EVALUATION OF SADDLE HEIGHT IN ELITE CYCLISTS

Marlene Mauch[1] and Andreas Goesele[1]

crossklinik, Swiss Olympic Medical Center, Basel, Switzerland[1]

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INTRODUCTION: Proper bike fit is essential to prevent injuries and improve performance. Especially recreational cyclists, often short on experience, rely on professional adjustment for seating position. Common bike fitting methods use formulas based on rider anthropometrics, e.g. the LeMond method (pubic symphysis height [PSH] x 0.883) (LeMond, 1988) or the Hamley method (PSH x 1.09) (Hamley et al., 1967). Pruitt (2006) recommends the correct saddle height [SH] within a knee angle [KA] of 25-35°. The purpose of this study is to verify these methods in elite men and women cyclists for today's application.

METHODS: Anthropometrics and SH of 31 (8 women, 23 men; 27.2 ±4.1 years) elite cyclists were measured using a water-level ruler and measuring tape. Differences between nominal (calculated SH based on LeMond and Hamley method) and actual (measured) SH were analysed. Additionally, 25 of these cyclists were recorded using a video camera (25Hz) (Sony®) and KA were analysed using Templo® (Contemplas Inc., Germany). Independent *t*-test was used to determine the differences between men and women.

RESULTS: PSH averages 84.4 ±4.3 cm, KA 41.8° ±4.4° (Table 1). There were significant differences between women and men for both the LeMond ($p<0.01$) and Hamley methods ($p<0.05$): on average women sat 1.1 cm lower and men 0.4 and 0.1 cm higher than the calculated value recommended (Table 2).

Table 1 Knee angle (°)

Sex	Min	Max	Mean	SD
Women (n=7)	38.7	45.7	41.9	2.56
Men (n=18)	32.2	51.9	41.8	5.03

Table 2 Nominal/actual value comparison (cm)

Sex	LeMond-Method Difference		Hamley-Method Difference	
	Mean	SD	Mean	SD
Women (n=8)	-1.12	± 1.55	-1.12	± 1.56
Men (n=23)	0.43	± 1.18	0.10	± 1.25

DISCUSSION: The results indicate that elite cyclists, especially women, sit lower than recommended in current literature (Pruitt, 2006). This lower position could enable them to generate more power or achieve a better aerodynamic position. Sex-related differences could relate to different soft tissue characteristics or preferences in seating position.

CONCLUSION: In recreational cyclists, preventing injuries and overuse syndromes should have a high priority to allow for enjoyable and long-lasting activity. A low SH is often accompanied by injures (Pruitt, 2006). Further (prospective) studies should focus on the relationship of biomechanical factors and aerodynamics as well as the incidence of injuries to develop and validate a method in bike fitting applicable for both professionals and amateurs.

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