

SADDLE PERCEIVED COMFORT OF COMPETITIVE WOMEN ROAD CYCLISTS

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The purpose of this study was to identify which are the most used saddle types by competitive women cyclists and their effect on perceived comfort. A comfort questionnaire was completed by 60 elite women cyclists that competed in the Road Cycling Cup, and a picture of their saddle was taken. The participants saddles were classified according to their design (i.e., women, men, and unisex saddles) and their dimensions were also obtained. Women road cyclists find women's saddles more comfortable than men's ones, being the women's saddle the type most used by the participants. However, experienced cyclists use men's saddles. In addition, the type of saddle influenced the location of the pain and the cyclist's position on the saddle, with the later potentially affecting bike-fit. Further research is needed to validate this hypothesis and examine potential consequences on performance.

KEYWORDS: road cycling, injuries, performance, bike-fit.

INTRODUCTION: Women's road cycling has gained significant interest in the last decade, narrowing the gap with men's cycling in terms of relevance. The number of women's cycling teams, cyclists, and races has doubled over the past two years, while some events like La Vuelta or Le Tour du France have been added for the first time to the women's racing calendar (Herrero-Molleda et al., 2023). Therefore, it has become crucial to analyse all aspects affecting women cycling performance, such as bike-fit. An incorrect bike adjustment is one of the main causes of overuse injuries, which constitute a significant portion of the total reported injuries in cycling (Priego-Quesada et al., 2019). However, a recent study revealed that none of the existing bike-fit methods are suitable for women (Encarnación-Martínez et al., 2021). This study also stated that these women bike-fit problems could be related to the type of saddle used. As women have a wider pelvis than men, they might need a wider saddle than them to fully support their ischial tuberosities. Thus, women using men's saddles would be sitting at the rearmost part of the saddle (i.e., trying to improve their comfort), unintentionally increasing their effective saddle height. Several studies have also explored the impact of the different saddle types (e.g., standard, cutout) on comfort, safety, and performance, highlighting the need for women-specific saddle designs (Lin et al., 2023). However, only a few studies have focused on this topic, so there remains a lack of consensus on the optimal type of saddle for professional women cyclists. Therefore, the aim of this study is to investigate which are the most used saddles and their effect on perceived comfort among elite women road cyclists.

METHODS: The participants of this study were sixty national level women cyclists who competed in the Spanish Road Cycling Cup (24.2 ± 6.6 years; 56.6 ± 6.5 kg and 165.2 ± 6.4 cm). All of them were informed of the benefits and risks of the investigation and signed a written consent. The procedure consisted of two different phases. The first phase took place before the competitions, where the participants were asked to complete a saddle comfort questionnaire of 18 questions. Nine of these questions focused on the participants training history and characteristics, such as their weight, training load or years of cycling experience. Three other questions focused on saddle comfort (i.e., 1-5 comfort scale) and the part of the saddle in which they sat (i.e., at the tip, centered or at the back of the saddle), and two on saddle-related pain (e.g., location of pain). In the last four questions cyclists were asked about their perceived comfort regarding all saddle types they had previously used. Saddles were classified according to the manufacturer's specifications as women's saddles, men's saddles, or unisex. Lastly, a photograph of each participant saddle was taken, and its length was measured. During the second phase, a quantitative analysis of the dimensions of the saddles was performed. The software Kinovea (v.0.9.5) was used to obtain maximum width, width at half-length and the length from the maximum width to the rearmost part of the saddle.

The software SPSS V.26.0 (SPSS, Inc., Chicago, IL, USA) was used for the statistical analysis. As there was a limited number of unisex saddles, the analysis was performed comparing only men's and women's saddles. Independent samples t-test was used to compare the differences between men's and women's saddle dimensions as well as the characteristics of women who used those saddles. Pearson's Chi-squared test was used to analyse the effect of the type of saddle on the variables related to comfort, pain, and the zone of the saddle were the cyclists sat. A value of $P < 0.05$ was considered statistically significant.

RESULTS: Women's saddles were used by 50% of the participants ($n = 30$), with men's saddles representing 39% of the total ($n = 23$), and unisex saddles the remaining 11% ($n = 7$). No differences were observed between cyclists who used women or men's saddles in any of the physical characteristics (i.e., age, body mass, height) and years of cycling experience. However, men's saddles were significantly more used than women's saddles by cyclists of a higher weekly (6.0 ± 1.1 vs. 5.2 ± 1.2 days/week, respectively; $p = 0.01$) and annual training load ($14,674 \pm 4,604$ vs. $11,917 \pm 4,239$ km/year; $p = 0.01$), as well as cyclists with more years of competing experience (4.7 ± 0.9 vs. 4.0 ± 1.5 years; $p = 0.02$). Regarding the dimensions and level of comfort of the saddles, women's saddles were significantly wider (14.3 ± 0.8 vs. 13.3 ± 0.8 cm; $p < 0.001$), shorter (26.1 ± 1.5 vs. 27.9 ± 1.5 cm; $p < 0.001$), and more comfortable than men's saddles (4.2 ± 0.6 vs. 3.8 ± 0.9 on a 1-5 comfort scale; $p = 0.02$). The analysis of saddle-related pain revealed that half of the participants (50%) suffered it, with no significant differences between women's and men's saddles (40.0 vs. 60.9%; $p = 0.22$). The ischial tuberosities were a source of pain for almost all participants when analyzing all saddle types together (80.8%; $p = 0.04$) as well as when analyzing woman's and men's saddles independently (58.8% vs. 95.6%; $p < 0.01$). Women's saddles were also reported to cause pain in the crotch (41.2%), as opposed to what happened with men's saddles (4.4%) ($p = 0.11$). Out of the cyclists who had tried both saddles, 55% felt more comfortable with the women's saddle, 16% with the men's saddle, and 29% found no differences ($p < 0.01$). Lastly, 57% of cyclists who used women's saddles reported that they sat centered on the saddle, while 67% of the cyclists who used men's saddles sat at the back of the saddle (Figure 1) ($p = 0.04$).

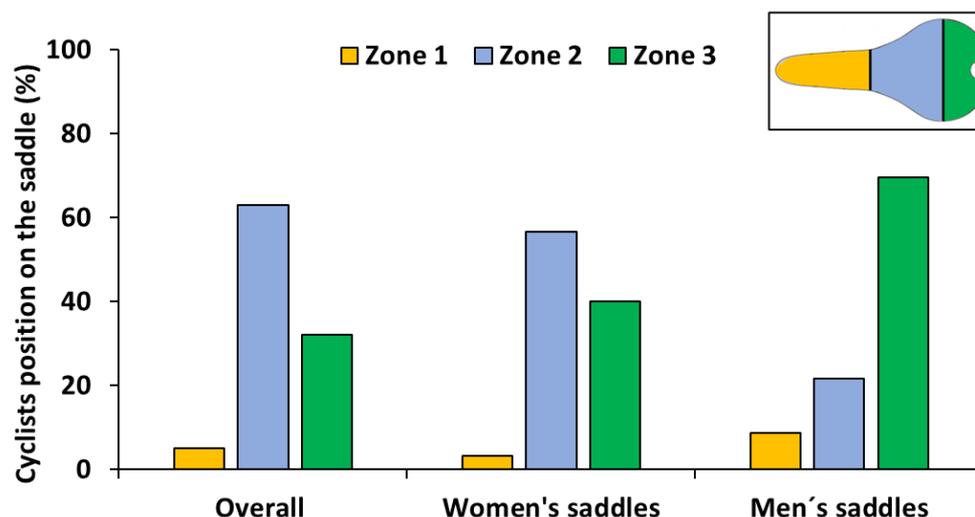


Figure 1. Cyclists self-reported position on the saddle (%) according to the saddle they were using (overall, men's saddles and women's saddles). Zone 1 = at the tip of the saddle; Zone 2 = centered on the saddle; Zone 3 = at the back of the saddle.

DISCUSSION: The main finding of this study highlights that most of competitive women road cyclists use women's saddles, which have been rated more comfortable than men's saddles. Despite this trend, experienced cyclists used men's saddles, which could be influenced by sponsorship obligations from team sponsors. Another important finding is that half of the

participants experienced saddle-related pain, which was mainly located in the ischial tuberosities of men's saddles users, and both there and in the crotch in the case of women's saddles users. The type of saddle also had an impact on the cyclist's position on the saddle, as women reported to sit further back in the saddle when using men's saddles (Figure 1), which could have some implications for bike-fit (i.e., higher effective saddle height).

The majority of cyclists used women's saddles, which were also rated more comfortable than men's saddles (4.2 vs. 3.8 on a 1-5 scale, respectively). Moreover, among cyclists who had tried both saddles, 55% felt better with the women's saddle, while only 16% preferred the men's one. This is in consistent with the results of previous studies that recommended the use of wider saddles for women to accommodate their greater ischium width (Potter et al., 2008; Guess et al., 2011; Piazza et al., 2020). In fact, recent research has found that the optimal saddle width for active women should be 1 cm wider than the cyclists' ischium width (Lin et al., 2023). However, despite the average width difference of 1 cm found in this study between both type of saddles, some of the women's saddles were narrower than some of men's, prompting the need for further investigation into the optimal saddle width for competitive women road cyclists.

Also, the prevalence of saddle-related pain in women (50%) exceeds the one observed in previous studies carried out with participants of both sexes (10.7-38%) (Priego-Quesada et al., 2019; Bini & Hunter, 2023), but is consistent with data from studies performed solely in women (39-69%) (Gaither et al., 2018; Greenberg et al., 2019; Hermans et al., 2016). These findings highlight the need for more research focused on the causes of this gender difference. On the other hand, the preference for men's saddles among the most experienced cyclists could be attributed to various factors, including a potential adaptation to saddle pain (Priego-Quesada et al., 2019). Another possible explanation is that men's and women's sections of a team might share a common sponsor that provides them with the same type of saddle. Therefore, directors and sponsors of women's cycling teams should take this into consideration when choosing their equipment.

At last, the type of saddle influenced the cyclist's position on the saddle and the location of the pain. The fact that women report to sit at the rear of the saddle when using men's saddles might be related with its smaller width, making women sit further back to be able to fully support their ischial tuberosities. This could influence women's bike-fit by increasing their effective saddle height and setback (Encarnación-Martínez et al., 2021), so more studies should be conducted to verify this hypothesis and to assess its possible consequences on muscular activity and pedalling technique. Likewise, the differences between men's and women's saddles in the location of the pain might be related to the diversity of saddle shapes found for both designs (e.g., cut-out or standard), which constitutes this study main limitation and should be investigated in the future. Other limitations of the study include not measuring saddle tilt (i.e., it may affect pain location), not considering that cyclists might have problems evaluating previous saddles used if a lot of time had passed (i.e., when reporting the most comfortable saddle out of the saddles they had tried) and the classification of saddles as men's or women's (i.e., each manufacturer has its own classification system). However, this classification based on the manufacturers' specifications was chosen because it had been used in a previous study on this topic (Potter et al., 2008). Finally, as explained before, it might be possible that athletes have chosen the saddle they ride based on their sponsorship obligations. Therefore, future studies on this topic should include a question to determine if the cyclist had chosen the saddle they use, or it was imposed by the team sponsors.

CONCLUSION: Women's saddles are the type of saddles used by most competitive women road cyclists, being also reported more comfortable than men's saddles. Despite of these results, experienced cyclists use the latter, which could be related to sponsors giving the same material to both sections of each team (i.e., men and women) and should therefore be taken into consideration by cyclists and team directors. The type of saddle also had an impact on the cyclist's position on the saddle, so future research should explore its potential effect on women's bike-fit.

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