



Menstrual symptoms and perceived exertion in U14 and U16 players of the Chilean national women's handball team

Síntomas menstruales y percepción del esfuerzo en jugadoras de las categorías Sub14 y Sub16 de la selección chilena femenina de balonmano

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Received: 11-10-25

Accepted: 12-01-26

How to cite in APA

Salvatierra-Calderón, V., Morales Ríos, C., Roldán Figueroa, N., Villaseca-Vicuña, R., Barraza-Gómez, F., Segueida-Lorca, Álvaro, Stein, A. C., & Pérez-Contreras, J. (2026). Menstrual symptoms and perceived exertion in U14 and U16 players of the Chilean national women's handball team. *Retos*, 77, 188-198. <https://doi.org/10.47197/retos.v77.117856>

Abstract

Introduction: Sports participation in adolescent girls requires consideration of physiological and emotional factors that may affect performance. Among these, the menstrual cycle is a significant variable, as it can impact perceived exertion and tolerance to training loads. Despite increasing interest in this topic, there is limited evidence in team sports and Latin American youth populations.

Objective: To identify the most frequent symptoms during the menstrual phase and their relationship with perceived exertion in Chilean female handball players.

Method: A cross-sectional study was conducted with 48 players from the Chilean women's national handball team, including U14 (n = 20; age 12-14) and U16 (n = 28; age 15-16) categories. Perceived exertion was assessed using the modified Borg scale, and menstrual symptoms were recorded through a structured questionnaire.

Results: A total of 18.8% of players reported a Borg level of 6. U14 players mainly reported a Borg score of 6 (25%), while U16 reported a Borg score of 7 (21.4%). The most frequent symptoms were abdominal pain (33.3%), bloating, and cravings (16.7% each). An association between menstrual symptoms and perceived exertion was observed ($\chi^2 = 26.36$; $p = .049$), although agreement was weak (Kappa = .016).

Conclusion: Abdominal pain, cravings, and bloating were the most reported symptoms. While associations with perceived exertion were statistically significant, they showed weak agreement. Future studies should consider training load and symptom intensity to gain a more comprehensive understanding of perceived exertion in this population.

Keywords

Dysmenorrhea; female handball; menstrual cycle; perceived exertion; training.

Resumen

Introducción: La práctica deportiva en adolescentes mujeres requiere considerar factores fisiológicos y emocionales que pueden influir en el rendimiento. Entre ellos, el ciclo menstrual destaca como una variable relevante, al afectar la percepción del esfuerzo y la tolerancia a la carga de entrenamiento. Pese al creciente interés en esta temática, existe escasa evidencia en deportes colectivos y contextos latinoamericanos, especialmente en poblaciones juveniles. **Objetivo:** Identificar los síntomas más frecuentes durante la fase menstrual y su relación con la percepción del esfuerzo en jugadoras chilenas de balonmano.

Método: Estudio transversal con 48 jugadoras de la selección chilena de balonmano femenino, categorías Sub14 (n = 20; edad = 12-14 años) y Sub16 (n = 28; edad = 15-16 años). Se evaluó la percepción del esfuerzo mediante la escala de Borg modificada, y los síntomas menstruales a través de un cuestionario estructurado.

Resultados: El 18,8 % de las jugadoras reportó un nivel de Borg = 6. La Sub14 presentó mayormente Borg = 6 (25 %) y la Sub16, Borg = 7 (21,4 %). Los síntomas más frecuentes fueron dolor abdominal (33,3 %), hinchazón y antojos (16,7 % cada uno). Se observó una asociación entre los síntomas menstruales y la percepción del esfuerzo ($\chi^2 = 26,36$; $p = .049$), aunque con baja concordancia (Kappa = .016).

Conclusión: Los síntomas más frecuentes fueron dolor abdominal, antojos e hinchazón. Las asociaciones con la percepción del esfuerzo fueron significativas pero débiles. Futuros estudios deberían incorporar variables como la carga de entrenamiento y la intensidad sintomática para una comprensión más integral.

Palabras clave

Balonmano femenino; ciclo menstrual; dismenorrea; entrenamiento; percepción del esfuerzo.

Introduction

The menstrual cycle is a physiological phenomenon that affects most women of childbearing age, involving a series of cyclical hormonal changes that can have an impact on various aspects of daily life, including physical and athletic performance (Ergin & Kartal, 2020). This process begins at puberty with menarche, which corresponds to the first menstruation, and ends with menopause (de la Fuente de la Parte et al., 2023), with normal variability in its duration, ranging from 21 to 35 days (Konovalova, 2013; Wojtys et al., 2015). The cycle is divided into three main phases (Thiyagarajan et al., 2025): 1) the follicular phase, which begins with menstruation (approximately 4-6 days of bleeding) and is initially characterized by low levels of estrogen and progesterone, which then rise to stimulate follicular development; 2) the ovulatory phase, around days 14-15, in which the peak of luteinizing hormone causes the release of the egg and progesterone levels begin to increase; and 3) the luteal phase, lasting 10-14 days, marked by the activity of the corpus luteum, which secretes progesterone to prepare the endometrium, degenerating if fertilization does not occur and restarting the cycle. In the menstrual phase, characterized by decreased levels of estrogen and progesterone, various physiological effects occur that could influence athletic performance and increase the sensation of fatigue (Giménez-Blasi et al., 2022).

During adolescence, starting with menarche, the menstrual cycle takes approximately six years to reach maturity, presenting irregularities and associated symptoms during this period (Serret Montoya et al., 2012). The symptoms not only affect quality of life and general well-being, but can also compromise athletic performance (Aguilar Macías et al., 2017). Paludo (2022), notes that female athletes may experience a reduction in strength and recovery capacity during the menstrual phase, particularly if the symptoms are severe.

Symptoms usually appear during the first few days of menstruation and mainly affect women in their twenties and thirties (Serret Montoya et al., 2012). The most common symptoms include abdominal cramps, headaches, nausea, diarrhea, mood swings, and general fatigue, which can vary in intensity and duration (Aguilar Macías et al., 2017), affecting both training capacity and competition performance (Oester et al., 2024), due to the greater perception of effort that some athletes express (Findlay et al., 2020).

Perceived exertion is defined as the subjective intensity that an individual experiences during physical activity (Borg, 1982). This variable represents a determining factor in athletic performance, as it reflects the personal interpretation of the workload being performed and allows workloads to be adjusted according to individual responses, thus optimizing performance and preventing overtraining (McNulty et al., 2020).

Given its subjective nature, the perception of effort is influenced by a variety of factors, including physiological components such as heart rate and hormonal fluctuations, as well as psychological aspects such as motivation and mood (Dam et al., 2022). It is important to note that these psychological factors can be particularly affected during the menstrual phase, as associated symptoms can significantly alter perceived exertion (Ekenros et al., 2024).

This relationship is highly complex, determined by individual responses and the multiple factors that influence performance (Rael et al., 2021). Current evidence reveals distinctive patterns in the perception of performance throughout the menstrual cycle, with athletes reporting a greater perception of effort during the premenstrual and menstrual phases compared to other phases of the cycle (Dam et al., 2022; Giménez-Blasi et al., 2022), mainly due to symptoms such as fatigue and pain, which can affect their performance in both training and competition (Carmichael et al., 2021; Paludo et al., 2022; Vogel et al., 2023).

Despite the growing interest in understanding the influence of the menstrual cycle in the sports field (Hirschberg, 2022), significant gaps in knowledge remain due to limited objective information (Ekenros et al., 2024; Janse de Jonge et al., 2019), particularly in adolescent populations, where this issue may be especially relevant for the comprehensive development of young female athletes. Adolescence represents a critical developmental period characterized by profound physiological, hormonal, and psychological changes, including the establishment of the menstrual cycle (Benito et al., 2023). In young female athletes, these changes occur simultaneously with increasing training demands and competitive exposure, which may influence both symptom perception and responses to physical effort (Carmichael et al.,



2021). However, most existing research on menstrual cycle-related responses to exercise has focused on adult or collegiate athletes, with limited attention given to younger populations, particularly those involved in high-performance sport contexts (Janse de Jonge et al., 2019). This limitation is particularly evident in team sports such as handball, partly because, despite its inclusion in the Olympic program and its growing development in certain regions, it remains a sport with less media and scientific visibility than disciplines such as soccer or basketball (Mamani-Jilaja et al., 2023), which has limited the production of specific studies on physiological, anthropometric, and performance variables in female contexts (Ramos-Angulo et al., 2018). Furthermore, the existing evidence comes mainly from European or North American contexts (Carmichael et al., 2021; Niering et al., 2024), without considering the cultural, social, and sporting specificities of Latin America. In the case of Chilean handball players, no studies have explored the relationship between menstrual symptoms and perceived exertion, which limits the possibility of making informed decisions that can contribute to training planning and periodization (Carmichael et al., 2021; Ekenros et al., 2024; Giménez-Blasi et al., 2022). Studying perceived exertion and menstrual symptoms in U14 and U16 athletes is therefore relevant, as it provides early insight into how these factors interact during formative stages of athletic development and may contribute to the design of more age-appropriate, individualized, and gender-sensitive training approaches.

Considering the limited evidence in elite South American youth populations, this research aims to describe the predominant symptoms during the menstrual phase and analyze their relationship with perceived exertion in players from the Chilean national handball team's U14 and U16 categories. To achieve this, a cross-sectional, exploratory design was chosen, based on the need to obtain an initial profile of symptoms and optimize access to the sample of players during their national training schedules. It is hoped that these results will provide an empirical basis that will contribute to the design of more individualized, equitable, and evidence-based training load planning and management strategies (Arenas-Pareja et al., 2023), thus promoting a more inclusive and effective sporting environment for women in training.

Method

Study design

The study has a quantitative approach, with a descriptive scope and a cross-sectional design that was applied retrospectively (Slater & Hasson, 2025).

Participants

The sample consisted of 48 handball players, divided into two categories: U14 ($n = 20$; age: 12 to 14 years; weight = 61.15 ± 9.94 kg; height = 166.05 ± 7.32 cm) and U16 ($n = 28$; age: 15 to 16 years; weight = 65.79 ± 7.55 kg; height = 169.50 ± 6.34 cm), corresponding to the infant and cadet categories used in the national handball development system. The athletes came from different national handball clubs and were part of the Chilean national selection process in their respective categories.

The study included players belonging to the Chilean national handball team in the U14 or U16 categories who had already experienced menarche, ensuring that at the time of evaluation, they had experienced at least one menstrual cycle. Participants who did not have informed consent signed by their legal guardian, who did not sign the corresponding consent form, or who had physical discomfort at the time of evaluation that prevented them from training normally were excluded.

Procedure

Participants were recruited during a scheduled national team training camp as part of the Chilean women's handball selection process (October 2024). Prior to data collection, written informed consent was obtained from parents or legal guardians, and participants provided assent. The entire procedure was carried out in accordance with the ethical principles established in the Declaration of Helsinki (World Medical Association, 2013), which regulate biomedical research in humans, guaranteeing the protection, privacy, and well-being of the individuals involved.

Data collection was conducted during a scheduled morning session, prior to regular training activities. Before completing the questionnaire, participants received standardized verbal instructions explaining



the study objectives and procedures. The questionnaire was administered individually and in a private setting to ensure confidentiality. Participants were randomly organized into small groups of five to facilitate data collection without disrupting training routines. Each participant was assigned a numerical identification code to guarantee anonymity.

The data were collected during a morning session before regular training. Players currently menstruating reported their symptoms and perceived exertion in real time, while those not currently menstruating recalled symptoms from their most recent cycle. This approach was adopted due to logistical constraints associated with national team training, including limited schedules, variable attendance, and the alternating participation of U14 and U16 squads. These factors made it unfeasible to conduct repeated assessments or wait for all participants to be evaluated during their menstrual phase; consequently, a single data collection session was scheduled to ensure the inclusion of all available players.

To minimize recall bias, participants were instructed to refer specifically to their most recent menstrual experience. Nevertheless, the retrospective nature of part of the data collection may have introduced recall-related limitations, which are acknowledged and considered when interpreting the findings.

Instruments

Modified Perceived Exertion Scale – CR 10 Borg

The Borg scale (Borg, 1982), is a tool designed to measure an individual's exertion, dyspnea, and fatigue during physical work (Williams, 2017). In its adapted version, it assigns a score ranging from 0 to 10, where 0 represents “no exertion” and 10 represents “maximum exertion.” It was used to determine the perception of effort during the menstrual phase, with the specific question, “How do you feel the effort of training or matches during menstruation?” The visual scale was used for better understanding by the players.

Questionnaire on symptoms during the menstrual phase

A questionnaire was administered to the athletes with the question: “Do you experience any discomfort during your menstrual period?” If the answer was yes, 10 options accompanied by images were presented, from which each player had to select the main or most frequent symptom. The selection of these symptoms was based on previous research and questionnaires that have described common discomforts during menstruation (Badkur & Wanjpe, 2024; Hantsoo et al., 2022; Parker et al., 2022). The options included: “cravings,” “breast tenderness,” “high temperature,” “bloating,” “constipation,” “nausea,” “stomach pain,” “headache,” “weakness,” and “diarrhea.” The questionnaire was administered retrospectively in cases where participants were not in their menstrual phase at the time of assessment.

Data analysis

Descriptive statistics were used to summarize participant characteristics, expressed as mean and standard deviation. Data normality was assessed using the Shapiro–Wilk test.

The distribution of perceived exertion levels and menstrual symptoms was examined using frequency and percentage distributions (Tables 2 and 3). To explore the relationship between perceived exertion and menstrual symptoms, a descriptive cross-tabulation analysis was conducted (Table 4), examining the distribution of reported symptoms across Borg scale levels during the menstrual phase.

In addition, the chi-square (χ^2) test was applied (Table 5) to assess the presence of an association between variables, and the Kappa coefficient was calculated as a complementary measure of agreement. Given the exploratory nature of the study and the presence of low expected frequencies in several cells, inferential results were interpreted with caution and considered complementary to the descriptive findings. All analyses were performed using IBM SPSS software version 30 from 2024.

Results

Table 1 provides a description of athletes' characteristics. The mean values and standard deviations are presented by category and for the total sample (Table 1).



Table 1. Descriptive characteristics of the total sample and by category.

	Total (n=48)		U14 (n=20)		U16 (n=28)	
	M	± SD	M	± SD	M	± SD
Players' age (years)	14.83	± 1.06	13.75	± 0.55	15.61	± 0.49
Weight (kg)	63.85	± 8.84	61.15	± 9.94	65.79	± 7.55
Height (cm)	167.85	± 6.87	166.05	± 7.32	169.50	± 6.34
BMI (kg/m ²)	22.54	± 2.18	22.10	± 2.75	22.86	± 1.64
Age at menarche (years)	11.79	± 1.09	11.45	± 0.82	12.04	± 1.20
Menstrual phase duration (days)	5.08	± 1.33	5.35	± 1.34	4.89	± 1.31

Data are presented as mean (M) ± standard deviation (SD).

Kg = kilograms; cm = centimeters; BMI = body mass index; kg/m² = kilograms per square meter.

Frequency of perceived exertion

According to the modified Borg scale applied (Table 2), the prevalence showed that 18.8% of the total sample of players stated that the effort during training is “Hard (heavy)” when they are in the menstrual phase.

Table 2. Frequency distribution of perceived exertion levels.

Modified Borg scale	Total (n=48)	Categories	
		U14 (n=20)	U16 (n=28)
0 = Nothing at all	2 (4.2%)	2 (10%)	--
1 = Very, very light	4 (8.3%)	2 (10%)	2 (7.2%)
2 = Very light	4 (8.3%)	2 (10%)	2 (7.2%)
3 = Moderate	4 (8.3%)	2 (10%)	2 (7.2%)
4 = Somewhat hard	8 (16.7%)	3 (15%)	5 (17.8%)
5 = Hard	7 (14.6%)	2 (10%)	5 (17.8%)
6 = Hard (heavy)	9 (18.8%)	5 (25%)	4 (14.2%)
7 = Very hard	7 (14.6%)	1 (5%)	6 (21.4%)
8 = Very, very hard	3 (6.3%)	1 (5%)	2 (7.2%)
9 = Almost maximal	--	--	--
10 = Maximal	--	--	--

Values represent the number and percentage of players classified at each level of the modified Borg scale (0–10). Frequencies are presented for the total sample (n = 48) and stratified by category (U14 and U16).

When comparing categories, U14 players most frequently reported the “hard (heavy)” level (Borg 6), accounting for 25%, whereas in the U16 category the “very hard” level (Borg 7) predominated, with a frequency of 21%. Additionally, 10% of U14 players reported a score of 0 on the Borg scale, and no players in either category reported extreme exertion levels (Borg 9–10).

Frequency of menstrual symptoms

In the classification of the main symptom (Table 3), the most frequent in the total sample was “abdominal pain” with 33.3%, followed by ‘cravings’ and “bloating,” both with 16.7%, and in third place “breast tenderness” with 12.5%. The least frequent were “headache,” “nausea,” and “weakness,” each with 4.2%.

Table 3. Frequency and percentages of the main symptoms.

Main symptoms	Total	Categories	
		U14	U16
None	4 (8.3%)	1 (5%)	3 (10.8%)
Cravings	8 (16.7%)	5 (25%)	3 (10.8%)
Breast tenderness	6 (12.5%)	4 (20%)	2 (7.1%)
Bloating	8 (16.7%)	2 (10%)	6 (21.4%)
Nausea	2 (4.2%)	--	2 (7.1%)
Abdominal pain	16 (33.3%)	5 (25%)	11 (39.3%)
Headache	2 (4.2%)	1 (5%)	1 (3.5%)
Weakness	2 (4.2%)	2 (10%)	--

Frequency and percentage distribution of the main symptoms reported by the players, according to category and total sample.

The comparison between categories revealed that among U14 players, the most frequently reported symptoms were “cravings” (n = 5), “abdominal pain” (n = 5), and “breast tenderness” (n = 4), whereas

among U16 players, “abdominal pain” (n = 11) predominated, followed by “bloating” (n = 6) and “cravings” (n = 3).

Association between common symptoms and the Borg Scale

The association between menstrual symptoms and perceived exertion during the menstrual phase was explored using descriptive cross-tabulation and complementary inferential analyses.

Table 4 presents the descriptive cross-tabulation between Borg scale levels and menstrual symptoms, illustrating how symptom reports were distributed across perceived exertion levels during the menstrual phase. The analysis included 32 players out of the total sample of 48 who reported at least one of the three most frequent symptoms.

Table 4. Cross-tabulation results between the Borg scale and symptoms during the menstrual phase.

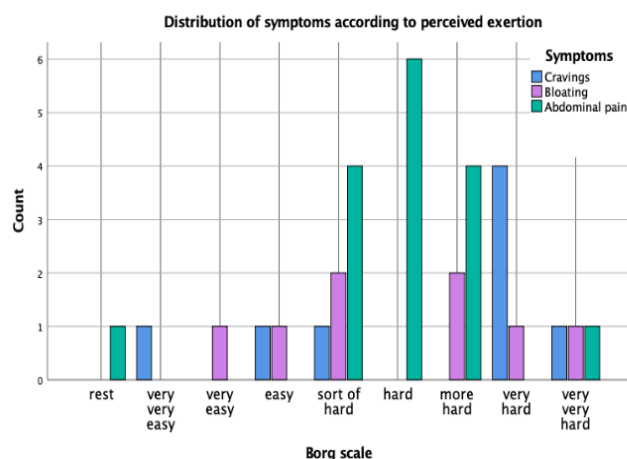
Borg scale	Percentage by symptom			Total
	Cravings	Bloating	Abdominal pain	
0 = Nothing at all	0.0%	0.0%	6.3%	3.1%
1 = Very, very light	12.5%	0.0%	0.0%	3.1%
2 = Very light	0.0%	12.5%	0.0%	3.1%
3 = Moderate	12.5%	12.5%	0.0%	6.3%
4 = Somewhat hard	12.5%	25%	25%	25%
5 = Hard	0.0%	0.0%	37.5%	18.8%
6 = Hard (heavy)	0.0%	25%	25%	18.8%
7 = Very hard	50%	12.5%	0.0%	15.6%
8 = Very, very hard	12.5%	12.5%	6.3%	9.4%

Values represent the number and percentage of players reporting each symptom at each Borg scale level during the menstrual phase (n = 32). Percentages are not mutually exclusive, and minor deviations from 100% may occur due to rounding. This table presents a descriptive cross-tabulation.

When analyzed by symptom, reports of “abdominal pain” were mainly distributed across the “hard (heavy)” (37.5%) and “somewhat hard” (25%) perceived exertion classifications. For “bloating,” the highest frequencies were observed in the “somewhat hard” (25%) and “hard (heavy)” (25%) levels. Among players reporting “cravings,” 50% rated their perceived exertion as “very hard.”

Figure 1 illustrates the distribution of perceived exertion levels according to the Borg scale for the most frequently reported menstrual symptoms.

Figure 1. Distribution of perceived exertion levels across Borg scale classifications for the most frequently reported menstrual symptoms (cravings, bloating, and abdominal pain).



Overall, the results indicate consistent descriptive patterns in perceived exertion and symptom distribution during the menstrual phase across the analyzed sample.

To complement the descriptive findings, a chi-square test was applied to explore the association between perceived exertion levels and reported symptoms (Table 5). Although the test yielded a χ^2 value

of 26.36 ($p = .049$), its assumptions were not met, as all cells presented expected counts below five (minimum expected count = .25). Therefore, these results should be interpreted with caution. In addition, Cohen's Kappa coefficient indicated a weak and non-significant level of agreement between symptom classification and perceived exertion ($\kappa = .016$; $p = .591$).

Table 5. Chi-square test results for the association between perceived exertion (Borg scale) and menstrual symptoms.

	Value	Df	Asymptotic significance (2-sided)
Pearson's Chi-square	26.36	16	.049
Likelihood ratio	31.15	16	.013
Linear association by linear	0.50	1	.477

Number of valid cases = 32.

Discussion

The practice of sports by adolescent females involves considering multiple physiological and emotional factors that can influence performance (Ergin & Kartal, 2020). Among these, the menstrual cycle has been widely identified as a relevant variable, as it can affect both the perception of effort and tolerance to training load (Ekenros et al., 2024). Despite increased research in this area, there remains limited evidence in less prominent team sports (Mamani-Jilaja et al., 2023) and in Latin American contexts, particularly in youth populations (Niering et al., 2024).

In this context, the objective of this study was to identify the most common symptoms experienced by players on the Chilean national handball team (U14 and U16 categories) during their menstrual phase, and to analyze how these symptoms relate to their perception of effort during training sessions.

The main findings of this study indicate that, in the total sample of 48 players, training effort during the menstrual phase was most frequently perceived as "hard (heavy)" (18.8%). Furthermore, when categories were analyzed separately, the highest proportion of U14 players reported this level of perceived exertion (25%), whereas among U16 players, the perception of "very hard" effort predominated (21%).

These results are framed within the context of the variability of the menstrual cycle in women of childbearing age, which causes hormonal fluctuations that determine different phases (Carmichael et al., 2021), with the menstrual phase being one of the most associated with possible effects on the perception of effort due to discomfort linked to menstruation (Ergin & Kartal, 2020), especially in young athletes who are just beginning to experience these changes (Benito et al., 2023). Some studies in team sports have found out that during the menstrual and premenstrual phases, female players experience lower physical performance (Domínguez Muñoz et al., 2024; Findlay et al., 2020; Paludo et al., 2022; Solli et al., 2020). However, recent meta-analyses (Carmichael et al., 2021; McNulty et al., 2020), have not found significant reductions in athletic performance during this phase, suggesting that perception may play an important role. Although it does not directly affect objective performance parameters, it does influence readiness and attitude toward training (Bruinvels et al., 2022; Paludo et al., 2022).

Although training loads were not considered in this study, the greater perception of effort reported by U16 players compared to U14 could be explained by their greater physiological and psychological maturity, which gives them a better appreciation and awareness of their physical effort (Malina et al., 2004; McNulty et al., 2020). Furthermore, as athletes progress through the stages of athletic development, the demands of intensity, training volume, and competitive load increase (Malina et al., 2004; Reynolds et al., 2021). Research conducted in team sports has observed that categories with more sporting experience exhibit a greater number of high-intensity actions and movements at high speeds during the game, compared to categories with less expertise (Reynolds et al., 2021). These differences may explain the increase in perceived effort reported by older players in the present study.

Among the causes related to an increase in perceived effort during the menstrual phase, symptoms may play a significant role. The manifestation of symptoms has been associated with greater discomfort in both young athletes and non-athletes (Aguilar Macías et al., 2017; Van Lersel et al., 2016), potentially affecting the perception of effort (Brown et al., 2021). Ekenros (2024), found that 82% and 69% of female soccer and handball players, respectively, reported menstrual pain. According to the evidence, the most common symptoms include abdominal pain, bloating, breast tenderness, back and head pain, joint



and muscle pain, and fatigue (Mohebbi Dehnavi et al., 2018), which interfere with physical activity (Aguilar Macías et al., 2017). These findings largely coincide with those of this research, where “abdominal pain” is the most frequent main symptom in the total sample of 48 players. In turn, when distinguishing by category, U16 report “bloating” as the second most common symptom, while for U14 category, “abdominal pain” and “cravings” were reported with equal frequency, which is consistent with what is described in the literature (Mohebbi Dehnavi et al., 2018).

Regarding the analysis of the association between menstrual symptoms and perceived exertion, the chi-square results ($\chi^2 = 26.36$; $p = .049$) suggest a possible association between variables, indicating that the distribution of perceived effort levels is not random with respect to the symptoms reported. Although a statistically significant chi-square value was observed, Cohen’s Kappa was included only as a complementary indicator and not as a primary measure of association. The very low Kappa value suggests weak agreement between variables, reinforcing the exploratory nature of the analysis. Accordingly, the following interpretations should be understood from a descriptive perspective.

The descriptive patterns observed in the association analyses indicate that players who reported “cravings” most frequently perceived exertion within the “very hard” classification, accounting for 50% of cases in this group. In contrast, players reporting “abdominal pain” tended to concentrate their perceived exertion at higher levels, particularly within the “hard (heavy)” classification (37.5%). For those experiencing “bloating,” the distribution of perceived exertion was more heterogeneous, with similar proportions reported for the “somewhat hard” and “hard (heavy)” levels, suggesting greater individual variability in this symptom group. These findings suggest that certain menstrual symptoms, particularly those associated with pain or discomfort, may be related to higher perceived exertion during the menstrual phase. This interpretation is consistent with previous research indicating that menstrual symptoms can influence exercise responses by affecting mood, motivation, and attentional focus during physical activity (Findlay et al., 2020; Momma et al., 2021). Nevertheless, the very low and non-significant Kappa value ($\kappa = .016$) indicates a weak level of agreement between symptom categories and perceived exertion classifications, highlighting substantial inter-individual variability. This reinforces the notion that perceived exertion during the menstrual phase is a highly subjective experience, influenced by multiple physiological and psychological factors beyond the presence of specific symptoms (Findlay et al., 2020).

Strengths and limitations of the study

Among the strengths of this study is its focus on young female handball players, a population and discipline that is underrepresented in the scientific literature. By focusing on Chilean players participating in a national selection process, the study provides contextualized and relevant evidence for the national and Latin American context. Likewise, the inclusion of little-explored variables, such as menstrual symptoms and their association with the perception of effort during training, reinforces its thematic value and contributes to the development of gender-focused lines of research in youth sports.

Despite the findings presented, this study has limitations that must be considered. First, the cross-sectional and retrospective design precludes the establishment of definitive causal relationships between the menstrual cycle and perceived exertion. By asking athletes to report symptoms based on their previous cycles, there is a risk of recall bias, where players may overestimate or underestimate the intensity of their symptoms due to the time elapsed. This methodological decision may limit the comparability between participants evaluated during their menstrual phase and those providing retrospective reports. However, this approach was chosen given the exploratory nature of the study and the logistical limitations of conducting longitudinal follow-up with a national team during limited and intense training schedules. To mitigate this limitation, future research should utilize a prospective design, employing daily symptom logs and monitoring perceived exertion over at least three consecutive menstrual cycles. Furthermore, the inclusion of hormonal markers would provide greater precision in determining cycle phases, complementing the subjective data collected through questionnaires.

From an applied perspective, the results of this study reinforce the importance of considering menstrual symptoms when planning training for adolescent athletes, particularly in highly demanding team sports. Incorporating strategies for individualized load adjustment, menstrual education, and regular monitor-

ing could benefit both the performance and well-being of female athletes in their formative years, contributing to more inclusive, informed, and sensitive environments with regard to the female hormonal cycle.

Conclusions

Based on the results obtained, it can be concluded that the most frequently reported symptoms among U14 and U16 handball players during the menstrual phase were “abdominal pain,” “bloating,” and “cravings.” Likewise, in the total sample, perceived exertion was mainly concentrated at levels 6 and 7 on the Borg scale, corresponding to the “hard (heavy)” and “very hard” classifications, respectively. An association between menstrual symptoms and perceived exertion was observed, highlighting the relevance of considering these variables in youth training contexts.

These findings underscore the importance of expanding the study of the menstrual cycle in sport, utilizing longitudinal designs that assess perception of effort throughout the entire cycle, while also incorporating monitoring of symptom intensity and training load. This perspective would enable a more comprehensive understanding of the factors that influence the performance of adolescent athletes, leading to more personalized, inclusive, and evidence-based practices.

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