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ORIGINAL PAPER

Erectile function in amateur cyclists

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Summary *Introduction: Cycling is a popular means of transport and recreational activity; bicycles are also a source of genitourinary injuries and there is the idea that cycling may have a significant impact on sexual function. The objective of this study was to evaluate the effect of amateur cycling on erectile function.*
Methods: We used a questionnaire comparing amateur cyclists (n = 199) and footballers (n = 43), regarding sexual related comorbidities and hours of practice per week. The cyclists were also characterized in terms of road vs cross-country, breaks during cycling, saddle, and shorts. To evaluate erectile function, the International Index of Erectile Function questionnaire was applied.
Results: there was no difference in International Index of Erectile Function total score between groups. Age and presence of erectile dysfunction associated comorbidity were negative factors in the International Index of Erectile Function score in cyclists but not in the footballers.
Conclusions: Cycling is usually associated with perineal numbness, but that numbness did not lead to lower International Index of Erectile Function scores. In conclusion amateur cycling has no effect on EF.

KEY WORDS: Cycling; Football; Erectile function; Perineal numbness.

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INTRODUCTION

Cycling is a popular means of transport and recreational activity for many people in a wide age range. It is an economical and efficient form of aerobic non-impact exercise with well-established cardiovascular beneficial effects and with a positive effect on quality of life (1, 2). Bicycles are also a source of genitourinary injuries, that can be categorized into acute traumatic injuries versus chronic overuse injuries (3).
Exercise is a well-known preventer of erectile dysfunction, in an Italian study patients with lower physical activity were associated with higher levels of erectile dysfunction (4). Since the 80's, there is the idea that cycling may have a significant impact on sexual function (including *erectile dysfunction* (ED), perineal numbness and chronic pain) (1, 5, 6). The most frequently proposed pathophysiological mechanisms for ED in cyclists are vascular and nerve injuries (related to nerve entrapment and vascular occlusion with continuous compression of the pudendal nerve and pudendal artery) (1).
Studies have shown that ED and numbness occur, respectively in up to 24% and 61% of selected groups of riders. However, most studies were conducted on long-distance/intensive cyclists, so there is little information about the true effects of cycling in the sexual life of amateur practitioners (6-11).
With this study, we aimed to evaluate the effects of amateur cycling in erectile function using a comparative athlete group and a validated sexual questionnaire.

METHODS

Recruitment and sporting clubs' outreach

199 amateur cyclists (cyclists that do not receive financial support or sponsorship) were recruited in person in several cycling meetings and completed an anonymous survey. We chose four mountain cycling events with high participation.
The comparison group consisted of 43 amateur footballers (sport without perineal contact) recruited in person from two amateur clubs.
Institutional review board approval was obtained.

Survey predictor variables

The two groups of athletes were characterized and compared regarding their age, body mass index, alcohol intake, smoking, medication (diuretics, high blood pressure drugs, excluding angiotensin-converting enzyme inhibitors and angiotensin receptor blockers, anti-depressants, anti-anxiety drugs, antihistamines, Parkinson's disease medications, prostate cancer medications, 5α-reductase inhibitors, chemotherapy), comorbidities (hypercholesterolemia, hypertriglyceridemia, arterial hypertension, myocardial infarction, stroke, diabetes mellitus, chronic kidney disease, chronic liver disease, thyroid disease, hormonal disorder, neurological disease, spine injury, prostate disease, perineal radiotherapy, penile/perineal trauma, depression, anxiety disorder) and hours per week of sports practice. The cyclists (group 1) were specifically characterized in terms of road vs cross-country, rest breaks during cycling (by questionnaire), saddle, shorts, and the riding position. The effect of each of these characteristics on sexual function was assessed.

Survey outcome variables

To evaluate EF, the *International Index of Erectile Function* (IIEF-5) questionnaire was applied. The presence of

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numbness was also registered, although in a subjective way ("yes or no" question).

Statistical analysis

Data was analysed using SPSS 21.

Demographic and medical variables were compared across athletic groups using Pearson chi-square and Mann-Whitney tests. The effect of cycling variables in EF was calculated with Mann-Whitney, Pearson chi-square and Kruskal-Wallis tests. A p-value of ≤ 0.05 was considered statistically significant.

Results

General characterization and comparison between the two groups is summarized in Table 1. The subjects in group 1 were older (38.1 *vs* 30.5 years old; p = 0.001), and less individuals consumed alcoholic beverages (60% vs 79%, p = 0.018). The remaining variables did not differ between the 2 groups.

There was also no difference in the IIEF-5 total score between groups (22.45 *vs* 21.70; p = 0.071). Group 1 showed better results in question 3 of the IIEF-5, which concerns the ability to maintain erection after penetration (4.49 *vs* 4.14, p = 0.014).

Age and the presence of ED associated comorbidities were negative factors in the IIEF-5 total score in cyclists (p = 0.032 and p = 0.036, respectively) but not in footballers (p = 0.120 and p = 0.623, respectively). No other variables influenced IIEF-5 in the cycling group or in the football group when evaluated separately (Table 2).

The IIEF-5 total score ≤ 21 included 37.2% of cyclists and 26.6% of footballers (p = 0.164), with no difference regarding ED severity between the two groups (p = 0.173) (Table 3).

Regarding cycling specific variables (Table 4), there was no relation between IIEF-5 and number of hours per week of practice (p = 0.666), type of shorts (p = 0.254), type of saddle (p = 0.611), frequency of resting pauses (p = 0.288) and predominant position of the trunk while cycling (p = 0.371).

Table 1.
General characterization and homogeneity.

	Cycling (n = 199)	Football (n = 43)	P
ED associated comorbidities	76.8%	86.0%	0.208
Mean age (years)	38.1	30.5	0.001
Mean weight (Kg)	77.3	75.1	0.157
Mean BMI (Kg/m^2)	24.9	24.4	0.255
Alcohol consumption	60.3%	79.1%	0.018
Smoking	34.2%	46.5%	0.112

BMI: Body Mass Index.

Table 2.
Effect of Erectile Dysfunction associated variables on IIEF-5 total score by sport modality.

	Cycling IIEF-5	P	Football IIEF-5	P
BMI < 25 Kg/m^2				
Yes	22.57 (n = 119)	0.423	21.80 (n = 30)	0.759
No	22.26 (n = 80)		21.46 (n = 13)	
Alcohol				
Yes	22.24 (n = 119)	0.363	21.35 (n = 34)	0.200
No	22.75 (n = 80)		23.00 (n = 9)	
Tobacco				
Yes	22.27 (n = 67)	0.159	21.00 (n = 20)	0.081
No	22.54 (n = 132)		22.30 (n = 23)	
ED associated medication				
Yes	23.00 (n = 34)	0.565	22.13 (n = 8)	0.987
No	22.30 (n = 165)		21.60 (n = 35)	
ED associated comorbidity				
Yes	21.79 (n = 57)	0.036	21.73 (n = 11)	0.623
No	22.71 (n = 142)		21.69 (n = 32)	
Age				
≤ 20	22.67 (n = 9)	0.032	18.78 (n = 9)	0.120
21-30	23.08 (n = 37)		22.81 (n = 16)	
31-40	22.88 (n = 78)		21.08 (n = 10)	
41-50	21.67 (n = 55)		23.00 (n = 6)	
> 50	21.60 (n = 20)		21.50 (n = 2)	

BMI: Body Mass Index; ED: Erectile Dysfunction.

Table 3.
Erectile Dysfunction severity by sport modality.

ED severity (IIEF-5 score)	Cycling	Football	P
Severe ED (1-7)	n = 0; 0%	n = 0; 0%	0.173
Moderate ED (8-11)	n = 3; 1.5%	n = 0; 0%	
Mild-Moderate ED (12-16)	n = 7; 3.5%	n = 3; 7.0%	
Moderate ED (17-21)	n = 43; 21.6%	n = 13; 30.2%	
No ED (22-25)	n = 46; 73.4%	n = 27; 62.8%	

ED: Erectile Dysfunction.

Table 4.
Effect of cycling related variables on erectile function.

ED severity (IIEF-5 score)	Cycling	Football	P
Hours per week	< 5 (n = 73)	22.18	0.666
	5-8 (n = 75)	21.30	
	> 8 (n = 51)	21.67	
Shorts	Uncoated (n = 2)	23.00	0.254
	Gel (n = 107)	22.40	
	Sponge (n = 77)	22.34	
Saddle	Hard (n = 29)	22.70	0.611
	Gel (n = 105)	22.51	
	Sponge (n = 55)	22.32	
Continuous exercise until pause*	30 min (n = 29)	21.90	0.288
	60 min (n = 60)	22.49	
	120 min (n = 29)	23.28	
	No pauses (n = 92)	22.34	
Modality	Only cross-country (n = 136)	22.13	0.023
	Cross-country + road (n = 63)	23.13	
Perineal numbness	Yes (n = 50)	22.54	0.508
	No (n = 149)	22.42	
Predominant position	No (n = 64)	21.97	0.371
	30° (n = 4)	21.75	
	45°-60° (n = 124)	22.77	
	90° (n = 7)	21.57	

* *Time from start until stopping for rest.*

Athletes that also practice road cycling had better IIEF-5 scores (p = 0.023).
Perineal numbness during or after exercise was present in 25.1% (n = 50) of cyclists and 7.0% (n = 3) of footballers (p = 0.009). Athletes (both groups included) without perineal numbness (n = 189), with numbness during the exercise (n = 46) and with numbness only after exercise (n = 7) had an IIEF-5 score of 22.35, 22.46 and 20.43, respectively (p = 0.301). Regarding only cyclists, athletes without perineal numbness (n=149), with numbness during exercise (n = 46) and with numbness only after exercise (n = 4) had an IIEF-5 score of 22.42, 22.46 and 23.5, respectively (p = 0.752).

Discussion

We choose amateur footballers as a control group for two main reasons: 1) the aerobic metabolism is used in 90% of movements in football players and cycling is an aerobic sport (12, 13); 2) football might be the most practiced sport among Portuguese males.
Our study shows that amateur cycling does not cause erectile dysfunction, when compared with amateur footballers. Among cyclists, only age, presence of ED related comorbidities and the exclusive practice of cross-country cycling were related to lower IIEF-5 scores.
Age is strongly associated with ED, being erectile function reduced in men particularly after the age of forty due to multiple causes (14). In a study analysing a Spanish population, a culturally similar population to the one in our study, higher rate of ED was found when the IIEF-5 score was used versus direct questioning. A rate of 8.48% and 13.72% was found for men between 25-39 and 40-49 respectively, and rate almost doubled in men between 50-59 years (15). In our population with a median age difference of 8 years, the cycling group should in theory present with higher rates of ED that were not observed in our study.
In the 80s, some case reports began to relate cycling with sexual dysfunction (1). In the 90s, *Andersen et al.* showed a relation between cycling and ED (13% of 160 cyclists who rode in a 540 km touring race, but only 1.9% lasted more than a month) (8). In fact, ED and perineal numbness are the most common described bicycle related sexual symptoms in literature, occurring, respectively, in up to 24 and 61% of selected groups of riders (6). In relation to the possible pathophysiology responsible for this association, the most frequently proposed causes are vascular and nerve injuries. *Sommer et al.* described nerve entrapment and vascular occlusion related to continuous compression (compression of the pudendal nerve and pudendal arteries through *Alcock's canal*) as the more plausible cause (1).
Rider/saddle interaction, namely the type of saddle, shorts, preferential riding position, cycling modality (low impact vs. high impact) and hours of practice can explain possible different rate of cycling related ED.
We did not find ED differences between types of saddles or shorts, but we only evaluated coating. In literature, the saddle plays a major role in cycling related ED (6). The best saddle (for ED protection) seems to be a wide, unpadded, no nose saddle that allows proper placement of the sit bones (more weight on the ischial tuberosities and less on the perineal soft tissues) (1, 6, 16-21). A more horizontal or even downward-pointing position of the saddle has been associated with reduced pressure on the perineum (22). In relation to shorts, a study showed that the saddle is more important for compression than shorts pad, suggesting that cyclist should choose self-reported comfortable shorts (23). We also did not find ED differences between the rider preferential position, although there is some literature evidencing that the rider's position influences compression on perineal structures. Cycling in the seated position decreases perineal blood flow and this decrease is inversely related with body weight (1, 6, 10, 21). Cycling in a reclined position reduces compression, while leaning forward in the "*aero*" position (as the nose of the saddle bears almost all of the rider's weight) decreases blood flow by approximately 70% (10). Adjusting the handlebars, stem length and angle, and crank, has shown to have beneficial effect on perineal pressure. Related to position, riders should cycle in a more upright position and changing a seat to a "*standing*" position (1).
In our study, cyclists that only practiced cross-country had lower IIEF-5 score. Cross-country cycling (mountain bike) is associated with perineal numbness and incident ED, that can be explained by the vibrations associated with this modality (6, 9, 21).
In our study, cyclists had more perineal numbness, but that numbness did not lead to lower IIEF-5 scores. Numbness in perineum, penis, scrotum or buttocks, usually referred to as "*genital numbness*" is probably the most common and most recognized symptom of pudendal compression. Most of the times it is the only symptom or the earliest one to indicate compression syndrome. Genital numbness may occur unrelated to ED although cycling related ED is invariably associated with genital numbness, which may serve as a marker for increased risk for erectile dysfunction (24).
As in our study, recent works failed to show cycling as a risk factor for ED. An internet survey on 3932 cyclists showed that low and high intensity cyclists had better sexual function than swimmers and runners (25).
We also did not find IIEF-5 differences related to hours of practice per week (older studies, focused on elite long-distance riders, related intensive cycling with ED) (24). Marceau et al (7) investigated ED incidence in the general population, in recreational cyclists (< 3 hours per week) and in intensive cyclists (> 3 hours per week).
The ED incidence was 21%, 11% and 17%, respectively, showing that intensive cyclists may have worse erectile function than recreational riders (although both have better results than non-cyclists). A recent large-scale observational study on 5282 cyclists, also did not find differences in ED incidence between several intensity groups < 3.75, 3.75-5.75, 5.76-8.5, and > 8.5 hours/week) (26).
We must understand that the practice of sport can influence sexual behaviour, interfering with the hypothalamic-pituitary-testicular axis function. However, competitive sports can lead to both reproductive or sexual tract injuries, dysfunction that can be transient (genital pain, hypoesthesia of the genitalia, hypogonadism, ED, altered sexual drive, etc.) or permanent (hypogonadism, ED,

etc.), by direct action (traumas of the external genitalia, saddle-related disorders in cyclists, etc.) or indirect (exercise-related hypogonadism, drug abuse, doping, stress, etc.) (27). A recent systematic review and meta-analysis indicates that moderate-intense physical activity improves erectile dysfunction problems (28).
Results of a cross-sectional study show a sexual function benefit for those exercising at least 18 *metabolic equivalent* (MET) hours of activity weekly, an amount translating to 2 hours of strenuous exercise such as running or swimming, 3.5 hours of moderate exercise, or 6 hours of light exercise (29).
Our study has some limitations, namely its cross-sectional design (it does not evaluate the temporal sexual evolution of the athlete), the low number of athletes in the control group and age differences between groups with an average age difference of 8 years, as erectile disfunctions in strongly associated with age (although our older group did not present with higher rates of ED). We also did not evaluate all the important saddle characteristics (presence of nose, width, cut-outs) and we did not investigate cyclists that only practice road cycling. Another limitation was the higher percentage of alcohol and tobacco consumption in the football group, although when statistically analysed no significant difference was found.
The numbness outcome was self-reported and was investigated with a non-validated question. The questionnaire utilized was not validated but being the questions made in person by the researcher, the subjectivity was reduced. Another possible limitation is selection bias as healthier cyclist might have been chosen as there are the ones that usually participate in competing events, having been excluded cyclist in poorer condition and with more comorbidities. A final limitation might be the lack of questioning about the use of anabolic steroids, that alter erectile function. However, the authors believe that there was no important impact on the quality of the study by this, because the use of such substances is limited in the Portuguese population.

Conclusions

Amateur cycling has no effect on EF and the intensity of practice seems to have no influence on EF. However, cycling is associated with perineal numbness, but ED was not found in conjunction to this.

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