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## Title:

## Menstrual Cycle, Hormonal Contraceptives and Pelvic Floor Dysfunction in Ladies Gaelic Football and Camogie: Prevalence of Use, Side-effects and Perceived Symptomology.

**Authors:**

David Nolan1, Poppy Jean Maguire1, Lee Bell2

**Affiliations:**

1School of Health and Human Performance, Dublin City University, Dublin, Ireland

2Academy of Sport and Physical Activity, Sheffield Hallam University, Sheffield, S10 2BP, UK

**Corresponding Author:**

David Nolan

School of Health and Human Performance, Dublin City University

Email: David.nolan@dcu.ie

**Keywords:**

Gaelic Games, female athlete, pelvic floor dysfunction

**Orcid ID’s:**

David Nolan <https://orcid.org/0000-0002-0743-8801>

Lee Bell <https://orcid.org/0000-0003-0583-3522>

**Word Count:** 3636

**References:** 35

*Please cite as: Nolan, D., Maguire, PJ., Bell., L. (2024). Menstrual Cycle, Hormonal Contraceptives and Pelvic Floor Dysfunction in Ladies Gaelic Football and Camogie: Prevalence of Use, Side-effects and Perceived Symptomology. SportRχiv.*

## Abstract:

This study investigated the prevalence of hormonal contraceptive (HC) use and perceived side-effects, menstrual cycle (MC) related symptoms and perceived influences on performance, and pelvic floor dysfunction (PFD) screening items among female athletes in ladies Gaelic football and camogie. An anonymous online survey was completed by 455 athletes currently competing in these sports in Ireland. Participants provided information on demographics, sport participation, MC characteristics, HC use, perceived symptomatology, and PFD screening items. In this cohort, 51.7% of respondents were current HC users, with the oral contraceptive pill being the most commonly report HC type (69.2%). Among HC users, 62.0% reported side effects with fatigue (37.2%) and mood changes (35.0%) the most prevalent. Of the non-HC users, 97.7% reported MC-related symptoms, with abdominal cramping (84.0%) and fatigue (82.2%) being the most prevalent. Pelvic floor dysfunction related symptoms were also common, with urinary urgency (47.8%), genital pain (44.3%) the most experienced. These findings demonstrate a high prevalence of HC use, MC-related symptoms, and PFD symptoms in this population. This study may provide a rationale for increased education and support for female athletes in Gaelic games regarding these health issues, as well as the development of individualized strategies for managing symptoms. Future research should focus on PFD in Gaelic Games athletes, incorporating objective measures and exploring interventions to mitigate these issues.

## Introduction

Gaelic Games, the national sports of Ireland, encompass Gaelic football, ladies' football, hurling, camogie (kuh·mow·gee), rounders, and handball. Ladies' football and camogie are female-only sports; both are invasion games played between two teams of fifteen players, with camogie distinguished by the use of sticks. These sports resemble other invasion games by combining offensive and defensive strategies and are characterised by high-intensity, intermittent match play (Malone *et al.*, 2023; Duggan *et al.*, 2024). Despite their amateur status, players compete at two distinct levels: club (non-elite) and intercounty (elite). Intercounty players are club athletes identified as high performers and selected to represent their county at the elite level. Although still amateur, these elite teams often commit to demanding weekly training schedules that include multiple pitch- and gym-based sessions in addition to regular match play (Duggan *et al.*, 2020).

The menstrual cycle (MC) is a complex biological process characterised by the cyclical fluctuation of ovarian hormones, primarily oestrogen and progesterone, in females of reproductive age, spanning from menarche to menopause. It has been hypothesised that hormonal fluctuations during specific phases of the MC, such as the luteal phase, may negatively impact athletic performance. However, current evidence does not substantiate this hypothesis (McNulty et al., 2020; Colenso-Semple et al., 2023). Despite empirical evidence suggesting that MC phase does not significantly influence objective performance measures, the lived experiences of female athletes present a contrasting narrative. A substantial proportion of female athletes report negative menstrual-related symptoms, such as abdominal cramping, fatigue, mood changes, and back pain (Martin *et al.*, 2018). Additionally, many athletes (50.0-84.6%) perceive these symptoms to adversely affect their athletic performance (Carmichael *et al.*, 2021). Athletes are more likely to perceive a negative impact on their performance during the early follicular and late luteal phases, which coincides with higher reports of symptoms (Brown, Knight and Forrest Née Whyte, 2021; Carmichael *et al.*, 2021). This perceived symptomology and its impact on performance are marked by significant individual variability. To comprehensively understand the potential influences of MC phase on athletic performance, it is essential to adopt a biopsychosocial perspective, considering both physiological parameters and the lived experiences of athletes.

Hormonal contraceptives (HCs) involve the administration of exogenous hormones that disrupt the endocrine regulation of the female reproductive system, primarily by downregulating the secretion of endogenous gonadal hormones (Elliott-Sale *et al.*, 2020). Hormonal contraceptives are widely utilised by a sizeable percentage of individuals in both the general population (~28-43%) (United Nations, 2019; Cea-Soriano *et al.*, 2014) and athletic populations (~40-51%) (Martin *et al.*, 2018; Nolan, Elliott-Sale and Egan, 2023). These contraceptives are categorised based on their constituent hormones: combined HCs contain both oestrogenic and progestin components, while others consist solely of a progestin component. The delivery methods for HCs include injections, transdermal patches, intrauterine devices, arm implants, and vaginal rings, with the oral contraceptive pill (OCP) being the most prevalent method among young women.

Combined OCPs, the most common form, can be classified as monophasic (consistent dosage), biphasic (two dosage levels), or triphasic (three dosage levels), based on the variation in the dosage of exogenous hormones throughout the OCP cycle. Additionally, OCPs are often categorised by "generation," which refers to the specific form of progestin used. Ethinyl oestradiol, the most commonly used oestrogenic component in OCPs, differs chemically and molecularly from 17 beta oestradiol, a bioidentical hormone. This distinction may be relevant when hypothesising the potential influences that HCs may have on athletic performance and adaptive responses to exercise training. Current evidence suggests that oral contraceptive pills do not significantly influence adaptations related to hypertrophy, power, or strength (Nolan et al., 2024). However, further research is necessary to fully elucidate the potential influences of HCs on longer term (>16 weeks) chronic adaptations to exercise training.

The pelvic floor consists of muscles and connective tissue which support the bladder, bower and uterus (Donnelly and Moore, 2023). Symptoms of pelvic floor dysfunction (PFD) are highly prevalent in female athletes (including nulliparous women), with athletes reporting experiences of urinary incontinence i.e. “leaking” (19-88%), anal incontinence (12-17%), pain during sex (63.5%), vaginal bulge (42%) and chronic pelvic pain (9%) (Culleton-Quinn *et al.*, 2022; Rodríguez-Longobardo *et al.*, 2023; Bosch-Donate *et al.*, 2024; McCarthy-Ryan *et al.*, 2024). Post-partum athletes (Donnelly and Moore, 2023) and those competing in high-impact sports display higher prevalences of PFD (Nygaard and Shaw, 2016).

Pelvic floor dysfunction has a meaningful impact on athletes, leading to emotional and social stress, modification of training, limited fluid intake, use of pads/tampons, and even premature retirement (Culleton-Quinn *et al.*, 2022; Johnston *et al.*, 2023; Bosch-Donate *et al.*, 2024). Symptoms of PFD may be alleviated through interventions such as pelvic floor muscle training (Rodríguez-Longobardo *et al.*, 2023). Despite its high prevalence and substantial impact, both athlete and coach knowledge relating to PFD is generally poor (Bosch-Donate *et al.*, 2024). As an illustrative example, a significant proportion of young female strength athletes reported being unaware of pelvic floor muscles (20.6%) or pelvic floor muscle training (42.8%) (Skaug *et al.*, 2022).

This study aimed to investigate the prevalence of HC use, HC- and MC-related side effects and perceived performance effects, and the prevalence of PFD symptoms in ladies Gaelic football and camogie athletes currently competing on the island of Ireland. Ladies Gaelic games are understudied in the context of empirical research, and this study aims to provide important descriptive data to inform future research directions and policies.

## Methods

### Experimental Approach

Ethical approval was granted by the Dublin City University School of Health and Human Performance local research ethics committee (reference 2023\_SHHP\_SSH\_001). No validated questionnaires for MC- and HC-related investigations in athletes exist, thus the survey in this study was adapted from previously used questionnaires in this research domain (Martin *et al.*, 2018; Heyward *et al.*, 2024). Screening items relating to pelvic floor dysfunction were sourced from the PDF-sentinel, a screening-tool developed through international Delphi consensus (Giagio *et al.*, 2023). The final questionnaire (available at [osf.io](https://osf.io/se6aj/?view_only=96bfa75b911044a7b0e935f87cd55aca)%20)) included questions which examined self-reported demographics, sport participation, MC characteristics, HC use, MC/HC-related perceived symptomology and influence on athletic performance, and pelvic floor dysfunction screening items. Questions consisted of single-, and multiple- choice items, and open-ended questions. The online survey was administered via Google Forms, with data collection lasting for a period of one month from February 14th, 2024.

### Participants

Self-identifying adult ladies Gaelic football and camogie athletes (N = 455) volunteered to complete an anonymous online survey circulated through professional networks and social media platforms. The inclusion criteria were; ≥18 years, currently competing in either ladies Gaelic football or camogie. Exclusions criteria were; ≤18 years, have never experienced a menstrual cycle. Two participants were excluded as they were not currently competing in either ladies Gaelic football or camogie. Two further participants reported having no experience of a menstrual cycle and were therefore excluded from the majority of the analysis. Therefore, the sample entered for analysis regarding MC/HC characteristics and PFD was n=451. Using a sample size calculator (Raosoft.com) with a 5% error margin, 95% confidence interval, population size of 30,000 (based on rough estimation of 1000 clubs, each with ~30 senior players), and 50% response distribution, the recommended sample size was 380, which was exceeded in this study.

### Data Analysis

Data were retrieved from Google Forms (Google LLC, 2024) and visually inspected in Microsoft Excel (Microsoft Corporation, 2019). Statistical analysis were performed in R (V4.3.1; R Core Team 2023) using the tidy verse package (Wickham et al., 2019). Descriptive statistics (i.e., mean, *SD*, and frequency analysis) were used to display subject characteristics and responses to survey questions providing ordinal data. Athletes were categorised by their sport (Gaelic football, camogie, or both) and level (club or intercounty) for data representation purposes.

This study was grounded in a descriptive research paradigm (Thomlison, 2001) and therefore the decision was taken not to conduct inferential statistics. The primary objective of this research is an exploratory analysis to document and describe the patterns and frequencies of specific health-related characteristics within a defined population. This descriptive research paradigm emphasises the observation and description of phenomena, including the collection of empirical data to establish facts about the prevalence and symptomatology associated with hormonal contraceptive use, menstrual cycle effects and pelvic floor dysfunction. This aligns with the principle of empiricism that prioritises observable, empirical evidence as the foundation of knowledge. It was agreed by the authors that descriptive statistics as presented provide a comprehensive overview of the data without the need for inferential techniques. This focus ensures that the results accurately reflect the real-world conditions of the study population without introducing potential biases or assumptions inherent in inferential methods (Sand, 2022).

 The aim is to present a clear and precise picture of the current state, detailing observable phenomena. The authors felt there were no reasonable a-priori hypotheses warranting inferential statistics i.e., no plausible mechanism for differences between sports or competitive level, but have provided the full raw dataset to facilitate this should another research group see fit to do so (available at [osf.io](https://osf.io/se6aj/?view_only=96bfa75b911044a7b0e935f87cd55aca)%20)).

## Results

### Subject characteristics

Subject characteristics are detailed in Table 1. Subjects were predominantly (99.7%) Caucasian (white Irish/other white background). Camogie-only was the most prominent code played by respondents (50.6%) followed by Gaelic football (26.5%) and dual-player i.e., plays both codes (22.9%). A total of 51.7% of respondents were currently using HC with the oral contraceptive pill being the most common form used (69.2% of HC users), followed by the implant (13.7%), intrauterine device (13.7%), transdermal patch (2.1%), and the injection (1.3%). 7% of respondents used non-hormonal intrauterine devices. The whole-group mean menstrual cycle duration was 28.6 ±6.3 days, with a mean menstruation duration of 5.0 ±1.1 days.

**Table 1. Respondent characteristics and menstrual status overview**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Whole Group** | **Gaelic Football** | **Dual Player** | **Camogie** |
| **Current highest playing level** | **Overall** | **Club Level** | **Inter-County** | **Club Level** | **Inter-County** | **Club Level** | **Inter-County** |
| **N** | 453 | 101 | 19 | 71 | 33 | 159 | 70 |
| **Age** | 23.6 | 24.6 | 23.2 | 22.9 | 21.2 | 24.2 | 22.8 |
| **Age SD** | 5.4 | 5.4 | 4.1 | 4.8 | 3.6 | 6.3 | 4.5 |
| **Stature (m)** | 1.65 ±0.13 | 1.67 ±0.15 | 1.66 ±0.11 | 1.65 ±0.16 | 1.64 ±0.13 | 1.69 ±0.08 | 1.65 ±0.13 |
| **Body Mass (kg)** | 68.17 ±11.20 | 67.12 ±8.35 | 70.45 ±18.81 | 68.00 ±13.11 | 68.90 ±15.71 | 64.74 ±10.15 | 68.89 ±15.33 |
| **Menstrual Cycle Duration (Days)** | 28.6 ±6.3 | 28.6 ±4.9 | 28.6 ±1.8 | 28.5 ±7.4 | 27.5 ±8.2 | 28.0 ±6.4 | 31.1 ±5.4 |
| **Menstruation Length (Days)** | 5.0 ±1.1 | 4.8 ±1.0 | 4.1 ±1.0 | 5.1 ±1.3 | 4.8 ±0.9 | 5.2 ±1.1 | 5.0 ±0.9 |
| **Prevalence of HC Use (n (%))** | 234.0 (51.7) | 53.0 (52.5) | 9.0(47.4) | 38.0 (53.5) | 12.0 (36.4) | 79.0 (49.7) | 43.0 (61.4) |
| **Prevalence of Non-Hormonal IUD (n)** | 7.0 | 1.0 | 0.0 | 0.0 | 1.0 | 4.0 | 1.0 |

### HC-Use

A total of 62.0% of HC-users reported side effects (Table 2) with the most common being tiredness (37.2%), mood changes (35.0%) and bloating (29.1%). A total of 31.6% of HC-users perceived their use to have an influence on athletic performance, yet the majority (45.7%) of HC-users perceived their HC use to have no influence. Full details of symptomology and perceived influences are displayed in Table 2.

**Table 2. Perceived effects of contraceptives in HC users (n=234).**

|  |  |  |
| --- | --- | --- |
| ***Do you perceive your use of hormonal contraceptives to have an influence on your athletic performance?*** | **Frequency** | **%** |
| Yes | 74 | 31.6 |
| No | 160 | 68.4 |
| ***How would you describe your perceived influence of your menstrual cycle on your athletic performance?*** |  |  |
| My hormonal contraceptive use does not impact my athletic performance | 107 | 45.7 |
| My hormonal contraceptive use both positively and negatively impacts my athletic performance | 75 | 32.1 |
| My hormonal contraceptive use negatively impacts my athletic performance | 32 | 13.7 |
| My hormonal contraceptive use positively impacts my athletic performance | 20 | 8.5 |
| ***Do you get side effects (or symptoms) because of using your contraceptive?*** |  |  |
| Yes | 145 | 62.0 |
| No | 89 | 38.0 |
| **Perceived Side Effects** |  |  |
| Tiredness/Fatigue/Lethargy | 87 | 37.2 |
| Mood Changes | 82 | 35.0 |
| Bloating | 68 | 29.1 |
| Abdominal Cramping | 57 | 24.4 |
| Irritability | 54 | 23.1 |
| Headache/Migraine | 42 | 17.9 |
| Increased Appetite | 41 | 17.5 |
| Poor Skin/Skin Outbreaks | 34 | 14.5 |
| Sore Breasts | 32 | 13.7 |
| Back Pain | 23 | 9.8 |
| Diarrhoea/Digestive Issues | 22 | 9.4 |
| Dizziness/Light-headed | 21 | 9.0 |
| Flustered/Inability to Concentrate or Focus | 20 | 8.5 |
| Sleep Disturbances | 19 | 8.1 |
| Muscle Ache | 18 | 7.7 |
| Hot Flushes/Increased Sweating | 17 | 7.3 |
| Nausea/Sickness/Vomiting | 17 | 7.3 |
| Irregular Bleeding/ Spotting | 11 | 4.7 |
| Constipation | 7 | 3.0 |
| Leg Discomfort | 7 | 3.0 |
| Decreased Appetite | 4 | 1.7 |
| Lack of Coordination | 3 | 1.3 |
| Weight Gain | 3 | 1.3 |
| Reduced Sex Drive | 2 | 0.8 |
| Increased Anxiety | 1 | 0.4 |
| Increased Discharge | 1 | 0.4 |
| Ovulation Pain | 1 | 0.4 |
| Vaginal Dryness | 1 | 0.4 |

### Menstrual Cycle (non-HC users)

Ninety-seven-point seven percent of respondents reported symptoms related to the MC, with the most common being abdominal cramping (84.0%), tiredness (82.2%), bloating (71.2%) and irritability (71.2%). 85.7% of respondents perceived their MC to have an influence on their athletic performance, with the majority (59.0%) reporting a negative influence. Symptom severity was reported to be highest during the luteal (51.2%) and bleeding (44.7%) phases. Menorrhagia (12.4%) and oligomenorrhea (11.1%) were the most prevalent self-reported menstrual dysfunctions. Full details of symptomology and perceived influences are displayed in Table 3.

**Table 3. Perceived effects of the menstrual cycle in naturally menstruating females (n=217)**

|  |  |  |
| --- | --- | --- |
| **Do you perceive your menstrual cycle to have an influence on your sporting/athletic performance?** | Frequency | Percentage |
| Yes | 186 | 85.7 |
| No | 31 | 14.3 |
| **How would you describe your perceived influence of your menstrual cycle on your athletic performance?** |  |  |
| My menstrual cycle negatively impacts my athletic performance | 128 | 59.0 |
| My menstrual cycle both positively and negatively impacts my athletic performance | 62 | 28.6 |
| My menstrual cycle does not impact my athletic performance | 24 | 11.1 |
| My menstrual cycle positively impacts my athletic performance | 3 | 1.4 |
| **Do you get side effects (or symptoms) during your menstrual cycle?**  |  |  |
| Yes | 212 | 97.7 |
| No | 5 | 2.3 |
| **If you experience symptoms related to your menstrual cycle, at which point of your menstrual cycle are these symptoms most prevalent?** |  |  |
| In the phase preceding the onset of my bleeding phase/period (i.e. the luteal phase) | 111 | 51.2 |
| During my bleeding phase (period) | 97 | 44.7 |
| In the ~10 day phase following the cessation of my bleeding phase (i.e. the follicular phase) | 7 | 3.2 |
| Does not experience symptoms  | 2 | 0.9 |
| **Perceived Symptoms** |   |   |
| Abdominal Cramping | 184 | 84.0 |
| Tiredness/Fatigue/Lethargy | 180 | 82.2 |
| Bloating | 156 | 71.2 |
| Mood Changes | 156 | 71.2 |
| Irritability | 135 | 61.6 |
| Poor Skin/Skin Outbreaks | 122 | 55.7 |
| Back Pain | 116 | 53.0 |
| Increased Appetite | 106 | 48.4 |
| Sore Breasts | 99 | 45.2 |
| Diarrhoea/Digestive Issues | 92 | 42.0 |
| Headache/Migraine | 88 | 40.2 |
| Muscle Ache | 57 | 26.0 |
| Hot Flushes/Increased Sweating | 52 | 23.7 |
| Sleep Disturbances | 50 | 22.8 |
| Nausea/Sickness/Vomiting | 47 | 21.5 |
| Dizziness/Light-headed | 45 | 20.5 |
| Flustered/Inability to Concentrate or Focus | 38 | 17.4 |
| Constipation | 33 | 15.1 |
| Leg Discomfort | 32 | 14.6 |
| Decreased Appetite | 26 | 11.9 |
| Lack of Coordination | 16 | 7.3 |
| Proctalgia | 2 | 0.9 |
| **Self-Reported Menstrual Dysfunction**  |  |  |
| Menorrhagia | 27 | 12.4 |
| Oligomenorrhea | 24 | 11.1 |
| Amenorrhea | 7 | 3.2 |
| Menometrorrhagia | 6 | 2.8 |
| Metrorrhagia | 6 | 2.8 |
| Menometrorrhagia | 5 | 2.3 |
| Polymenorrhagia | 3 | 1.4 |
| Endometriosis | 3 | 1.4 |
| Polycystic ovary syndrome (PCOS) | 1 | 0.5 |
| Adenomyosis | 1 | 0.5 |

### Pelvic Floor Dysfunction

Symptoms of pelvic floor dysfunction were present in this cohort (figure 1), with subjects reporting experience of urinary urgency (47.8%), genital pain (44.3%), urinary leakage (36.8%), anal incontinence (17.5%), and vaginal bulge (11.3%).



Figure 1. Prevalence of Self-Reported Pelvic Floor Dysfunction Screening Items

## Discussion

This is the first study to investigate the prevalence of hormonal contraceptive use, perceived MC- and HC-related symptomatology and PFD symptoms in Gaelic Games. Over half of respondents reported current use of HC with a high proportion (62.0%) reporting perceived HC-related side-effects. Almost all non-HC users (99.7%) reported perceived menstrual related symptoms. These findings are broadly in line with previous findings from other sports and geographical locations (Martin *et al.*, 2018; Kiemle-Gabbay *et al.*, 2024). The prevalence of several PFD-related symptoms were reported by a considerable proportion of respondents.

Perceived menstrual-related symptoms reported by non-HC users are similar to previous findings (Martin *et al.*, 2018; Nolan, Elliott-Sale and Egan, 2023) with the abdominal cramping (84%), fatigue (82.2%), bloating (71.2%) and mood changes (71.2%) being the most commonly reported. Symptoms were reported as most prevalent during the luteal (51.2%) and bleeding phases (44.7%). While there is no strong evidence to suggest that the MC has a significant effect on athletic performance (Colenso-Semple *et al.*, 2023), a high proportion of respondents in the present study 85.7% perceived their MC to influence their athletic performance, with the majority (87.6%) perceiving negative impacts on their performance. It should be noted that much of the existing research investigating the influence of the MC on athletic performance is arguably of low quality, often characterised by small sample sizes and significant methodological issues, such as inadequate controls and the absence of blood sample verification for hormonal status (McNulty *et al.*, 2020). These limitations impede the ability to draw definitive conclusions at present. The MC is commonly framed in a negative perspective in respect to athletic performance, yet a considerable proportion of respondents (~30%) reported perceived positive impacts of the MC on their performance. This paradox between the objective empirical data and the subjective perceptions of athletes presents a challenge for applied practitioners. Whilst practitioners should be aware of the lived experiences of female athletes relating to MC symptomatology and perceived influence on performance, they must also be cognisant that meaningful inter- and intra-individual variability exists (Brown, Knight and Forrest Née Whyte, 2021; Kiemle-Gabbay *et al.*, 2024). Therefore, a personalised approach is most appropriate when developing MC-related coping strategies(Lebrun, Joyce and Constantini, 2020)**.**

 The prevalence of HC-use in this study of Gaelic Games athletes (51.7%) are similar to previous findings in various sports (49.5%) (Martin *et al.*, 2018). The majority of HC-users (62.0%) reported perceived side-effects of HC use, with fatigue (37.2%) and mood changes (35.0%) the most commonly reported side-effects. Consistent with the findings related to the MC in this study, the experiences of hormonal contraceptive users also present a paradox. Approximately one-third (31.6%) of respondents perceive that their use of hormonal contraceptives influences their athletic performance. This presents an interesting finding in the context of the current body of evidence that HC-use has minimal effects on athletic performance (Elliott-Sale *et al.*, 2020). Again, the majority of literature to date investigating this relationship is of low to moderate quality and further research is required to full elucidate the influence of HC-use on performance. Considering the widespread use of HC in athletic populations and potential associated negative side effects, it may be prudent for medical staff to monitor their athletes' use of these contraceptives. It is advisable for practitioners to remain aware of emerging evidence and best practice guidelines related to hormonal contraceptive use in sports. It's also important to recognise that the motivation behind hormonal contraceptive use is personal and often multifaceted, which must be considered if discussing this topic with athletes.

 Conceivably, the most novel and impactful findings from an applied perspective of the present study relate the experience of PFD symptoms reported by the respondents. Pelvic floor dysfunction is often highlighted as an issue for post-partum athletes, yet a considerable proportion of respondents in this study reported experiences of PFD symptoms, with urinary urgency (47.8%), genital pain (43.4%) and urinary incontinence (36.8%) the most commonly experienced symptoms. This study did not gather data on whether respondents had previous childbirth experience. However, considering the mean age of respondents (23.6 years) and the average age of first-time mothers in Ireland (31.5 years)(Irish Central Statistics Office, 2023), it can be reasonably inferred that most respondents have likely not yet given birth. Urinary incontinence has been documented as a prevalent issue across various female sports and athletic populations (Mahoney, Heidel and Olewinski, 2023). Despite its commonality, urinary incontinence remains a potentially taboo subject within sport, often leading to embarrassment among athletes who may not be aware of its prevalence (Teixeira *et al.*, 2018; Mahoney, Heidel and Olewinski, 2023). This lack of awareness may exacerbate potential stigma, causing athletes to silently withdraw from sport or physical activity altogether (Bonaldi *et al.*, 2023). Although direct evidence linking urinary incontinence to the higher dropout rates of females in sports is lacking, it is plausible that this condition contributes to the phenomenon given that approximately half of athletes who experienced PFD symptoms report cessation of exercise due to symptoms (Dakic *et al.*, 2023). Therefore, it is imperative for coaches and practitioners to recognise the impact of this issue, as early identification and support may prevent athletes from disengaging. Athletes experiencing symptoms of PFD should be encouraged to seek consultation with medical professionals who can provide a comprehensive assessment and recommend appropriate interventions to alleviate these symptoms. Interventions which improve pelvic floor muscle strength are effective in reducing urine leakage (SMD = -1.13) in female athletes (Rodríguez-Longobardo *et al.*, 2023). Practitioners should create an environment in which athletes are aware of symptoms of PFD and are comfortable discussing any issues with appropriate medical support staff.

This study has some limitations that should be acknowledged. First, the study relied on self-reported data collected via online questionnaires which may lead to some bias and inaccuracies in responses. The study did not collect information on participants' childbirth history, which could have provided valuable context for interpreting PFD symptoms.

This study highlights the prevalence of hormonal contraceptive use, menstrual cycle-related symptoms, and pelvic floor dysfunction among female athletes in Gaelic Games. The findings suggest a need for increased education and support for female athletes regarding these health issues, as well as the development of individualized strategies for managing symptoms. Future research should focus further on PFD in Gaelic Games athletes, employing longitudinal studies that incorporate objective measures and clinical assessment. Investigating the potential role of pelvic floor dysfunction in female athlete dropout rates and exploring interventions to mitigate these issues would also be valuable areas for future research. Overall, a multidisciplinary approach that integrates physiological, psychological, and sociocultural factors will be essential for advancing our understanding of these complex issues and improving support for female athletes in Gaelic Games.

## Disclosure Statement

The authors declare no conflicts of interest.

## Funding Statement

The authors declare no sources of funding for this study.

## Data and Code Availability Statement

The full dataset and code used in this study, allowing for replication and secondary analysis are available via Open Science Framework ([osf.io](https://osf.io/se6aj/?view_only=96bfa75b911044a7b0e935f87cd55aca)%20)).

## References

1. Bonaldi, L. *et al.* (2023) ‘Urinary Incontinence and Other Pelvic Floor Dysfunctions as Underestimated Problems in People under Forty Years: What Is Their Relationship with Sport?’, *Life*, 14(1), p. 67. Available at: https://doi.org/10.3390/life14010067.
2. Bosch-Donate, E. *et al.* (2024) ‘Symptomatology and knowledge regarding pelvic floor dysfunctions and influence of gender stereotypes in female athletes’, *Scientific Reports*, 14, p. 11052. Available at: https://doi.org/10.1038/s41598-024-61464-x.
3. Brown, N., Knight, C.J. and Forrest Née Whyte, L.J. (2021) ‘Elite female athletes’ experiences and perceptions of the menstrual cycle on training and sport performance’, *Scandinavian Journal of Medicine & Science in Sports*, 31(1), pp. 52–69. Available at: https://doi.org/10.1111/sms.13818.
4. Carmichael, M.A. *et al.* (2021) ‘The Impact of Menstrual Cycle Phase on Athletes’ Performance: A Narrative Review’, *International Journal of Environmental Research and Public Health*, 18(4), p. 1667. Available at: https://doi.org/10.3390/ijerph18041667.
5. Cea-Soriano, L. *et al.* (2014) ‘Use of prescription contraceptive methods in the UK general population: a primary care study’, *BJOG: An International Journal of Obstetrics & Gynaecology*, 121(1), pp. 53–61. Available at: https://doi.org/10.1111/1471-0528.12465.
6. Colenso-Semple, L.M. *et al.* (2023) ‘Current evidence shows no influence of women’s menstrual cycle phase on acute strength performance or adaptations to resistance exercise training’, *Frontiers in Sports and Active Living*, 5. Available at: https://doi.org/10.3389/fspor.2023.1054542.
7. Culleton-Quinn, E. *et al.* (2022) ‘Elite female athletes’ experiences of symptoms of pelvic floor dysfunction: A systematic review’, *International Urogynecology Journal*, 33(10), pp. 2681–2711. Available at: https://doi.org/10.1007/s00192-022-05302-6.
8. Dakic, J.G. *et al.* (2023) ‘Experience of Playing Sport or Exercising for Women with Pelvic Floor Symptoms: A Qualitative Study’, *Sports Medicine - Open*, 9, p. 25. Available at: https://doi.org/10.1186/s40798-023-00565-9.
9. Donnelly, G.M. and Moore, I.S. (2023) ‘Sports Medicine and the Pelvic Floor’, *Current Sports Medicine Reports*, 22(3), p. 82. Available at: https://doi.org/10.1249/JSR.0000000000001045.
10. Duggan, J.D. *et al.* (2020) ‘Strength and Conditioning Recommendations for Female GAA Athletes: The Camogie Player’, *Strength & Conditioning Journal*, 42(4), p. 105. Available at: https://doi.org/10.1519/SSC.0000000000000577.
11. Duggan, J.D. *et al.* (2024) ‘The Physical and Physiological Demands of Intercounty Camogie During Competitive Match-Play’, *Journal of Strength and Conditioning Research*, 38(9), pp. e510–e520. Available at: https://doi.org/10.1519/JSC.0000000000004841.
12. Elliott-Sale, K.J. *et al.* (2020) ‘The Effects of Oral Contraceptives on Exercise Performance in Women: A Systematic Review and Meta-analysis’, *Sports Medicine*, 50(10), pp. 1785–1812. Available at: https://doi.org/10.1007/s40279-020-01317-5.
13. Giagio, S. *et al.* (2023) ‘PFD-SENTINEL: Development of a screening tool for pelvic floor dysfunction in female athletes through an international Delphi consensus’, *British Journal of Sports Medicine*, 57(14), pp. 899–905. Available at: https://doi.org/10.1136/bjsports-2022-105985.
14. Google LLC (2023) Google Forms [Online tool]. Available at: https://www.google.com/forms/about/ (Accessed: 2 October 2024).
15. Heyward, O. *et al.* (2024) ‘Oral contraceptive use in Premiership and Championship women’s rugby union: perceived symptomology, management strategies, and performance and wellness effects’, *Science and Medicine in Football*, 8(2), pp. 95–102. Available at: https://doi.org/10.1080/24733938.2022.2156588.
16. Irish Central Statistics Office (2023) *Ireland and the EU at 50 - Economic and Social Change in Ireland from 1973-2023*. CSO Statistical Publication. CSO. Available at: https://www.cso.ie/en/releasesandpublications/ep/p-ieu50/irelandandtheeuat50/society/births/ (Accessed: 1 October 2024).
17. Johnston, C.L. *et al.* (2023) ‘A national survey of urinary incontinence in professional Team England female athletes’, *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 282, pp. 12–16. Available at: https://doi.org/10.1016/j.ejogrb.2022.12.031.
18. Kiemle-Gabbay, L.R. *et al.* (2024) ‘Menstrual Cycle and Hormonal Contraceptive Symptom Severity and Frequency in Athletic Females’. Available at: https://doi.org/10.1123/wspaj.2023-0086.
19. Lebrun, C.M., Joyce, S.M. and Constantini, N.W. (2020) ‘Effects of Female Reproductive Hormones on Sports Performance’, in A.C. Hackney and N.W. Constantini (eds) *Endocrinology of Physical Activity and Sport*. Cham: Springer International Publishing, pp. 267–301. Available at: https://doi.org/10.1007/978-3-030-33376-8\_16.
20. Mahoney, K., Heidel, R.E. and Olewinski, L. (2023) ‘Prevalence and Normalization of Stress Urinary Incontinence in Female Strength Athletes’, *Journal of Strength and Conditioning Research*, 37(9), pp. 1877–1881. Available at: https://doi.org/10.1519/JSC.0000000000004461.
21. Malone, S. *et al.* (2023) ‘The running performance of elite ladies Gaelic football with respect to position and halves of play’, *Sport Sciences for Health*, 19(3), pp. 959–967. Available at: https://doi.org/10.1007/s11332-022-00991-4.
22. Martin, D. *et al.* (2018) ‘Period Prevalence and Perceived Side Effects of Hormonal Contraceptive Use and the Menstrual Cycle in Elite Athletes’, *International Journal of Sports Physiology & Performance*, 13(7), pp. 926–932. Available at: https://doi.org/10.1123/ijspp.2017-0330.
23. McCarthy-Ryan, M. *et al.* (2024) ‘Stress urinary incontinence prevalence and risk factors in female rugby players: a common health problem across four nations’, *BMJ Open Sport & Exercise Medicine*, 10(1), p. e001832. Available at: https://doi.org/10.1136/bmjsem-2023-001832.
24. McNulty, K.L. *et al.* (2020) ‘The Effects of Menstrual Cycle Phase on Exercise Performance in Eumenorrheic Women: A Systematic Review and Meta-Analysis’, *Sports Medicine*, 50(10), pp. 1813–1827. Available at: https://doi.org/10.1007/s40279-020-01319-3.
25. Microsoft Corporation (2019) Microsoft Excel [Software]. Available at: https://www.microsoft.com/en-us/microsoft-365/excel (Accessed: 2 October 2024).
26. Nolan, D., Elliott-Sale, K.J. and Egan, B. (2023) ‘Prevalence of hormonal contraceptive use and reported side effects of the menstrual cycle and hormonal contraceptive use in powerlifting and rugby’, *The Physician and Sportsmedicine*, 51(3), pp. 217–222. Available at: https://doi.org/10.1080/00913847.2021.2024774.
27. Nygaard, I.E. and Shaw, J.M. (2016) ‘Physical activity and the pelvic floor.’, *American journal of obstetrics and gynecology*, 214(2), pp. 164–171. Available at: https://doi.org/10.1016/j.ajog.2015.08.067.
28. R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.
29. Rodríguez-Longobardo, C. *et al.* (2023) ‘Pelvic Floor Muscle Training Interventions in Female Athletes: A Systematic Review and Meta-analysis’, *Sports Health*, p. 19417381231195305. Available at: https://doi.org/10.1177/19417381231195305.
30. Sand, A. (2022) ‘Inferential Statistics Is an Unfit Tool for Interpreting Data’, *Applied Sciences*, 12(15), p. 7691. Available at: https://doi.org/10.3390/app12157691.
31. Skaug, K.L. *et al.* (2022) ‘Prevalence of Pelvic Floor Dysfunction, Bother, and Risk Factors and Knowledge of the Pelvic Floor Muscles in Norwegian Male and Female Powerlifters and Olympic Weightlifters’, *The Journal of Strength & Conditioning Research*, 36(10), p. 2800. Available at: https://doi.org/10.1519/JSC.0000000000003919.
32. Teixeira, R.V. *et al.* (2018) ‘Prevalence of urinary incontinence in female athletes: a systematic review with meta-analysis’, *International Urogynecology Journal*, 29(12), pp. 1717–1725. Available at: https://doi.org/10.1007/s00192-018-3651-1.
33. Thomlison, B. (2001) *The Handbook of Social Work Research Methods*. SAGE Publications, Inc. Available at: https://doi.org/10.4135/9781412986182.
34. Wickham H, Averick M, Bryan J, Chang W, McGowan LD, François R, Grolemund G, Hayes A, Henry L, Hester J, Kuhn M, Pedersen TL, Miller E, Bache SM, Müller K, Ooms J, Robinson D, Seidel DP, Spinu V, Takahashi K, Vaughan D, Wilke C, Woo K, Yutani H (2019). “Welcome to the tidyverse.” Journal of Open Source Software, 4(43), 1686. doi:10.21105/joss.01686.
35. United Nations, Department of Economic and Social Affairs, Population Division (2019). Contraceptive Use by Method 2019: Data Booklet (ST/ESA/SER.A/435)