JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Naisliikkujan tai -urheilijan fysiologian tutkimus @JYU

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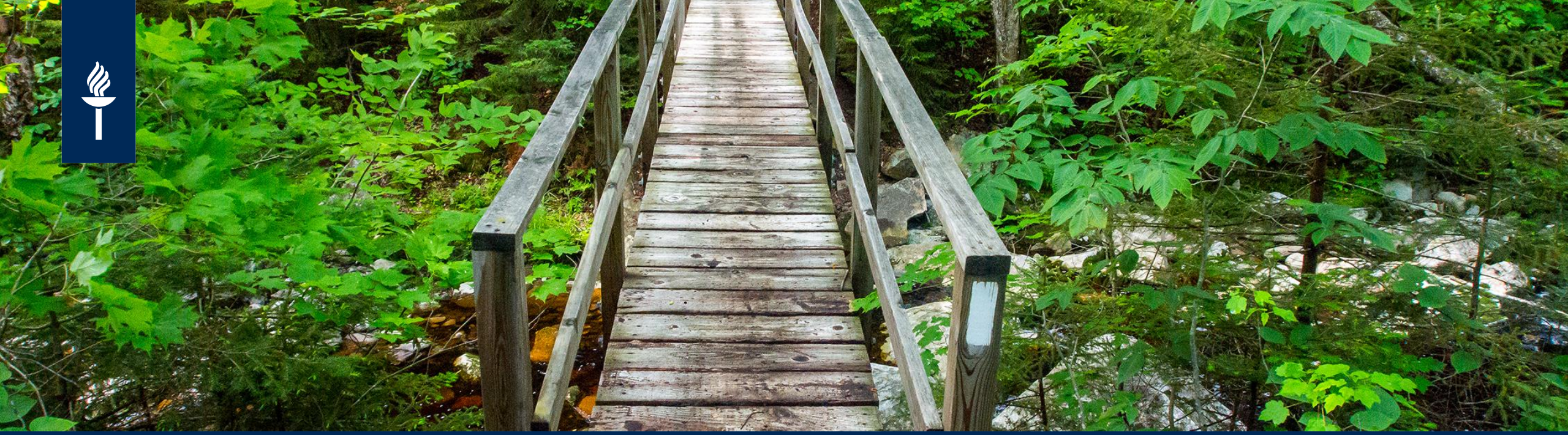
Sisältö

- Määritelmät
  - Millaista naisfysiologian tutkimusta tehdään?
- Sekundääritutkimus à la FIFA
- Mitä silmät ei nää…



primääri vs. sekundääri tutkimus

- muodostavat kaksi keskeistä lähestymistapaa tiedon hankkimiseen
- sekundäärityutkimus voi tarjota perustan ja suunnan
- primäärityutkimus tuottaa uutta, tarkkaa tietoa tutkimusongelman ratkaisemiseksi

Primääri vs sekundääri tutkimus

Primääritutkimus (primary research)

Keräät tiedot itse (ryhmäsi kanssa) suoraan lähteestä (alkuperäisaineisto)

Esimerkkejä:

- Kyselyt, haastattelut, fokusryhmät
- Koeasetelmat & havainnointi (testit)

Plussat:

- Tarkasti omiin tarpeisiin sopivaa tietoa
- Ajantasaista ja alkuperäistä
- Tutkija kontrolloi tiedonkeruuta

Miinukset:

- Aikaa vievää
- Usein kalliimpaa
- Vaatii suunnittelua ja osallistujia

Primary vs secondary research

Sekundääritutkimus (secondary research)

Käytetään jo olemassa olevaa aineistoa, jonka joku muu on kerännyt

Esimerkkejä:

- Kirjat ja/tai tieteelliset artikkelit
- Biopankki
- Viranomaisten raportit ja/tai tietokannat
- Uutiset ja/tai yritysten tiedot

Plussat:

- ”Nopeaa ja edullista”
- Paljon tietoa helposti saatavilla
- Hyvä taustatiedon hankintaan

Miinukset:

- Ei aina sovi tarkasti tutkimusaiheeseen
- Aineisto voi olla ”vanhentunutta”
- Laatu vaihtelee lähteestä riippuen

Primääri vs sekundääri
Naisliikkujan/-urheilijan tutkimus

Primääritutkimukset (primary research)

- VoKe
- MEndEx
- ReWo
- NaisQs
- NoREDs
- NeuroFem
- Korkeanpaikan…*
- Mensa
- UnPhased (rahoitus haettu)

Kuukautiskierron, hormonaalisen ehkäisyn, ja energiansaatavuuden vaikutukset harjoitteluvasteisiin ja adaptaatioihin

Primääri vs sekundääri
Naisliikkujan/-urheilijan tutkimus

Sekundäärit tutkimukset (secondary research)

1. **Perspectives on Concurrent Strength and Endurance Training *(Sports Med)***
2. **Beyond menstrual dysfunction *(Sports Med)***
3. **Period Periodized Training *(Strength and Conditioning)***
4. **Monitoring menstrual health *(FIFA, Sports Med)***
5. Menstrual health in servicewomen *(NATO, Sports Med Open)*
6. Female health and menstrual cycle research; do we need to broaden our approach? (IJSPP, submitoidaan 12/2025)
7. Hormonal contraceptives and LEA *(Työn alla)*

HC + LEA (originaali)
”Fitness tutkimusten” sekundäärianalyysi

Sekundaari tutkimus → FIFA ja kierron seuranta

Sports Medicine
https://doi.org/10.1007/s40279-025-02338-8

REVIEW ARTICLE

Monitoring Menstrual Health in Footballers: Considerations for Tracking Menstrual and Hormonal Contraceptive Cycles in the Field to Support Performance

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Accepted: 6 October 2025

Abstract
Monitoring menstrual health has gained popularity in sports like football as an opportunity to identify recurring symptoms or adverse symptoms related to the menstrual or hormonal contraceptive cycle; to recognize challenges related to low energy availability (LEA), low carbohydrate availability, overreaching/overtraining, and/or overall lifestyle stress due to their association with menstrual disturbance/dysfunction; to be informative in contextualizing athlete training status, e.g., training load and performance progression; and to promote and empower body/health literacy and overall health in female athletes. Monitoring menstrual health may also offer valuable insights to inform decisions regarding training and recovery. In team sports like football, where training loads and match schedules are relatively uniform across the squad, individualized strategies to effectively manage recurring adverse symptoms or menstrual disturbance/dysfunction may be necessary to ensure that all athletes can perform and recover optimally. The purpose of this article is to describe the rationale and suggested approaches for tracking menstrual and hormonal contraceptive cycles (including menstrual disturbance/dysfunction) in field settings to facilitate monitoring of menstrual health to potentially contextualize the other health and performance data. Herein, we assess the feasibility and potential limitations of different tracking methods from traditional paper and pencil records to more sophisticated digital applications and biochemical measures for use in real-world settings.

- **FIFA:n female health project**
- Sports Medicine special issue
- 212 lähdeviittausta
- ~2 vuoden prosessi
  - kirjoitusprosessi ~1 vuosi
  - arviointiprosessi ~1 vuosi
- 8 asiantuntijaa (ml. 2 lääkäriä)
  - Georgie ainoa, joka on päivittäin tekemisissä jalkapallon kanssa
- *Fysiologian asiantuntijuus voi leikata läpi lajien…*
- *Ei tarvitse olla jalkapallon asiantuntija auttaakseen jalkapalloilijoita!*

Player

Must give voluntary informed consent for menstrual health tracking and sharing of these medical data. May gain self/body literacy and empowerment allowing a proactive approach to managing menstrual health bleeding, symptoms, contraceptive choice, and overall health. Maintains right to withdraw consent at any time without repercussion for playing time/contracts/support.

Medical

Provides means for identification and diagnosis of menstrual dysfunction/disturbances. Physicians can share relevant information regarding menstrual health with the multidisciplinary team with the voluntary informed consent from the player and in line with ethical standards for medical data. Relevant information may include recommendations for modifications in training, recovery, or nutrition.

Multidisciplinary team

Where resources and trained professionals are available, can provide support around e.g. symptom management. May be privy to relevant information regarding menstrual health when voluntary informed consent from the player has been obtained. The multidisciplinary team must also adhere to ethical standards for medical data.

Performance and analysis team

Where resources and trained professionals are available, can provide a means to integrate menstrual health data with other data streams including symptoms, loading and recovery measures (resting heart rate and sleep), subjective wellness, training and performance data. Menstrual health data should never be used for e.g. team selection or contract negotiation.

Table 2. Tracking in athletes with different hormone profiles. Estradiol (E2), progesterone (P4), luteinizing hormone (LH), estrone conjugate (E1C), pregnanediol-3-glucuronide (PdG). "Essentials" can be used daily while "extras" should only be used with clear goals. Use of "extras" should, ideally, be preceded by adequate education of the MDT, physician, and athlete and should only be used when voluntary informed consent has been received from the athlete. * urine (saliva and blood) based tracking is not an established method in progestin-only hormonal contraceptive users although these methods could, in theory, be used in individuals who have maintained HPO-axis function during progestin-only hormonal contraceptive use. ** in individuals who have maintained HPO-axis function during progestin-only hormonal contraceptive use transvaginal ultrasound may be appropriate for assessment of ovulation.

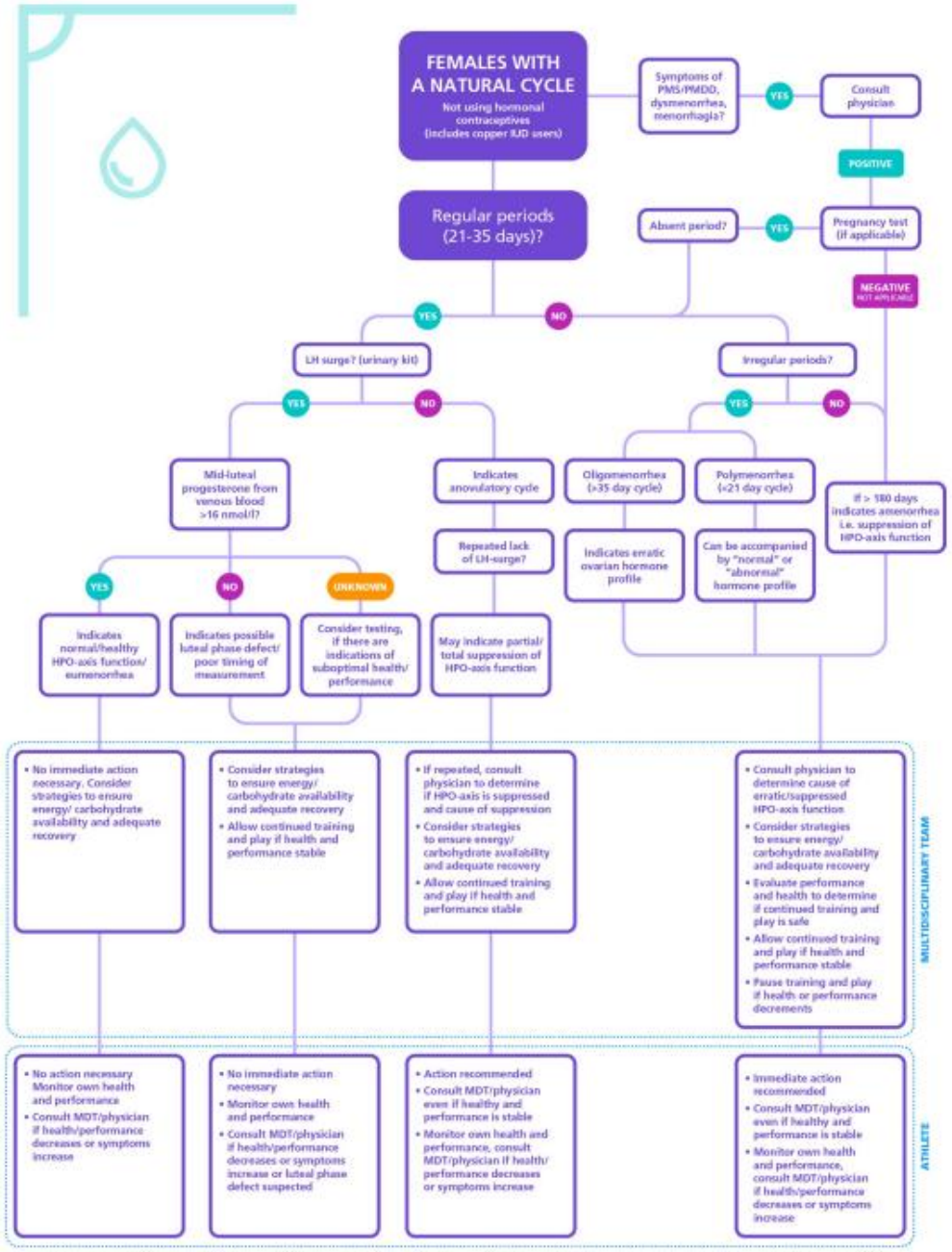
Tracking in athletes with different hormone profiles			
Eumenorrheic/naturally menstruating (and copper IUD users) *Cycle can be established by monitoring basic "essential" menstrual cycle characteristics as well as urine/salivary/blood-based measurements*	**Menstrual disturbance/dysfunction** *May be difficult to establish a cycle without uterine bleeding.* *Working to identify an LH-surge (E1C or PdG) is secondary to addressing root cause(s) of the dysfunction with a physician*	**Combined hormonal contraceptives** *Cycle is established by start of active phase (pill taking or insertion of vaginal ring) vs. placebo/breaks.* *Not possible to identify menstrual disturbance/dysfunction*	**Progestin-only hormonal contraceptives** *May be difficult to establish cycle in females without uterine bleeding but possible to try.* *Difficult to identify "menstrual" disturbance/dysfunction unless a baseline has been established while using progestin-only hormonal contraceptives*
Essentials for tracking • *Relatively simple tools that require only basic education for interpretation of results* • *Can be used/assessed regularly*			
Age of menarche			
Date of last menstrual period		Date of starting active phase and duration of use (21-24 "active" days vs. prolonged use)	Date of starting active pills, IUD, injection or patch use and duration of use
Menstrual cycle length/regularity of bleeding			
Days of bleeding/presence of abnormal bleeding		Days of bleeding/presence of abnormal bleeding	
Use of menstrual hygiene products and description of flow (e.g. light, moderate, heavy) to determine volume of blood loss		Use of menstrual hygiene products and description of flow (e.g. light, moderate, heavy) to determine volume of blood loss although flow should be mitigated with hormonal contraceptive use	
Pain associated with menses including associated symptoms (nausea, diarrhea, fatigue, etc.) and impact on daily life (school, work, activities, performance)		Pain associated with bleeding including associated symptoms (nausea, diarrhea, fatigue, etc.) and impact on daily life (school, work, activities, performance) although these should be mitigated with hormonal contraceptive use	
Symptoms associated with menstrual cycle in general and impact on daily life (school, work, activities, performance)	Symptoms associated with cycle in general and impact on daily life (school, work, activities, performance)	Symptoms and side-effects associated with hormonal contraceptive use and impact on daily life (school, work, activities, performance)	
Extras for tracking • *May provide valuable information, but requires advanced education and resources* • *Samples should be collected by the player themself (urine, saliva) or by a qualified professional (blood samples)* • *Should be used with discretion*			
LH-surge (with or without E1C)		-	LH-surge (with or without E1C)*
Luteal phase P4 or PdG		-	Luteal phase P4 or PdG*
(Phase-based) sex hormone measurements and/or other biomarkers			
Extras for research or if medically necessary • *May provide clinically valuable information, but must be collected by qualified medical personnel* • *Requires advanced education and resources* • *Should be used with medical discretion*			
Transvaginal ultrasound to determine ovulation		-	Transvaginal ultrasound to determine ovulation**

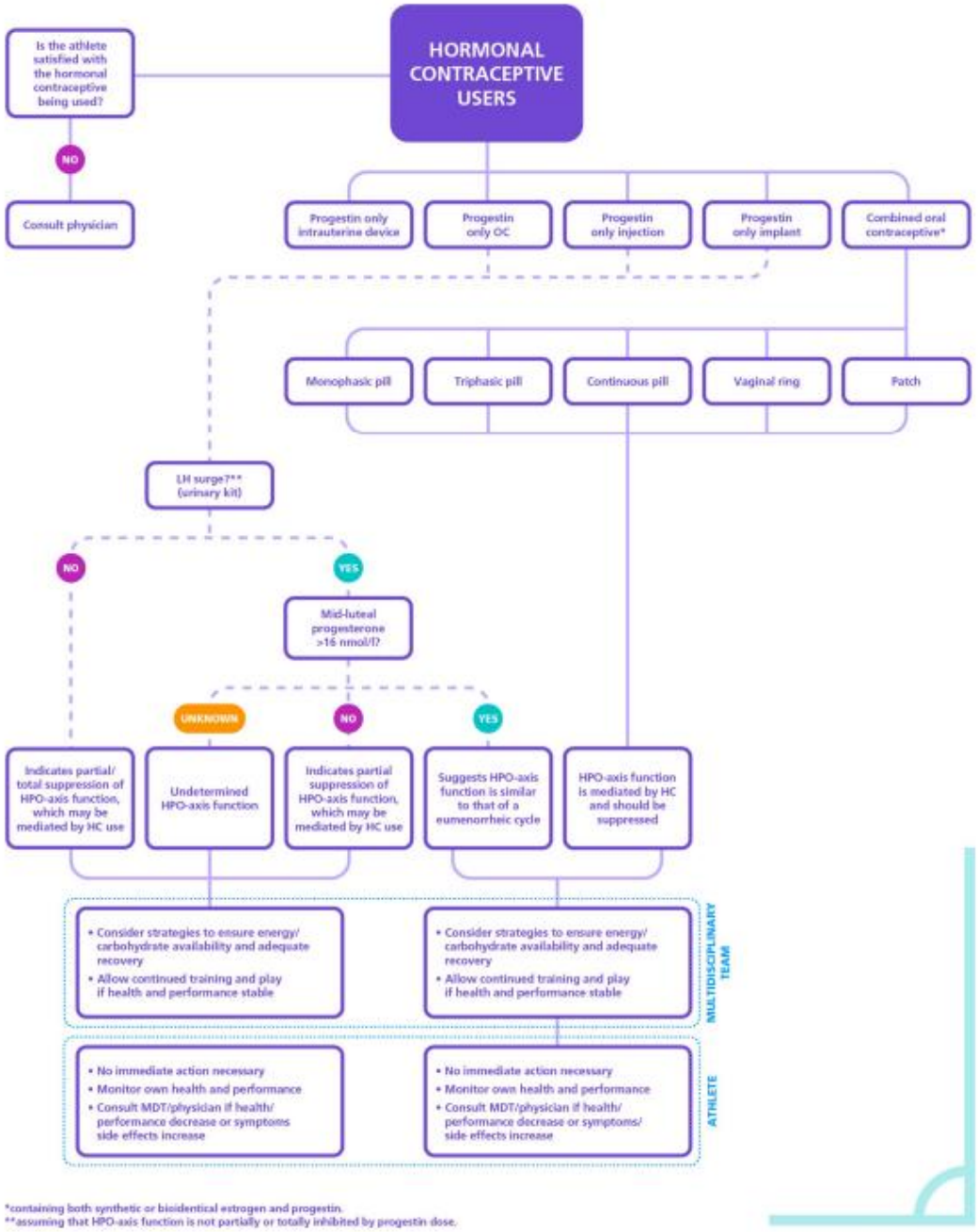
Table 3 Tools for tracking menstrual and/or hormonal contraceptive cycles

Tracking method	Benefits	Challenges	Sensitivity/reliability	Feasibility
Basic methods				
Pencil and paper: Retrospective tracking	Non-invasive and can gather comprehensive data on menstrual and hormonal contraceptive history, symptoms, and side effects	Relies on the athlete's recall and diligence in recording; may not capture all relevant physiological information. Self-reported data may be subject to bias and inaccuracies; not all available questionnaires are validated in athletes	Low reliability, as it relies on subjective reporting Reasonable reliability if teams are able to effectively use validated questionnaires Relatively low sensitivity unless athlete recall and body literacy is high	Highly feasible, as it can be implemented easily with minimal cost, but requires careful design to ensure data quality Need for validated questionnaires in different languages
Pencil and paper: Prospective tracking	Non-invasive, simple method to gather comprehensive data on menstrual and hormonal contraceptive characteristics, symptoms, and side effects	Relies on the athlete's diligence in recording; may not capture all relevant physiological changes. It requires the athlete to regularly transfer the data to an expert for "analysis"	Moderate reliability, as cycle characteristics, symptoms/side effects can provide valuable information regarding cycle characteristics Moderate sensitivity if tracking is consistent and body literacy is high	Highly feasible (easy to implement) and cost-effective Requires that athletes are committed to regular tracking and that athletes/teams are able to interpret the results
Basal body temperature (BBT)	*Manual:* Non-invasive; could indicate ovulation when a consistent increase BBT is observed, possibly allowing for identification of the luteal phase *Wearable:* Non-invasive; could indicate ovulation when a consistent increase in BBT is observed, possibly allowing for identification of the luteal phase	*Manual:* Requires daily measurements, typically taken at the same time each morning before any activity, which can be logistically challenging. Requires several cycles of tracking to establish a baseline *Wearable:* Requires consistent use, access to electricity for charging device; logistically easier than manual measurements. Requires several cycles of tracking to establish a baseline	Low reliability and sensitivity. Assuming a "eumenorrheic" cycle BBT can be used for tracking, but this method is *not effective for preventing pregnancy* as the increase in BBT happens after ovulation when concentrations of P4 increase. This method is *not reliable* for individuals with menstrual dysfunction or those using combined hormonal contraceptives but could be applied in progestin-only hormonal contraceptive users with maintained HPO-axis function	Feasible with proper education and adherence to consistent measurement practices but may be affected by factors like illness or disrupted sleep
Cervical mucus	Non-invasive; could indicate ovulation	Requires education to accurately interpret changes and may be influenced by factors like infections or sexual activity. This method is not effective in hormonal contraceptive users	With proper education, can be a reliable method to track fertility/ovulation [119, 120]. Cervical mucus reflects changes in E2 and pP4 levels; however, the interpretation of the changes is subjective	Feasible with proper education and adherence to consistent measurement practices but not recommended due to very low reliability and sensitivity
Digital or "smart" tools				
Online ovulation calculators	Non-invasive	Relies on the athlete's diligence in recording; may not be designed to capture all relevant information. May be subject to bias and inaccuracies present within the online calculator No published methods for identifying appropriate and accurate calculators for athlete needs	Low reliability and sensitivity, as calculators rely on averages to predict the timing of ovulation and menstruation	Feasible for athletes/teams with access to the internet
Smart phone applications	Non-invasive	Relies on the athlete's diligence in recording; may not be able to capture all relevant physiological changes. May be subject to bias and inaccuracies present within the application Data ownership is necessary to consider. Guidance included in applications may not be evidence-based or align with medical/research standards	Moderate reliability, as cycle characteristics and symptoms/side effects can provide valuable information regarding cycle characteristics. It should be noted that many applications will provide only a limited list of symptoms When combined with urinary hormone measures, algorithms based on the mid-cycle LH surge measured by over-the-counter urine tests appear to classify a higher proportion of anovulatory cycles when compared with algorithms that use serum P4 measurements from the luteal phase [121]	May be more accessible in better resourced countries Recommendations within the applications may not entirely be evidence-based [122]
Wearable devices (smart watches, rings)	Non-invasive Relies on indirect markers of menstrual cycle including heart rate variability and BBT [123, 124]	May not capture all relevant physiological changes; must be regularly used and are often connected to a specific smart phone application or applications Data ownership is necessary to consider. Guidance included in applications may not be evidence-based or align with medical/research standards	Variable reliability and sensitivity as interpretation of gathered data influenced by device-specific algorithms. Can identify fertile window, but research is limited, and errors in prediction have been reported [125]	Maybe more accessible in better resourced countries
Hormonal measurements (blood, urine, saliva)				
Ovulation kits (LH surge)	Can provide insights into the ovulatory phase via LH surge and help with understanding individual hormonal fluctuations	May require frequent testing of ~5–10 days per cycle (same time of day), which can be cumbersome and intrusive	Moderate reliability and sensitivity, although this may vary by kit used. Relies on the detection of LH surge, which may not perfectly correlate with actual ovulation and may be missed due to measurement timing	Feasible with the use of LH-surge kits, but cost and user compliance can be barriers
Ovulation kits (LH surge including E1C)	Can provide insights into the ovulatory phase via LH surge and estrogen concentrations and help with understanding individual hormonal fluctuations	May require daily testing of ~5–10 days per cycle (same time of day), which can be cumbersome and intrusive	Moderate reliability and sensitivity, although this may vary by kit used. Relies on the detection of increasing E1C and the LH surge, which may be missed due to measurement timing	Feasible with the use of LH and E1C combination tests, but cost and user compliance can be barriers
Serum blood, urine, or saliva samples for estrogen and P4	*Blood:* Invasive to obtain but has the potential to offer a more precise understanding of hormonal concentrations *Urine:* Minimally invasive but has the potential to offer a more precise understanding of hormonal concentrations *Saliva:* Minimally invasive but has the potential to offer a more precise understanding of hormonal concentrations	*Blood:* Requires (repeated) venipuncture and comes with a small risk for infection. Requires trained and qualified healthcare personnel for sample collection and analysis – may not be practical over a prolonged period of time. Samples require proper storage and transport before analysis *Urine:* Timing of measurements may be critical, and interpretation of results is specific to kits and reagents used. Interpretation requires education *Saliva:* Timing of measurements may be specific, and the interpretation of results is specific to kits and reagents used. Interpretation requires education	*Blood:* Relatively reliable/sensitive, but results must be contextualized, e.g., to menstrual cycle phase and consider possible hormonal contraceptives use. Testing is not necessarily warranted without clinical reasons *Urine:* Relatively reliable/sensitive, but results must be contextualized, e.g., to the menstrual cycle phase and consider possible hormonal contraceptives use. Thresholds for kits and their interpretation must be understood. Testing can commence without clinical reasons, but results should be interpreted with caution *Saliva:* Reliability and sensitivity affected by the rapid fluctuations in salivary concentrations of sex steroids [126] and collection method [127]	Less feasible for regular tracking due to the need for clinical intervention (blood), specific timing (blood, urine, saliva), and associated costs (blood, urine, saliva) Cost, user compliance, and time burden can be barriers (blood, urine, saliva)
Transvaginal ultrasound	Considered the gold standard for determining ovulation and can be used to assess endometrial thickness	Invasive [128]. May cause psychological distress in some populations and introduces potential for inadvertent boundary transgression [129]. Requires expensive equipment as well as trained and qualified healthcare personnel for data collection as well as a physician to interpret data and make diagnoses. Transvaginal ultrasound is not practical to use for "confirmation" of ovulations over a prolonged period of time. Necessitates appropriate cleaning and disinfection of the transducers between the procedures [130] and appropriate use of transducer cover materials [131]. Using ultrasound without medical indication can be considered ethically unjustifiable [132]	Considered the gold standard for determining ovulation and can be used to assess endometrial thickness. There are limitations in this gold standard related to the need for subjective interpretation of ovaries' ultrasonic morphology [128]	Not feasible for regular tracking due to the need for clinical intervention, specific timing, and associated costs (equipment and medical expertise) Individuals undergoing transvaginal ultrasound may prefer a chaperone be present if the technician is male [133]

Please note that this table is a simplified summary and the actual methods may have more nuanced benefits and challenges. It is important to consider individual differences among athletes when choosing a tracking method. In this table, reliability reflects the degree of error in the method and sensitivity reflects the ability of the tool to identify small but possibly meaningful changes, as assessed by the authors of the paper who are experts in the field. Please note that tracking methods are intended to characterize menstrual and hormonal contraceptive cycles, and these methods are not being endorsed or suggested for preventing pregnancy. Some of these tools can be used for diagnostic purposes, but diagnoses should only be made by a physician

E1C estrone conjugate, *E2* estradiol, *HPO* hypothalamic-pituitary-ovarian, *LH* luteinizing hormone, *P4* progesterone





*containing both synthetic or bioidentical estrogen and progestin.
**assuming that HPO-axis function is not partially or totally inhibited by progestin dose.

Artikkelin yhteenveto:

- Kiertoterveyden seuranta voi tarjota tärkeää tietoa urheilijoiden **yleisestä terveydestä, hyvinvoinnista sekä harjoittelu- ja palautumistarpeista**.
- Seurannan tulee olla **tarkoituksenmukaista** ja sidottua joukkueen ja pelaajien tavoitteisiin.
- Pelaajille ja valmennukselle tulee antaa **koulutusta ja perustelut**, ja suostumuksen tulee olla **vapaaehtoinen ja peruttavissa ilman seurauksia**.
- Seurantatyökalut ovat nykyään laajasti saatavilla, mutta niiden **hyödyt/haitat, rajoitukset, tietosuoja, eettiset ja kulttuuriset** näkökohdat on huomioitava.
- Joukkueilla tulisi olla **koulutettua henkilöstöä** analysoimaan tietoja eettisesti ja käytännöllisesti.
- Vaativat kierronseurantamenetelmät (esim. verinäytteet, kohdun/munasarjojen ultraäänitutkimus) tulee tehdä vain **pätevien ammattilaisten** toimesta tai pelaajan itse suorittamina (jos menetelmä sen sallii) – tarvitaanko näitä ilman lääketieteellistä syytä?

Mitä silmät ei nää…

- **Kierto ei kerro kaiken!**
  - **Muutoksia kuukautiskierrossa ovat** todennäköisesti hitaampia kuin esim. muutokset leposykkeessä, HRV:ssa, subjektiivisissa tuntemuksissa, jne
  - **Hormonaalinen ehkäisykierto kertoo vielä vähemmän** – eksogeeniset hormonit määrittelevät pitkälti sykliä – muut hormonit voivat olla taustalla ”sekaisin”
  - **”Kultainen standardi” ei ole aina paras ratkaisu / hyvä käytäntö**
  - **Harjoittelu, lepo, ravinto, psyykkinen/fyysinen terveys ja tuki ovat edelleen urheilun kulmakivet**

Kiitos!
Thank you!

Sports Technology Unit
Vuokatti, Finland

- @jyusport_vuokatti
- @Jyväskylän yliopisto liikuntateknologia Vuokatti

Liikuntateknologian maisterikoulutus on ensi kevään (2026) yhteishaussa!