



## EPIDEMIOLOGICAL ANALYSIS OF PAINFUL MUSCULOSKELETAL SYMPTOMS AMONG GREEK COMPETITIVE ROAD CYCLISTS OF DIFFERENT AGE CATEGORIES.

<b>Panagiotis Gkrilias*</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece *Corresponding Author
<b>Athanasios Zavvos</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece
<b>Anastasios Koumpetsos</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece
<b>Charalampos Matzaroglou</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece
<b>Konstantinos Fousekis</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece
<b>Evdokia Billis</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece
<b>Elias Tsepis</b>	Technological Educational Institute (TEI) of Western Greece, School of Health and Welfare, Department of Physical Therapy, Aigio Achaïas, Greece

### ABSTRACT

This study aimed to determine the incidence rate of painful musculoskeletal symptoms in competitive road cycling athletes of different age categories.

The Greek version of the Standardized Nordic Questionnaire (SNQ) was completed by 74 Male cycling athletes, who competed in 3 different age categories (Under-23, Men, Master). Participants in SNQ were asked whether they had pain/discomfort in 9 different anatomical regions during the preceding 12 months and if those symptoms impeded their normal activity during the last year and the 7 previous days.

The higher incidence of pain/discomfort (12-month report) was reported for the neck region (44.6%) followed by the lower back (39.2%) and shoulders (33.8%), independently of age category. There were no statistically significant differences among three ages sub-groups for all SNQ parameters.

Present study highlights the need for specific injury prevention and rehabilitation programs in competitive road cycling athletes.

### KEYWORDS : Competitive road cyclists, Musculoskeletal disorders

#### Introduction:

The repetitive movements in cycling put cyclists at risk of overuse injuries, particularly to the lower extremities (Berkovich et al. 2010). A study concerned recreational cyclists showed that 85% of the cyclists reported one or more overuse injuries and 36% of which required medical attention. Miles/week, lower number of gears and low level of experience were associated with increased prevalence of such type of injuries (Wilber et al. 1995). Another study (Silberman, 2013) that evaluated professional road cyclists reported that 94% of them had suffered at least one overuse injury in the previous 12 months with the knee injury being the most common one. A study (Clarsen et al. 2010) of 109 professional cyclists from seven professional teams in the USA showed a prevalence of knee overuse injury of about 23% which resulted in significant time loss. Nevertheless, professional cyclists had a lower incidence of knee pain than the amateur cyclists, suggesting that experience is protective (Althunyan et al. 2017). Following previous findings, other studies (Dannenberg et al. 1996, Weiss 1985, Wilber et al. 1995) have evaluated overuse injuries and have found that the knee joint was the predominant site of injury, which accounted for the 24% to 62% of all injuries. Other overuse injuries such as back pain and neck pain have an incidence rate of 3% to 31% and 3% to 66%, respectively. Studies mentioned above concerned noncompetitive recreational cyclists, and for this reason, their findings cannot be considered that may be applied also to competitive cyclists, because of vast differences in cycling exposure/training load between recreational and elite cyclists. One survey of recreational cyclists reported an average annual training volume of 7114 km and an average participation rate of 2.9 noncompetitive events per year (Wilber et al. 1995). Contrary, professional cyclists reported riding between 25000 and 35000 km and 50 to 100 days of intense racing each year (Jeukendrup et al. 2000, Mujika and Padilla, 2001). Based on the above the purpose of the present study was to determine the frequency of musculoskeletal symptoms occurrence for any age category.

#### Methods:

The Greek version of the Standardized Nordic Questionnaire (Antonopoulou et al. 2004) (SNQ) was given to participants mainly during the official road cycling race in Greece. Participants in SNQ were asked whether they had pain/discomfort in 9 different anatomical regions (neck, shoulder, elbow, wrist/hand, upper back, lower back, hip/thigh, knee and ankle/foot) during the preceding 12 months and if those symptoms impeded their regular activity during the last year as well as the 7 previous days.

One-Way ANOVA analysis for independent samples was utilized to examine differences among the three age categories for the parameters of training age and training total time per week. Post-hoc comparisons for the two parameters mentioned above were performed with the usage of LSD test. Chi-square test among the three age categories was performed for the evaluation of SNQ results for each body region. All statistical analysis conducted with the usage of SPSS 20.0. The significant statistical level was set to  $p \leq 0.05$ .

#### Results:

The anthropometric traits for the total sample participants ( $n=74$ ) and the 3 ages sub-groups presented in Table 1. Also, Table 2 presents the differences among the 3 age sub-groups for parameters of training age and training total time per week.

**Table 1: Anthropometric traits for the total sample participants (n=74) and the 3 age sub-groups and sex sub-groups (U-23:n=21, Men: n=30, Master: n=23).**

Parameter (Average ± SD)	Total Sample (n=74)	U-23 (n=21)	Men (n=30)	Master (n=23)
Age (years)	30.8 ± 9.2	20.7 ± 1.2	30.1 ± 5.7	40.9 ± 6.0
Body Weight (kg)	71.8 ± 7.6	68.6 ± 4.7	71.5 ± 7.3	75.5 ± 8.9

Body Height (m)	1.76 ± 0.05	1.77 ± 0.04	1.77 ± 0.05	1.75 ± 0.06
BMI (kg/m <sup>2</sup> )	23.1 ± 2.3	21.9 ± 1.3	22.9 ± 2.1	24.6 ± 2.6

**Table 2: Differences among 3 ages sub-groups (U-23: n=21, Men: n=30, Master: n=23) for parameters training age and training total time per week.**

Parameter (Average ± SD)	Total Sample (n=74)	U-23 (n=21)	Men (n=30)	Master (n=23)	F- Value between groups	P-Value between groups
Training age (years)	10.9 ± 6.2	6.9 ± 2.5	11.2 ± 4.3a	14.2 ± 8.4b	9.256	0.000
Training total time per week (hours)	14.4 ± 5.1	16.9 ± 5.9	14.6 ± 3.5	11.8 ± 5.1 c, d	6.084	0.004

(a) Statistically significant difference between U-23 and Men (p = 0.010)

- (b) Statistically significant difference between U-23 and Master (p = 0.000)
- (c) Statistically significant difference between U-23 and Master (p = 0.001)
- (d) Statistically significant difference between Men and Master (p = 0.043)

The 12-month incidence rate of pain/discomfort was 44.6% in neck followed by the lower back (39.2%), shoulders (33.8%), hips/thighs (28.4%), knee (21.6%), wrists/hands (14.9%), upper back (9.5%), ankles/feet (6.8%) and elbow (4.1%). Those symptoms impeded athletes' normal activity (functionality) during the last 12 months with different prevalence rate per anatomical body region (neck: 37.8%, lower back: 31.1%, shoulders: 25.7%, hips/thighs: 20.3%, knees: 14.9%, wrists/hands: 12.2%, upper back: 5.4%, ankles/feet: 5.4% and elbows: 4.1%) (Table 3).

**Table 3: The results from the SNQ per body anatomical region for the total sample (n=74) and age sub-groups (U-23: n=21, Men: n=30, Master: n=23) competitive cyclists participated in the study.**

Body Region	Parameter	Total Sample (n=74)	U-23 (n=21)	Men (n=30)	Master (n=23)	Pearson Chi-Square	
						Value	Asymp Sig. (2-sided)
Neck	Pain Last 12 months (%)	44.6	52.4	46.7	34.8	1.464	0.481
	Function Problem Last 12 months (%)	37.8	33.3	46.7	30.4	1.711	0.425
	Pain Last 7 days (%)	21.6	23.8	26.7	13.0	1.509	0.470
Shoulder/s	Pain Last 12 months (%)	33.8	28.6	33.3	39.1	0.552	0.759
	Function Problem Last 12 months (%)	25.7	23.8	23.3	30.4	0.398	0.820
	Pain Last 7 days (%)	12.2	19.0	10.0	8.7	1.322	0.516
Elbow/s	Pain Last 12 months (%)	4.1	4.8	6.7	0.0	1.525	0.466
	Function Problem Last 12 months (%)	4.1	4.8	6.7	0.0	1.525	0.466
	Pain Last 7 days (%)	4.1	4.8	6.7	0.0	1.525	0.466
Wrist/s-Hands	Pain Last 12 months (%)	14.9	14.3	16.7	13.0	0.143	0.931
	Function Problem Last 12 months (%)	12.2	9.5	13.3	13.0	0.192	0.908
	Pain Last 7 days (%)	6.8	9.5	6.7	4.3	0.467	0.792
Upper Back	Pain Last 12 months (%)	9.5	9.5	3.3	17.4	3.004	0.223
	Function Problem Last 12 months (%)	5.4	9.5	3.3	4.3	0.999	0.607
	Pain Last 7 days (%)	2.7	4.8	3.3	0.0	1.023	0.600
Lower back	Pain Last 12 months (%)	39.2	38.1	40.0	39.1	0.019	0.991
	Function Problem Last 12 months (%)	31.1	28.6	36.7	26.1	0.766	0.313
	Pain Last 7 days (%)	21.6	19.0	30.0	13.0	2.323	0.313
Hip/s-Thigh/s	Pain Last 12 months (%)	28.4	33.3	30.0	21.7	0.791	0.673
	Function Problem Last 12 months (%)	20.3	23.8	23.3	13.0	1.080	0.583
	Pain Last 7 days (%)	13.5	23.8	16.7	0.0	5.754	0.056
Knee/s	Pain Last 12 months (%)	21.6	19.0	30.0	13.0	2.323	0.313
	Function Problem Last 12 months (%)	14.9	14.3	23.3	4.3	3.716	0.156
	Pain Last 7 days (%)	10.8	9.5	13.3	8.7	0.341	0.843
Ankle/s-foot/s	Pain Last 12 months (%)	6.8	9.5	10.0	0.0	2.423	0.298
	Function Problem Last 12 months (%)	5.4	4.8	10.0	0.0	2.570	0.277
	Pain Last 7 days (%)	1.4	0.0	3.3	0.0	1.487	0.476

**Discussion:**

Most frequent painful anatomical sites among Greek competitive road cyclists were the neck, lower back, and shoulders, with a 12-months prevalence rate of 44.6%, 39.2 %, and 33.8%, respectively. Furthermore, these painful symptoms that hindered the functional capacity of cyclists the last 12 month were precisely same (neck: 37.8, lower back: 31.1% and shoulders: 25.7%). Secondly, there were no statistically significant differences among three ages sub-groups for all SNQ parameters.

The results of the present study are different compared to Clarsen et al. (2010), who reported that the highest prevalence rate of pain was the lower back by 45% and followed by knee 23% and neck 10% while the shoulders were last, on contrary to our study were third. Also, another study (Silberman, 2013) indicated that the most common site for overuse injury was the knee among professional road cyclists (94%) in contrast with our study findings that the most common overuse injury anatomical site was the neck region (44.6%). Wilber et al. (1995) observed that the training load per week and low level of experience were associated with increased prevalence overuse injuries. The previous report is in agreement with our findings as the athletes in Master group had the highest experience and underwent the lower training load, presenting the lower prevalence overuse injuries in relation to other groups. Moreover, a recent study (Althunyan et al. 2017) showed that the professional cyclists had a lower prevalence of

knee pain than the amateur cyclists, indicating that experience may constitute a protective mechanism. In this study, the Master group, which had the most experience than others and mostly U-23 group, seemed to have the lower prevalence in the most parameters.

In conclusion, the high prevalence of musculoskeletal pain/discomfort (in specific body regions) in competitive road cycling athletes highlights the need for specific injury prevention programs. Especially, in the Greek competitive road cyclists was observed that the younger, less experience and with higher training load had a higher prevalence of musculoskeletal pain/discomfort in several anatomical sites compared to other groups. For this reason, the injury prevention and rehabilitation programs should be adapted to the needs of each age group.

**References:**

- Althunyan, A.K., Darwish, M.A., Abdel Wahab, M.M (2017). Knee problems and its associated factors among active cyclists in Eastern Province, Saudi Arabia. *Journal of Family & Community Medicine*, 24(1), 23-29.
- Antonopoulou, M., Ekdahl, C., Sgantzou, M., Antonakis, N., & Lionis C (2004). Translation and validation into Greek of the standardized Nordic questionnaire for musculoskeletal symptoms. *European Journal of General Practice*, 10, 35-36.
- Berkovich, Y., Nierenberg, G., Falah, M., & Soudry, M. (2010). Knee injury in cyclists. *Harefuah*, 149 (11), 726-728.
- Clarsen, B., Krosshaug, T., & Bahr, R. (2010). Overuse injuries in professional road cyclists. *American Journal of Sports Medicine*, 38, 2494-2501.
- Dannenber, A.L., Needle, S., Mullady, D., & Kolodner, K.B (1996). Predictors of injury among 1638 riders in a recreational long-distance bicycle tour: Cycle Across

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- Maryland. *American Journal of Sports Medicine*, 24(6), 747-753.
6. Jeukendrup, A., Craig, N., & Hawley, J. (2000). The bioenergetics of world class cycling. *Journal of Science and Medicine in Sport*, 4, 414-433.
  7. Mujika, I., & Padilla, S. (2001). Physiological and performance characteristics of male professional road cyclists. *Sports Medicine*, 31(7), 479-487.
  8. Silberman, M.R. (2013). Bicycling injuries. *Current Sports Medicine Reports*, 12, 337-345.
  9. Weiss, B.D. (1985). Nontraumatic injuries in amateur long distance bicyclists. *American Journal of Sports Medicine*, 13(3), 187-192.
  10. Wilber, C.A., Holland, G.J., Madison, R.E., & Loy, S.F. (1995). An epidemiological analysis of overuse injuries among recreational cyclists. *International Journal of Sports Medicine*, 16, 201-206.