Does the menstrual cycle negatively affect the performance of menstruated circus artists?

by
Sarah Repond

DIE ETAGE, Schule der darstellenden und bildenden Künste

Contemporary circus department

04.2022

Today, the world population is composed of more than 9,975,000,000 humans, 26% of them are menstruated. 95% of the menstruated people are experiencing physical and/or psychological changes related to their period. Although the taboo around periods seems to be decreasing, only few studies are available regarding this topic. No need to mention that studies analysing athletes and menstruation are almost non-existent. Even in 2022 the menstrual cycle is barely taken into consideration in the sports world. Indeed, no complete study addresses the negative and positive effects of the cycle on the performance of menstruated athletes, by which I mean not only the female gender but all people endowed with a menstrual cycle. In the circus world, both coaches and performers are often not fully aware of the physiological and hormonal phenomena involved. Concentration, motivation, physical level and tiredness are some of the factors that vary in the different phases of the menstrual cycle and influence the training, performance and creativity of circus artists.

Nowadays, the negative aspects of the menstrual cycle are more and more thematised, but is menstruation only a disadvantage? This is what I will be addressing in this work by answering the following question:

Does the menstrual cycle negatively influence the performance of menstruated circus artists?

First of all, I have to define what the menstrual cycle is. It is a period of time between the onset of menstruation or bleeding, during which physiological and hormonal phenomena take place, preparing the menstruated body for a pregnancy each month and continuing if there is no impregnation. A cycle lasts an average of 28 days and its duration and effects vary from one person to another. In addition, when I mention circus artists in this work, I will be referring to athletes who excel in both their sports discipline(s) and in the art of creation. This, because circus artists cannot be defined as the essence of this art form lies in uniqueness.

The first chapter of this essay begins by discussing the influence of the menstrual cycle on the creative process, starting with the benefits of its hormonal fluctuations and

ending with its inconveniences. This leads into a second chapter, which analyses the impact on artists' sporting performance. Again, I will explore both the positive and negative aspects of this physiological and hormonal phenomena. Finally, I will conclude by sharing what I have gained from this study and how it has helped me to improve my relationship with my cycle, its specificities and its impact on my body.

As stated above, in this chapter I will deal with the artistic and creative aspect of the theme. In this part I will look into the positive influence the menstrual cycle has on mental well-being, self-perception, motivation and other factors that will intervene to provide an environment that is conducive to creation and artistic spirit.

In order to understand the ins and outs of the subject, it is important to clarify the hormonal changes that take place during the different phases of the menstrual cycle. The main hormones active during this cycle are oestrogen, progesterone, Follicle Stimulating Hormone (FSH), Luteinizing Hormone (LH), testosterone and cortisol. The menstrual regulation is divided into four distinct phases: (1) the menstrual phase or early follicular phase, (2) the follicular phase or late follicular phase, (3) ovulation and (4) finally the luteal phase. The first day of bleeding marks the beginning of the menstrual phase, which can last between 4 and 9 days and is repeated, depending on the cycle, every 21 to 35 days. During this period, the hormone levels of oestrogen and progesterone are at their lowest (see Fig. 1), which causes the breakdown of the endometrium and its evacuation through vaginal bleeding. Towards the end of the early follicular phase, the body begins to produce oestrogen, leading to its slight increase. In addition, another hormone is produced: serotonin, commonly known as the "happy hormone". After bleeding and until ovulation, the follicular period takes place, when oestrogen reaches its peak. The steady rise in oestrogen to its peak also triggers the growth of the endometrium to accommodate a fertilised egg. This is followed by the ovulation period, which can last from day 10 to day 23, during which the oestrogen level gradually decreases and the metabolism is accelerated. Physiologically, an egg is released for fertilisation. Hormonally, the increase in FSH activates the maturation of the ovarian follicles[1]. In addition, there is a peak in LH which in turn activates the release of a mature egg in the fallopian tubes. This hormone is not only responsible for destroying the capsule around the egg (corpus lutheum) but also for stimulating the production of progesterone, which in turn builds up the lining of the uterus, allowing the egg to attach to it. At the same time, the amount of oestrogen in the blood falls sharply and testosterone, although present in very small quantities in the body, also peaks

[1] Ovarian follicles are the basic units of female reproductive biology, each of which is composed of roughly spherical aggregations of cells found in the ovary. They contain a single oocyte. These structures are periodically initiated to grow and develop, culminating in ovulation of usually a single competent oocyte in humans. These eggs/ova are only developed once every menstrual cycle.
https://www.definitions.net/definition/ovarian%20follicle ,(accessed on 13th March 2022)

during ovulation. This hormonal upheaval can be felt to a greater or lesser extent by different people. Finally, there is the luteal phase, the last phase of the cycle before the return of menstruation, where the progesterone level increases constantly until it reaches its peak in the middle of the phase. Oestrogen levels fluctuate, starting with a decrease and peaking in the middle of the phase, as does progesterone. Once their peak is reached, both hormones experience a sharp decrease in levels until they are at their lowest, and the cycle begins again. The luteal phase can therefore be summarized as an oestrogen swing and a progesterone peak. As a summary and visual aid, below is a graph that represents the hormonal changes during the menstrual cycle. Since very little research has been done on the subject, there is no graph combining all the hormones acting during the cycle. For this reason I have created this graphic by gathering the information available.

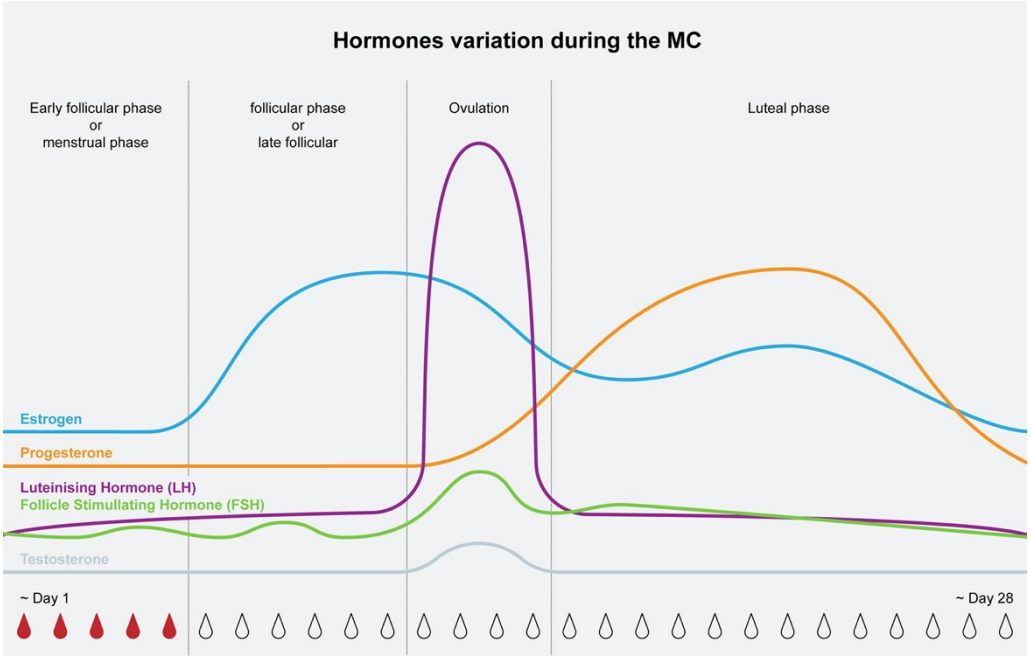

Figure 1: Hormones variation during the MC

By observing the graph above, I can observe that the menstrual cycle is characterized by an important oscillation of the hormonal levels. I am particularly interested in the fluctuation of oestrogen levels because it has positive physical and psychological effects. Indeed, this hormone will not only accelerate the metabolism, but also promote the production of serotonin, which is known as the "happy hormone". These slight hormonal rises at the beginning of the follicular period will attenuate premenstrual syndromes (PMS). The peak of energy and motivation felt later in this phase could be

due to the increase of these two hormones. In addition to this enthusiasm, cognitive functions, or the ability to interact with our environment, are influenced during ovulation. To be more precise, they can induce us to adapt, interact with others, concentrate and acquire new knowledge. Indeed, there are oestrogen receptors in several areas of the brain: the hippocampal formation, the amygdala and the cerebral cortex. These three regions are responsible for the functioning of emotions, memory consolidation and retrieval, and cognitive processes in general. As a result, during ovulation, thanks to the level of oestrogen, these cognitive functions are stimulated. Therefore, one might be more extroverted, more focused, and one might communicate more easily with the outside world. In order to substantiate this, I decided to create a questionnaire on the impact of their menstrual cycle and submitted it to over 80 menstruated athletes and circus artists, aged 18-35. In analysing their testimonies, the majority of them, 62.9%, felt more confident and 56.2% more productive and creative during their ovulatory period. It is important to note that the responses do not take into consideration those who are taking hormonal contraceptives as they inhibit menstrual symptoms.

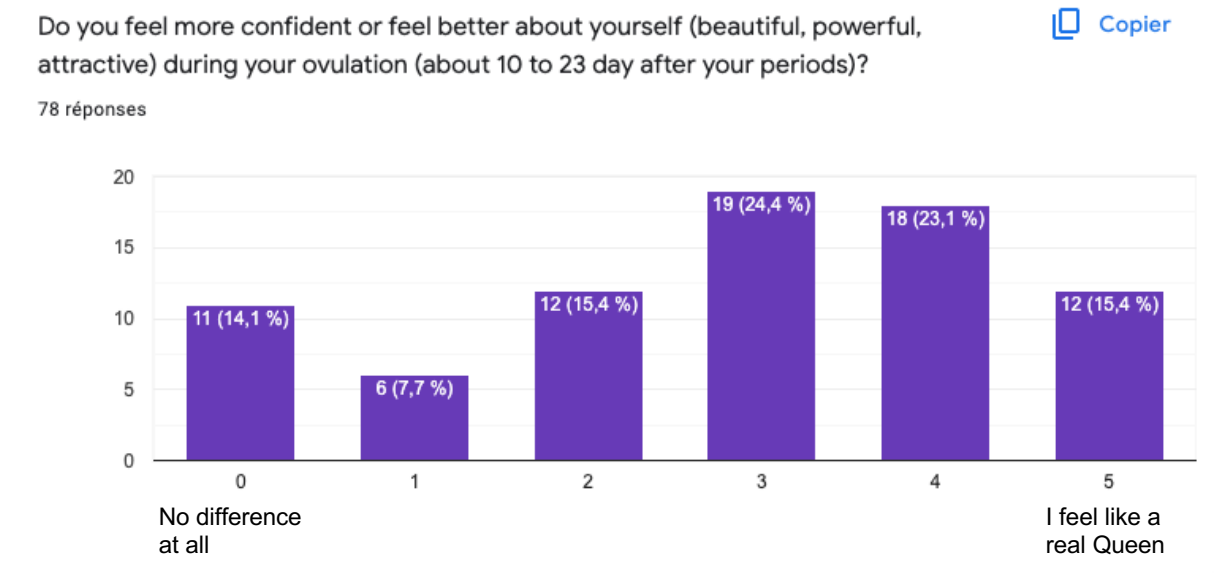

Figure 2: Result of the questionnaire

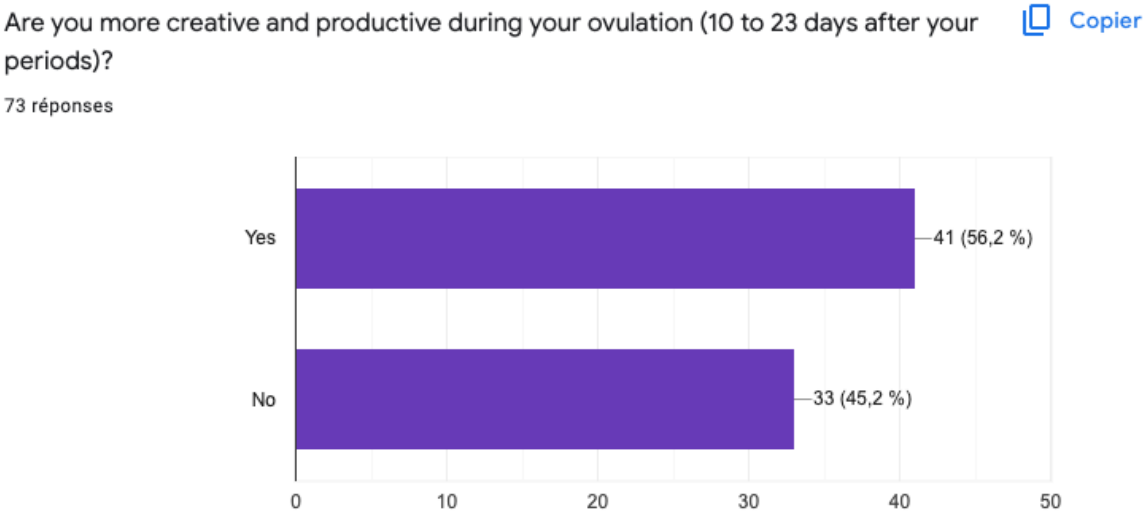

Figure 3: Result of the questionnaire

Therefore, one can infer that the hormonal changes taking place during the first part of the menstrual cycle, i.e. from the middle of menstruation until the end of ovulation, have a positive influence on creativity and artistic sense. Indeed, the high level of oestrogen during the follicular phase not only boosts the production of serotonin, which will improve mood, but will also decrease PMS, boost metabolism, motivation and lead to a peak of energy. The hormonal benefits are not only felt during the follicular phase but also during ovulation, which influences cognitive functions. Moreover, one can note that the majority of the people who testified, feel the beneficial effects of the cycle. Thus, all these biochemical reactions bring not only physical benefits to the menstruated person but also psychological and cognitive benefits. This set of factors will provide an environment that is more propitious to the artistic and creative sense.

For circus artists, however, menstrual symptoms often cause more discomfort than benefit. This argument will focus on the symptoms that diminish their creative and artistic abilities.

Pain, blood loss, stress and emotional upheaval affect mood and the ability to dedicate oneself to one's art. Unfortunately, these disadvantages do not only apply to circus artists but to all menstruated people. They occur mainly during the second part of the cycle, i.e. during the luteal phase.

First, I will focus on the period before menstruation. Indeed, as I mentioned earlier, hormonal fluctuations during the cycle play a major role in mental health, especially when progesterone and oestrogen levels drop, just before menstruation (ref. Fig.1). Indeed, these emotional discomforts have a name: premenstrual syndrome (PMS). [2]Symptoms include depressed mood, anxiety, anger, lack of interest and difficulty concentrating. In a study of 300 menstruated students aged 18-24 in the United Arab Emirates, more than 95% of participants reported having at least one of the symptoms of PMS.

Prevalence of premenstrual syndrome symptoms by the level of severity ($n = 300$).

Symptom	None	Mild	Moderate	Severe	Total
			n (%)		
	Psychological symptoms				
Depressed mood	15 (5.0)	130 (43.3)	100 (33.3)	55(18.3)	285 (95.0)
Hopelessness	95(31.7)	107 (35.7)	73 (24.3)	25 (8.3)	205 (68.3)
Guilt feeling	184 (61.3)	71 (23.7)	33 (11.0)	12 (4.0)	116 (38.7)
Anxiety/worry	74 (24.7)	106 (35.3)	72 (24.0)	48 (16.0)	226 (75.3)
Affective labiality	56 (18.7)	97 (32.3)	78 (26.0)	69 (23.0)	244 (81.30)
Increased sensitivity toward others	77 (25.7)	74 (24.7)	92 (30.7)	57 (19.0)	223 (74.3)
Anger feelings	43 (14.3)	84 (28.0)	98 (32.7)	75 (25.0)	257 (85.7)
Easily irritated/agitated	60 (20.0)	97 (32.3)	81 (27.0)	62 (20.7)	240 (80.0)
Lack of interest	61 (20.3)	94 (31.3)	100 (33.3)	45 (15.0)	239 (79.7)
Difficulty concentrating	118 (39.3)	118 (39.3)	48 (16.0)	16 (5.3)	182 (60.7)
Loss of control	84 (28.0)	96 (32.0)	78 (26.0)	42 (14.0)	216 (72.0)
Feeling overwhelmed	76 (25.3)	108 (36.0)	77 (25.7)	39 (13.0)	224 (76.7)

Figure 4: Result of the study on PMS

The participants in this study were asked about 12 psychological symptoms that make up premenstrual syndrome. In this data table, one can see that a majority of them suffers from at least 11 of the 12 symptoms. Among these, depression, anxiety, lack of interest, difficulty concentrating and feeling overwhelmed, can impact the psychological state and, de facto, the creative process of an artist. There is a more

[2] Premenstrual syndrome (PMS) is a cyclical late luteal phase disorder of the menstrual cycle whereby the daily functioning of women is affected by emotional and physical symptoms substantially interfering with their quality of life."(Freeman E.W., *Psychoneuroendocrinology.* 2003;28:25–37)

serious form of PMS: the premenstrual dysphoric disorder (PMDD). About 5% of the menstruated population, has a more severe reaction to hormonal fluctuations. According to an article *“Le trouble dysphorique prémenstruel : diagnostic et stratégie thérapeutique”', Rev Med Suisse 2005; volume -9. no. 052, 393 – 399* : "The essential features of PMDD are a depressed mood, marked anxiety and emotional lability, and a decreased interest in activities. These symptoms are comparable in severity, but not in duration, to those of major depression and cause marked impairment of activities or ability to function socially."

After the luteal phase comes the menstrual phase, which in turn has an important influence on the psychological state. Most menstruated people feel bad in their skin, experience discomfort and are emotionally at their lowest ebb not to mention the anxiety of " leaking ", i.e. losing blood in public. There is no research to date on the psychological effect of menstruation on professional athletes and artists, so I decided to include some questions about the creative aspect in my questionnaire. Here are some of the stories that were really pertinent:

“My heart sinks every time I am hired for a show and I see it is at the same time as the first few days of my cycle because I know how hard I will have to push myself and how uncomfortable it will be. I always push myself to perform through the pain because I don’t want to let my bleeding get in the way of my passion, but it is always so much harder than when I perform without the extra stress and anxiety of bleeding. If I am training, I will often take the day to let my body rest, but sometimes as women we don’t always have that option because people on the business do not always accept that as a valid excuse.”

“(…) in moments of shows I see no big chance how to protect me and my body from what the "world" is expecting from me in this moment.”
“I tend to feel very antisocial, extreme fatigue and heaviness/bloating the week leading up to and during my period. It makes performing shows a lot more challenging.”

“Sometimes I lose every sensations y I don’t control my body and I can’t perform as usual. I have less coordination and my mind are very negative (sad or very angry) and that’s affect a lot my training/competition. Nowadays people still think that menstruation symptoms (mental or physical) are excuses for bad trainings/competitions but that’s a reality and we have to educate the coaches to this reality.”

“It’s hard having to perform at the same level as always when you’re on your period because I’m bloated, tired, cranky, hungry, etc. so I practice giving myself grace because I’ll get disappointed in myself for not pushing myself. “

“I have PMDD and am taking antidepressants to help the symptoms. I use ibuprofen every month during my period, otherwise it’s excruciating and I can’t do anything properly, not to say training. It got worse with age. I have no children.”

All these examples above lead me to state that the ability to create and motivation in general is very much affected during the second part of the cycle. More precisely during the luteal phase, with 95% of menstruated people affected by PMS and the beginning of the menstrual phase, when it is more difficult to be physically 100%. What also stands out from these testimonies, apart from the difficulty of performing and training, is the additional stress that menstruation causes. I am talking about the fear of staining, the lack of understanding from coaches and the sports world in general, the reduced ability to concentrate, create and perform, the problems linked to costumes as well as the less-than-optimal means of protection for the athletes. All these disadvantages which I will have the opportunity to discuss in more detail in the next chapter add to the pressure, which affects the psyche but also the physical abilities.

In this chapter, I will deal with the sports aspect of the theme necessary for the analysis of a circus athlete. This argument will be devoted to the disadvantages of the menstrual cycle on athletic prowess, so it covers all types of athletes. Surprisingly one in three athletes experiences a decrease in performance due to their menstrual cycle.[3] In my questionnaire, 71.8% of the participants experienced a decrease in performance during the menstrual phase (see figure 5) and over 65% had difficulty even training during the peak of their period (see figure 6).

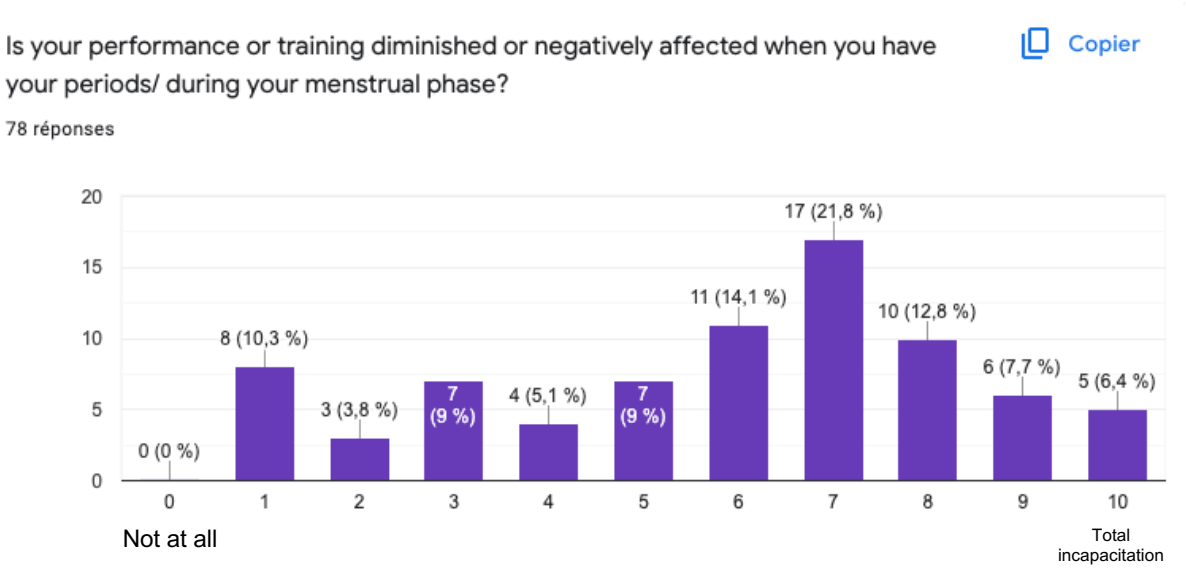

Figure 5: Result of the questionnaire

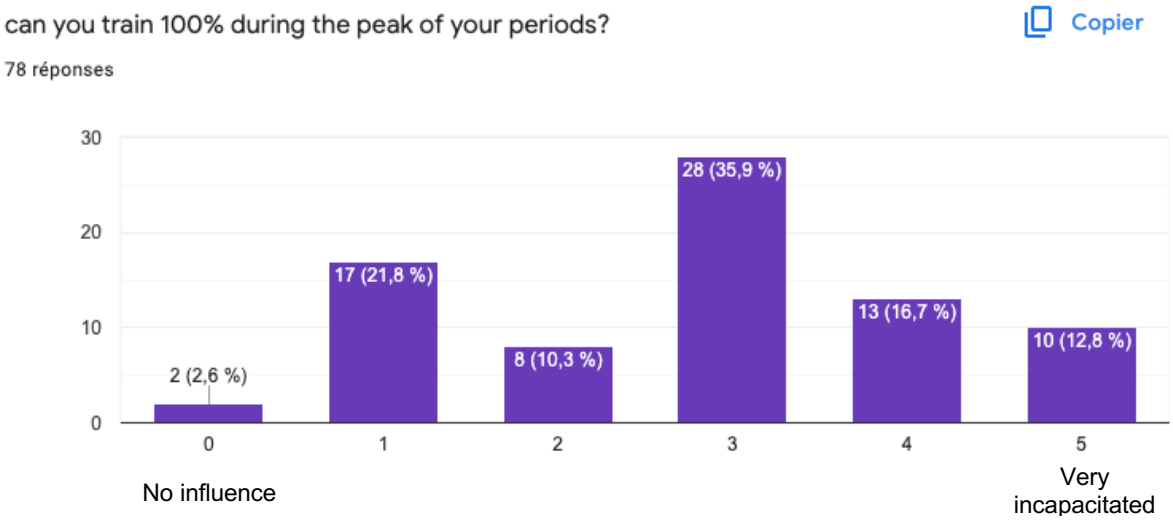

Figure 6: Result of the questionnaire

[3] Sibylle Matter, Patrik Noack, Joëlle Flück (2020). « Quelle est l'influence du cycle menstruel sur mon entrainement », Swiss Olympic 2020 (accessed on 23.02.2022)

Common somatic symptoms are pain in the lower abdomen (which can go as far as the hips), and/or in the lower back or thighs, nausea, vomiting, diarrhoea, dizziness, headaches, fatigue, intestinal disturbances or water retention. Some people gain up to 2 kg during their period. For aerial artists or flyers, this weight gain can make a significant difference. Most of the time these symptoms occur towards the end of the luteal phase and reach their peak around 24 hours after the start of the period, then disappear a few days later. These unpleasant sensations can be explained by the ejection of clots or pieces of bloody tissue from the wall of the uterus. The medical term for painful menstruation is dysmenorrhoea, which means "difficult menstruation". There are two types of dysmenorrhoea. Primary dysmenorrhoea, which affects 92%[4] of menstruated people, represents the normal menstrual process and is characterised by cyclical pain. Physiologically, there is no damage to the genitals, i.e. no associated gynaecological pathology[5]. Secondary dysmenorrhoea, on the other hand, has much more serious consequences. Some of these terms might seem familiar: adenomyosis[6], endometriosis[7], fibroids[8], etc. All these diseases are associated with secondary dysmenorrhoea. Those affected, about 10% of menstruated people, can be disturbed by the discomfort of cramps, to the point of not being able to go to work, having their quality of sleep degraded, and also affecting their participation in sport and social activities. Not only that, but since this condition is associated with damage to the reproductive organs, there can be complications such as infertility, heavy bleeding, anaemia and pelvic organ prolapse[9]. In fact, if these dysmenorrhoeas can have such a great impact on daily life, imagine now doing 6 hours of training or a show in these conditions, without forgetting the psychological symptoms and stress that are added to it.

Several studies have shown that stress has repercussions on the menstrual cycle. Indeed, it can increase the intensity of menstrual symptoms, the PMS, but also cause irregular periods, a heavier flow or on the contrary light bleeding, leading to

[4] Graz, B., Savoy, M., Buclin, T., Bonvin, □. (2014). 'Dysménorrhée : patience, pilules ou bouillotte ?', *Rev Med Suisse* 2014; volume 0. no. 452, 2285 – 2288

[5] The science that studies the diseases of the female organism and its genital system from a morphological, physiological and pathological point of view. According to https://www.cnrtl.fr/

[6] the tissue lining the uterus (called the endometrium) begins to grow inside its muscular walls

[7] fragments of the endometrial wall escape from the uterus and implant on other organs in the pelvis

[8] benign tumours that arise in or are attached to the uterine wall

[9] When the muscles and ligaments supporting a woman's pelvic organs weaken, the pelvic organs can drop lower in the pelvis, creating a bulge in the vagina (prolapse). According to https://www.mayoclinic.org/diseases-conditions/pelvic-organ-prolapse/symptoms-causes/syc-20360557

dysmenorrhea but also to amenorrhea. I would like to make a brief digression on amenorrhoea[10] because it has an even greater impact on menstruated athletes. Indeed, it directly affects bone formation and causes a deficit in oestrogen, a hormone necessary for bone regeneration. This bone deterioration is called osteoporosis. The problem with athletes is that their bone stock will decline more rapidly. Thus, there are athletes aged 30 who have the bone mass and fragility of a 75-year-old, so their bones are abnormally fragile.

Let's get back to stress. When our body is under stress, whether it is internal or external, it secretes a number of hormones in large quantities, including cortisol[11] and adrenaline[12]. In a state of chronic stress, the body is no longer able to pump out these hormones efficiently and becomes tired. To compensate for this, it will reduce the production of sex hormones, which are less necessary for the body, thus disrupting the cycle. The problem is all the more pronounced in athletes for several reasons. Indeed, in order to progress, not only is there constant physical stress imposed, but there is also external pressure to constantly create and perform, regardless of whether one is menstruating or not. Moreover, coaches often underestimate the effects of the cycle on training and performance. Finally, internal stressors such as undernourishment, more accurately known as Relative Energy Deficiency in Sport (RED-S), should not be minimised. In order to achieve better performance and reach the modern ideal of physical attractiveness, many artists tend to limit their energy intake, which not only leads to injury risks, cycle disturbances, decreased performance and thus can lead to osteoporosis. In addition, several other factors can be at the origin of a disturbance of the menstrual cycle, such as the beauty products that are put on the skin for example. It is important to remember that the skin is one of the largest organs and absorbs everything is put on it. Not only that, but sanitary protection (pads and tampons) which contain chemicals for dyeing and perfume, pesticides on fruit and vegetables, and soya and tofu affect our hormonal cycle. Both these products, if consumed heavily, can easily disrupt the cycle as they contain oestrogen, so it is better to avoid eating them when oestrogen levels are high in the body. Also, dairy products should ideally be

[10] The absence (primary amenorrhoea), suspension or cessation (secondary amenorrhoea) of menstrual flow in a woman of childbearing age. According to https://www.cnrtl.fr/definition/am%C3%A9norrh%C3%A9e

[11] Cortisol prepares the body for stress by providing a higher energy intake

[12] Adrenaline allows the body to react more quickly, it affects the heart rate, breathing and blood pressure.

avoided as they contain hormones that can disrupt the cycle or coffee which increases menstrual pain.

Here are two anonymous comments I received on my form that illustrate my point about external stress factors:

" (…) Nowadays people still think that menstruation symptoms, mental or physical, are excuses for bad trainings/competitions but that's a reality and we have to educate the coaches to this reality."

"If I am training I will often take the day to let my body rest, but sometimes as women we don't always have that option because people on the business do not always accept that as a valid excuse."

The results of my survey support the above: 39.2% of the participants will avoid performing or training during their period, 19.4% of the participants will choose painkillers and 19.2% of the participants will modify their cycle with chemical contraception to avoid menstruating during their show. In total, 77.8% of the menstruated respondents to this questionnaire prefer to tamper with their cycle or their daily routine during their bleeding rather than adapt to their natural cycle. It should be noted that these figures do not include people who are on hormonal contraceptives, which inhibit the production of hormones activated during the menstrual cycle by replacing them with synthetic ones. Some of the negative effects of hormonal contraceptives are fluid retention, weight gain, increased blood pressure, breast strain, headaches, nausea, sleep disturbances, increased risk of venous thrombosis, increased risk of developing cervical cancer, etc.

In conclusion, it has been demonstrated that the menstrual cycle affects the sports performance of circus artists, starting with premenstrual pain or dysmenorrhea that occurs during the end of the luteal phase until the first days of menstruation. Whether they are students, athletes or circus artists, the majority of all these people have testified to a decrease in their performance, or even to being disturbed in their daily activities. In addition, various types of stress, whether endogenous[13] such as RED-S or exogenous[14] such as the pressure of the circus industry, have serious and aggravating consequences on the menstrual cycle such as infertility, amenorrhea,

[13] Which comes from within, which has an internal cause. (According to https://www.cnrtl.fr/)
[14] Which comes from outside, that has an external cause. (According to https://www.cnrtl.fr/)

osteoporosis, and other malignant diseases. Several other factors can also disrupt or increase menstrual pain, such as cosmetics, scented or chemically tinted sanitary products, and certain foods such as dairy products, foods containing oestrogen, fruits or vegetables containing pesticides, or coffee.

On the other hand, by being aware of one's cycle and working in unison with it, it is possible to reduce pain, improve one's mood and even increase one's performance. In this argument I will discuss the benefits of the menstrual cycle on sports performance, training and how to take advantage of it.

In order to work side by side with one's cycle, one has to understand and know it. For a good understanding of one's cycle, it is more beneficial not to use hormonal contraceptives. This might be surprising as only 52.5% of the menstruated athletes who answered my questionnaire actually know their cycle (see figure 7).

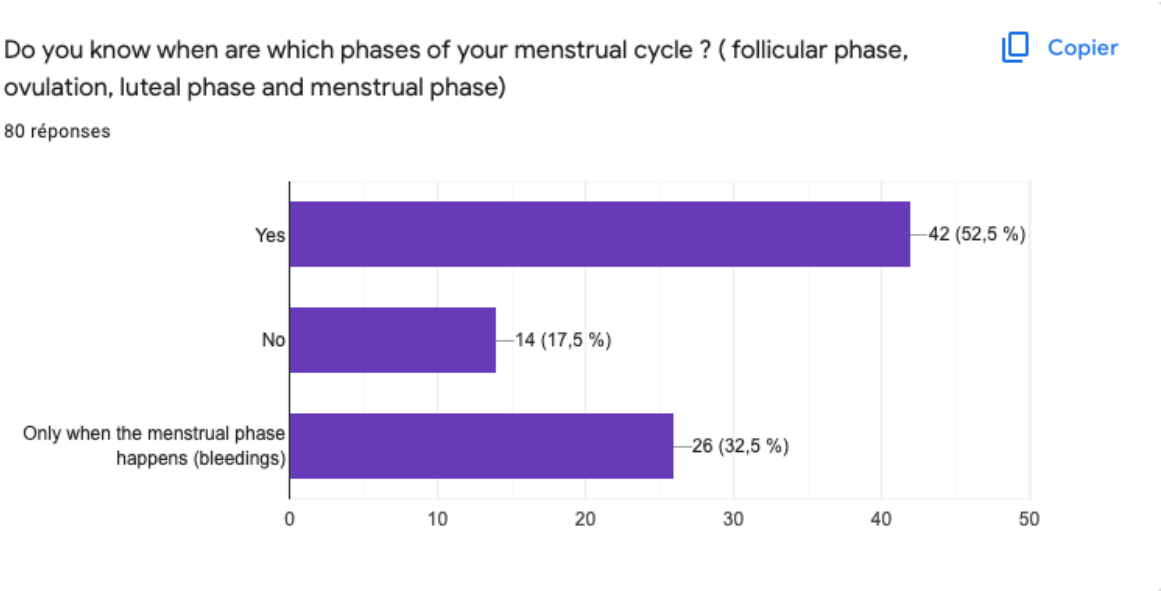

Figure 7: Result from the questionnaire

Regarding the physical aspect of the performance, it is interesting to divide the cycle into two parts: The (one) pre-ovulatory and the post-ovulatory part. The first part of the cycle is called anabolic, or, in other words, the building phase. In this phase it is easier to build muscle and the risk of injury is lower. The blood sugar level is stable, which means that fat is less easily stored and easier to eliminate. Nutritionally, good fats and iron-rich foods are recommended. As oestrogen and progesterone are in low

concentration at the beginning of the cycle and as the hormones are made up of fat, it is essential to eat fat to support their production. For example, eating nuts, salmon, eggs, avocados or good quality vegetable oils. In addition, to compensate for blood loss, it is essential to ingest iron either through supplements or through iron-rich foods such as beans or seaweed. During ovulation, fermented foods are consumed to support the intestines, which work with the hormonal system and thus allow ovulation. This is also the time when the body temperature starts to rise. Indeed, it increases by 0.3° and 0.5°, which is why staying well hydrated is more important.

In the second part of the cycle, that is, the catabolic part, it is more difficult to build muscle, coordination is lower, ligaments relax and the risk of injury is de facto higher. This is notably due to the high progesterone level in this part of the cycle. The body temperature continues to rise, up to +1°, so even more hydration is needed. The high level of progesterone slows down the functioning of the intestine and reduces peristalsis[15] in preparation for a possible pregnancy. Thus, to facilitate the absorption of nutrients, it is important to ingest fibres such as salad, cucumber, tomatoes, etc. It will also be very important to eat more protein due to this catabolic phase, which will tend to destroy more of the protein. Complex carbohydrates, such as rice, sweet potato, are also to be considered as they stabilise blood sugar levels and also reduce mood swings and PMS.

However, this is not the only way to alleviate menstrual pain. It has been proven that these uncomfortable and often disabling sensations are caused by the muscles of the uterus contracting to facilitate and accelerate the expulsion of menstrual blood. During physical exertion, breathing rate and blood flow increase to meet the increased oxygen requirements of the body's muscles. This maximised supply of oxygen to the muscular areas, including the pelvic area, helps to relieve abdominal cramps and menstrual pain. In addition, during a sports session, the body secretes various hormones, such as endorphins, a natural analgesic whose effectiveness against pain is comparable to that of morphine.

[15] Peristalsis is a function of the human body that serves to move certain substances through the tubular organs we have. In this article we explain how it works. (According to https://amelioretasante.com/quest-ce-que-le-peristaltisme/)

As demonstrated above, the menstrual cycle is a complex phenomenon specific to each individual, which can be taken advantage of if these particularities are mastered. Thanks to all the factors studied in this work so far, it is possible to create a training plan adapted to the cycle by following the biological changes occurring during each of its phases. Let's start with the period of menstruation. As mentioned above, during this period, sports practice is recommended as it will reduce menstrual pain through blood diversion and the secretion of painkilling hormones. On the other hand, it is not recommended to train the abdominal muscles as they will tend to increase menstrual pain. Physical exercise will be more tiring, so one should opt for either a short but intensive workout such as HIIT[16] or a light exercise such as Pilates or stretching. From the end of bleeding until ovulation, the level of oestrogen rises. This hormone, which has been discussed previously, promotes muscle development and regeneration, increases bone density, improves mood and reduces pain signals. In addition, this anabolic phase will help our body to burn carbohydrates more efficiently. The follicular phase is the most suitable period for building muscle mass. Therefore, it is advisable to carry out more intensive and harder training to increase strength with a higher volume of exercises. It is also an ideal time to start a new routine or training programme. On the downside, during ovulation one has to be aware of the risk of injuries as the high levels of oestrogen increase the elasticity of joints and tissues. However, the peak in testosterone leads to increased energy, motivation and resistance to pain. Moreover, it plays an important role in muscle building. Athletes are therefore more prone to injury during this period because of their increased resistance to pain due to testosterone but also because of the weakening of their joints. As a result, they should train more intensely but warm up longer to prevent ligament injuries and avoid overstretching the muscles. The luteal phase or premenstrual phase will be the most difficult period on all levels, both physically and mentally. According to the *American Journal of Clinical Nutrition*[17], due to the high level of progesterone the metabolism is 7.7% higher than at its normal level, thus implying higher energy consumption. The result is a significant increase in resting body temperature (up to +1° as seen above). Thus, any additional physical effort will be more energy consuming

[16] High Intensity Interval Training
[17] S P Dalvit, The effect of the menstrual cycle on patterns of food intake, The American Journal of Clinical Nutrition, Volume 34, Issue 9, September 1981, Pages 1811–1815, https://doi.org/10.1093/ajcn/34.9.1811

and will make them feel tired more quickly. Not to mention that serotonin levels, which influence mood and motivation and can affect sleep, are at their lowest. During this phase of high energy consumption, the feeling of hunger is more intense and the drop in serotonin leads them to consume carbohydrate-rich foods to compensate for this lack. The body at rest during this period is less sensitive to insulin and therefore uses carbohydrates less efficiently. In order to eliminate them, it will be preferable to do less intense but longer training sessions, they should focus on technical skills or practice low intensity endurance sports, i.e. between 60% and 80% of our maximum heart rate. In fact, it is said that one should be able to maintain a conversation throughout the session as to keep this heart rate. In summary, during this phase, one should focus on consolidating the training through endurance and technique, without imposing too much load on their body, as recovery will be longer.

In conclusion, there is good evidence in favor of the advantages to train and eat in accordance with one's cycle. As an athlete, it is therefore important to have a good knowledge of one's own body and the processes that take place in it and not to alter its cycle by taking chemical hormones. What is relevant is that at the beginning of the menstrual cycle, there is an increase in strength. Therefore, more intense, more difficult and new training forms are interesting. During ovulation, one can maintain intense training but has to be careful to take time to warm up as the risk of injury is higher. Finally, there is a general drop in performance in the second part of the cycle so concentrate on consolidating existing training. On the other hand, it is even more important to continue with sport during this period as it will prevent period-related pain and improve one's mood.

The impact of the menstrual cycle on menstruated circus athletes is often underestimated, as its disadvantages are rarely taken into consideration during training and even less so during performance. Furthermore, in our society, the menstrual cycle is often seen as a burden to be carried around rather than a symbol of empowerment. This leads us to assume that the menstrual cycle has a negative influence on circus performers, but after this research one might second guess this assumption.

In fact, the first part of the cycle is a period in which everything is on the rise, both physically and psychologically. Indeed, creativity, cognitive functions, motivation, muscle regeneration, training capacity and strength increase. On the other hand, the luteal phase, or second half of the cycle, will be a more complicated period in all respects. It will be harder to train and motivate and this lack of energy will often be followed by pain and PMS.

In general, the symptoms of the menstrual cycle are downplayed and silenced, yet this cycle influences the lives of menstruated people for at least forty years, which for circus performers probably means their entire career. Furthermore, the body is the main tool for circus artists to create and perform, so it is essential to work with its phases and not against them. In order to optimise the follicular and ovulatory phases, training should be intensified and reinforced and the diet adapted. The luteal and menstrual phases should be used to recuperate, concentrate on technique, eat well and listen to oneself. Especially during this phase, one should not be to blame for not being productive or feeling depressed, as stress enhances the menstrual symptoms.

Below, a chart that I have made to bring together all the information on the different aspects studied during this work: mental, physical, training and nutrition. It serves not only as a comprehensive summary but also as a support that one can print and annotate for one’s own use.

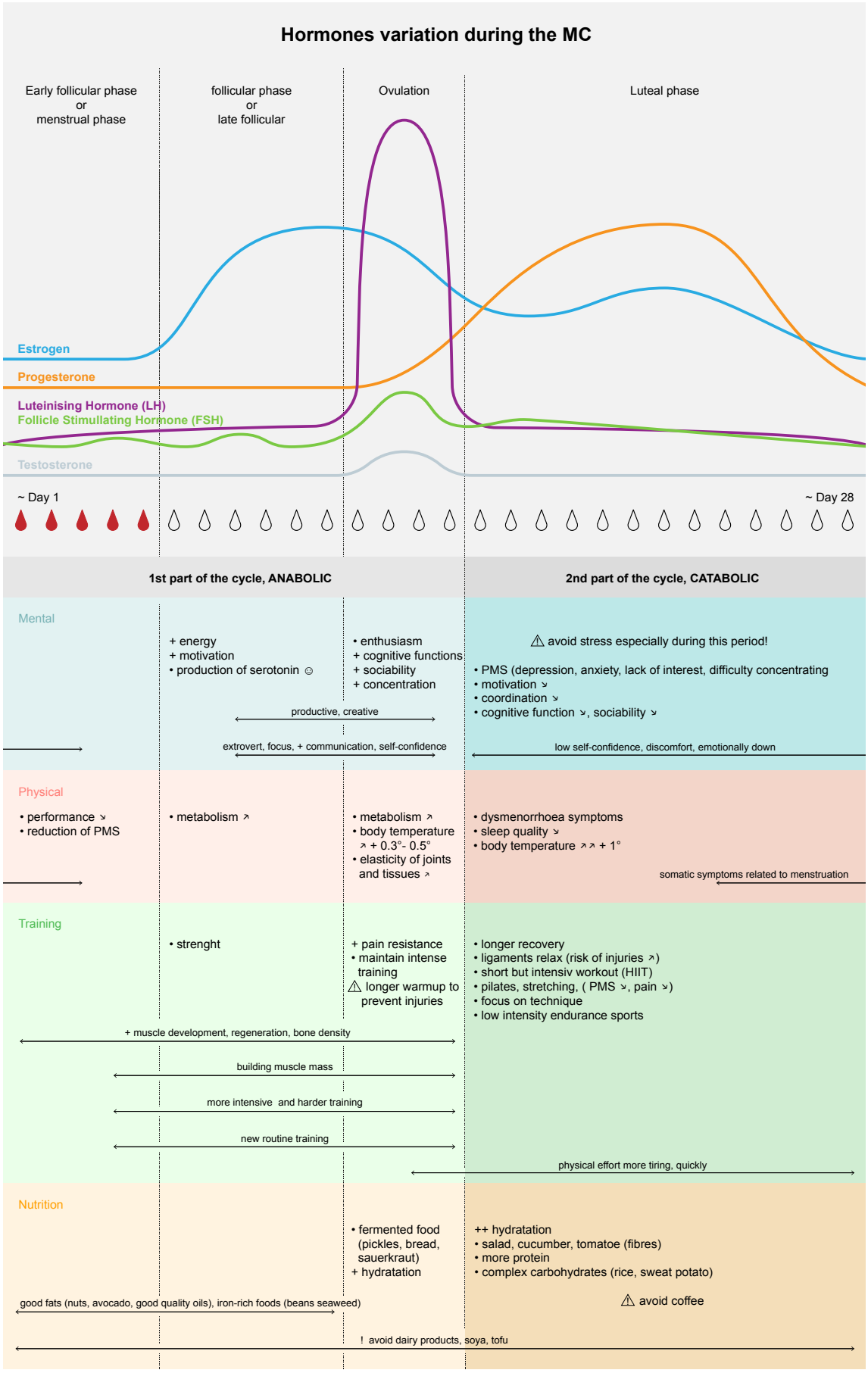

Figure 8: Graph with all the information studied

The menstrual cycle does not negatively influence the performance of menstruated circus artists, it is just misunderstood.

The menstrual cycle is ignored, even though it is a determining factor in the daily supervision of menstruated athletes. Too often the symptoms are ignored, even though they are the signals that the body sends to tell what it needs. Common narrative is that pain is normal or that it is no excuse for not being 100%, so most people turn a blind eye to these signals and ignore what the body is telling, which increases the intensity of the somatic and psychic symptoms associated with menstruation. For artists who do not always have the choice of adapting their career to their menstrual cycle, taking it into account in the management of training allows them to optimise the work done.

The taboo will not be broken, and performance maximized, on one condition: that the menstrual cycle is discussed freely and without shame. The question now is:

How do we bring this awareness to coaches and athletes?

Corrections: Noëlle Von Siebenthal

List of figures

Bibliography

- https://www.youtube.com/watch?v=3aVU1Tkb048&ab_channel=PERIOD (accessed 10 January 2022)
- https://swissolympic.ch/fr/athletes-entraineurs/femme-sport-delite/themes-principaux (accessed 17 January 2022)
- http://www.wts.fr/wp-content/uploads/2015/11/dangers-du-sport-chez-la-femme_pdf.pdf (accessed 17 January 2022)
- https://www.garmin.com/fr-FR/blog/les-quatre-phases-du-cycle-menstruel/ (accessed 20 January 2022)
- https://www.youtube.com/watch?v=qj0TVu-0qpo&ab_channel=BFMGrandLille (accessed 1 February 2022)
- https://swissolympic.ch/fr/athletes-entraineurs/femme-sport-delite/podcast?tabId=a1a2dd05-b591-4ab4-a709-8905d3be0961 (accessed 5 February 2022)
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7937612/ (accessed 10 February 2022)
- https://www.definitions.net/definition/ovarian%20follicle (accessed on 13th March 2022)
- https://pubmed.ncbi.nlm.nih.gov/32046446/ (accessed 17 February 2022)
- Oleka, C.T. (2019). *Use of the Menstrual Cycle to Enhance Female Sports Performance and Decrease Sports-Related Injury. Journal of Pediatric and Adolescent Gynecology* (accessed 24 February 2022)
- (Freeman E.W., *Psychoneuroendocrinology.* 2003;28:25–37) (accessed 24 February 2022)
- https://www.google.de/amp/s/www.slate.fr/story/165632/le-cycle-menstruel-influe-sur-le-cerveau-des-femmes%3famp (accessed 24 February 2022)
- http://www.cngof.fr/communiques-de-presse/103-le-cycle-menstruel (accessed 25 February 2022)
- https://www.valdemarne.fr/newsletters/sport-sante-et-preparation-physique/influence-du-cycle-menstruel-sur-la-pratique-des-activites-physiques-et-sportives (accessed 28 February 2022)
- Middleton, L.E., Wenger, H.A. Effects of menstrual phase on performance and recovery in intense intermittent activity. *Eur J Appl Physiol* **96,** 53–58 (2006). https://doi.org/10.1007/s00421-005-0073-9 (accessed 4 March 2022)
- https://www.perdieme.com/blogs/infos/faire-du-sport-pendant-les-regles-bonne-ou-mauvaise-idee (accessed 4 March 2022)
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7916245/ (accessed 4 March 2022)
- Carmichael MA, Thomson RL, Moran LJ, Wycherley TP. The Impact of Menstrual Cycle Phase on Athletes' Performance: A Narrative Review. Int J Environ Res Public Health. 2021 Feb 9;18(4):1667. doi: 10.3390/ijerph18041667. PMID: 33572406; PMCID: PMC7916245. – (accessed 7 March 2022)
- https://sante.journaldesfemmes.fr/fiches-anatomie-et-examens/2517763-serotonine-hormone-bonheur-role-taux/ (accessed 7 March 2022)
- https://www.revmed.ch/revue-medicale-suisse/2010/revue-medicale-suisse-258/syndrome-premenstruel-envie-de-sucre-et-serotonine#tab (accessed 10 March 2022)

- https://www.youtube.com/watch?v=wOgd5nHc2b8&list=PLtnook3HBWnMW7QkG0uArmHwEtdNcASwm&index=6&ab_channel=LauraPhilipp (accessed 10 March 2022)
- https://centre-ressource-rehabilitation.org/fiche-thematique-les-fonctions-cognitives (accessed 12 March 2022)
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6422548/ (accessed 12 March 2022)
- Ali, S. A., Begum, T., & Reza, F. (2018). Hormonal Influences on Cognitive Function. *The Malaysian journal of medical sciences : MJMS*, *25*(4), 31–41. https://doi.org/10.21315/mjms2018.25.4.3 (accessed 12 March 2022)
- Hashim, M. S., Obaideen, A. A., Jahrami, H. A., Radwan, H., Hamad, H. J., Owais, A. A., Alardah, L. G., Qiblawi, S., Al-Yateem, N., & Faris, M. (2019). Premenstrual Syndrome Is Associated with Dietary and Lifestyle Behaviors among University Students: A Cross-Sectional Study from Sharjah, UAE. *Nutrients*, *11*(8), 1939. https://doi.org/10.3390/nu11081939 (accessed 13 March 2022)
- Lanza di Scalea T, Pearlstein T. Premenstrual Dysphoric Disorder. Psychiatr Clin North Am. 2017 Jun;40(2):201-216. doi: 10.1016/j.psc.2017.01.002. Epub 2017 Mar 1. PMID: 28477648. (accessed 19 March 20.22)
- Bianchi-Demicheli, F. (2005). 'Le trouble dysphorique prémenstruel : diagnostic et stratégie thérapeutique', *Rev Med Suisse* 2005; volume -9. no. 052, 393 – 399 (accessed 19 March 2022)
- 'Le trouble dysphorique prémenstruel : diagnostic et stratégie thérapeutique', *Rev Med Suisse* 2005; volume -9. no. 052, 393 – 399 (accessed 20 March)
- Sibylle Matter, Patrik Noack, Joëlle Flück (2020). « Quelle est l'influence du cycle menstruel sur mon entrainement », Swiss Olympic 2020 (accessed on 23.02.2022)
- Nagy H, Khan MAB. Dysmenorrhea. 2021 Sep 1. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. PMID: 32809669. (accessed 24 March 2022)
- Graz, B., Savoy, M., Buclin, T., Bonvin, □. (2014). 'Dysménorrhée : patience, pilules ou bouillotte ?', *Rev Med Suisse* 2014; volume 0. no. 452, 2285 – 2288 (accessed 25 March 2022)
- https://www.mayoclinic.org/diseases-conditions/pelvic-organ-prolapse/symptoms-causes/syc-20360557 (accessed 25 March 2022)
- https://www.msdmanuals.com/fr/accueil/probl%C3%A8mes-de-sant%C3%A9-de-la-femme/troubles-menstruels-et-anomalies-du-saignement-vaginal/absence-de-r%C3%A8gles (accessed 29 March 2022)
- https://www.cnrtl.fr/definition/am%C3%A9norrh%C3%A9e (accessed 30 March 2022)
- For my definitions: https://www.cnrtl.fr/
- https://amelioretasante.com/quest-ce-que-le-peristaltisme/ (accessed 1 April 2022)
- S P Dalvit, The effect of the menstrual cycle on patterns of food intake, The American Journal of Clinical Nutrition, Volume 34, Issue 9, September 1981, Pages 1811–1815, https://doi.org/10.1093/ajcn/34.9.1811 (accessed 3 April 2022)
- https://countrymeters.info/fr (accessed 11 April 2022)

Eidesstattliche Erklärung

Hiermit erkläre ich, dass ich die vorliegende schriftliche Abschlussarbeit, selbstständig und ohne fremde Hilfe verfasst und keine anderen als die angegebenen Hilfsmittel verwendet habe. Die Stellen, die anderen Werken wörtlich oder sinngemäß entnommen wurden, sind unter An- gabe der Quelle als Entlehnung kenntlich gemacht. Ich versichere, dass die Arbeit noch nicht veröffentlicht oder in einem anderen Verfahren als Prüfungsleistung vorgelegt worden ist.

Sarah Repond

Unterschrift

Berlin, den