, 2002) (Elliott KJ, 2003) (Janse de Jonge, X. 2012).

In a study with 430 athletes, 77% of elite athletes had no hormonal effects during the menstrual cycle, including pain (abdominal/lower back), cramping (abdominal) and headache/migraine (Martin D, 2018). Between 31.7 and 54% of women stated that their menstrual cycle impacts upon their training and performance (Bruinvels G, 2016). Almost 75% of the athletes denied any negative influence with the initiation of contraception and about 10% reported that pill increased physical performance, while only 5% reported that the initiation of contraception negatively affected their performance. These data are similar to those described by Coutinho et al. (Coutinho F, 2021).

About 20 to 70% of elite athletes in the world use HC, with a significant variation depending on the country and modality (Oxfeldt M, 2020) (Cheng, J. 2020) (Larsen B, 2020) (Martin D, 2018). In a recent study, nearly half of the population studied did not have an eumenorrheic menstrual cycle (Martin D, 2018). Of these, 68% of the athletes were users of combined HC (Martin D, 2018), a lower rate than what we found (83.3%).

In this study 68.7% used some type of contraceptive, slightly higher than that recorded in Portugal in 2020 (68.7% vs. 61%) (European Contraception Policy Atlas - Portugal, 2021), but similar to the 71,5% found in another (Coutinho F, 2021). In our study, 83.3% of contraceptive users used HC, and of these, 84.6% used combined hormonal contraception. This is in agreement with other studies where the combined pill was preferred over the progestin-only pill (Oxfeldt M, 2020) (Larsen B, 2020) (Martin D, 2018) (Coutinho F, 2021). Long-acting reversible contraceptives are contraceptive options with little use among female athletes (Coutinho F, 2021), as was also seen in our sample.

It has been reported that the vast majority of COC users deliberately manipulate the time, frequency and amount of menstruation, for reasons of convenience, sports competitions, special events or holidays (Oxfeldt M, 2020) (Martin D, 2018) (Schaumberg MA, 2017).

However, in this study, only 8.9% used contraception with the primary objective of regularizing their menstrual cycle and only 2 athletes use contraception to monitor and model the menstrual cycle for competitions.

The most common adverse effects reported after initiation of hormonal contraception were increased body weight and mood changes, both of which can affect performance (Martin D, 2018). In our study, almost 12% of the athletes reported weight gain.

A prospective study of low-potency progestin COC and androgenicity suggested a causal link between COC administration and weight gain (Notelovitz M, 1987). This weight gain can be harmful to the performance of athletes in sports where weight gain is relevant, whether for dynamic reasons (e.g. athletics), aesthetic reasons (e.g. gymnastics), or because body weight determines a competition category (Notelovitz M, 1987) (Ex: rowing, weightlifting, judo, boxing) (Notelovitz M, 1987). Another study in inactive women revealed no differences in body weight after initiation of monophasic COC (Tantbirojn P, 2002). Rickenlund et al. demonstrated that endurance athletes who used the monophasic pill for 10 months showed a significant increase in weight and fat mass, however only in athletes with previous oligomenorrhea or amenorrhea, associated with a decrease in ovarian androgens and an increase in bone mineral density (Rickenlund, et al., 2004).

Most of the athletes received contraceptive counselling from a physician, as in the study by Coutinho et al. (Coutinho F, 2021).

There are some limitations of this study: 1) despite including a large number of elite athletes in Portugal, the sample is small and there is a large inter-individual variation, despite including almost half of Portuguese high-performance athletes, 2) the comparisons are made between athletes from different modalities with different types of training and different body weights; 3) the performance evaluation is based on the athletes' perception and not by the evaluation of physiological parameters, 4) the performance evaluation and the relation with the menstrual cycle phase is not based on laboratory criteria, and 5) great diversity of combined compounds with different doses and types of oestrogens and progestins.

CONCLUSION

In our sample, about 70% of the athletes used some type of contraception, and the combined oral contraception was the most frequently used. The main reason for its use was to avoid pregnancy and acne treatment. Around 13% do not menstruate regularly and almost 11% of them have had previous periods of amenorrhea, with a higher rate among athletes of sports where fat mass is usually low. More than half of the athletes revealed that menstruation does not interfere with their sports practice. Of those who reported changes, almost half reported that menstruation negatively affected their performance. On the other hand, most felt that menstrual cycle phase is related with their physical performance and that the late follicular phase was the best time for performance. In most athletes, starting contraception did not affect their sports performance.

AUTHOR CONTRIBUTIONS

Inês Margarida Neves Gomes: Idea/Concept, Design, Control/Supervision, Data Collection and/or Processing, Analysis and/or Interpretation, Literature Review, Critical Review, References and Fundings. Alexandra Ruivo Coelho: Literature Review, Writing the Article, Critical Review. José Luís Bento Lino Metello: Control/Supervision, Writing the Article, Critical Review.

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DISCLOSURE STATEMENT

This study was approved by the ethics committee.

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