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What Factors Influence the Injuries of Canoeists and Kayakers over the Years?

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Abstract: (1) Background: The purpose of this study was to analyze the number of injuries in the canoe and kayak disciplines. (2) Methods: A cross-sectional and retrospective epidemiological study was conducted on a convenience sample of elite canoeists and kayakers during the Spanish Championships of each canoeing and kayaking modality. Retrospective data were collected on the number, body area, type, and severity of injuries sustained in previous seasons, as well as other affiliation data. Four separate multiple linear regression models were used to investigate the impact of the sports mode of canoeing, age, and sex on the occurrence of injuries. (3) Results: The findings indicate a distinction in injury frequency between canoeing and kayaking modalities, with injuries being more common in canoeing. The occurrence of mild injuries decreases with age among canoeists, while remaining consistent in kayaking. As athletes age, confidence intervals increase. Canoeists have a higher injury probability, and across all injury types, men have a lower injury risk. (4) Conclusions: The frequency of injuries is higher in the canoe modality across all age groups. Coaches and athletes should be well-informed about the insights provided in this study to implement targeted injury prevention strategies, especially in women canoeists.

Keywords: canoe sport; prevalence; epidemiology; injury

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1. Introduction

Canoeing and kayaking are popular water sports that require a combination of physical fitness, technical skills, and physiological adaptations [1–3]. The prevalence of injuries in these sports is a concern, with studies identifying a range of acute and chronic injuries, influenced by factors such as skill level, weather conditions, and competition characteristics [4].

High-intensity interval training has been studied in canoe–kayak athletes, with a focus on the physiological responses to different training sessions, aiming to optimize both central and peripheral adaptations [5]. Additionally, the relationship between maturity status, anthropometry, and physical fitness has been explored in young elite paddlers, highlighting the importance of these factors in predicting performance [6].

Strength and anthropometric parameters have been found to be significant in canoe slalom male paddlers, emphasizing the role of strength in performance [7]. Furthermore, the associations between anthropometry, physical fitness, and sport-specific performance in young canoe sprint athletes have been investigated, considering the influence of age and sex [8].

Biological maturation and years of practice have also been identified as important factors in kayaking performance, indicating the need for a holistic approach to athlete development [9] and greater medical education to provide a better understanding of injuries and their rehabilitation [10]. The biomechanical process of canoeing can be segmented into

three distinct phases [4,11]: (a) the paddle's entry into the water, also known as the attack; (b) the application of maximum force during the middle part, referred to as traction; and (c) the paddle's exit from the water, termed extraction, and recovery. In the attack phase, the paddle is at its furthest distance from the canoeist, with the lower arm extended and the upper arm semi-extended above the head.

Moreover, the determination of anaerobic parameters in elite kayakers has been studied, shedding light on the physiological demands of the sport [12]. Additionally, the hearth risk associated with white water kayaking has been examined, emphasizing the need for safety considerations in extreme water sports [13,14]. Finally, the relationship between performance tests and body composition/physical strength characteristics in sprint canoe and kayak paddlers has been explored, providing insights into the physical attributes associated with performance [15]. Conversely, physical factors like overtraining and fatigue are the primary causes of injuries in competitive sports [16].

The purpose of this study was to analyze the relation between the number of injuries (in terms of frequency and severity) in canoe and kayak disciplines and their association with sociodemographic factors (age, gender) and sports variables (amount of training hours).

2. Methods

2.1. Study Design

This epidemiological study was observational, cross-sectional, and retrospective. This research obtained ethical approval from the Ethics Commission of the Faculty of Education and Sport Sciences, University of Vigo (code: 111/13/00).

2.2. Participants

This study was carried out in a convenience sample made up of elite canoeists and kayakers during the Spanish Championships of each canoe and kayak modality in 2023, and the questionnaire applied collected the lifelong injuries of kayakers and canoeists. In total, the sample was made up of 484 participants, of which 25.2% were canoeists. Table 1 describes the sample that participated in this research.

Table 1. Sample distribution.

CANOE				
Age	**Men**		**Women**	
	n	Mean ± SD	n	Mean ± SD
14–16	14	15.8 ± 0.36	6	15.8 ± 0.41
17–18	20	17.4 ± 0.50	9	17.55 ± 0.52
19–25	30	21.0 ± 1.85	5	20.4 ± 1.34
26–31	15	28.3 ± 1.04	2	26.0
32–40	15	36.1 ± 2.55	--	--
+40	5	45.4 ± 3.20	1	42.0
KAYAK				
Age	**Men**		**Women**	
	n	Mean ± SD	n	Mean ± SD
14–16	122	15.4 ± 0.70	80	15.2 ± 0.65
17–18	42	17.3 ± 0.48	34	17.3 ± 0.49
19–25	26	21.8 ± 2.38	10	22.0 ± 1.76
26–31	8	28.0 ± 1.51	4	27.5 ± 1.73
32–40	10	35.0 ± 2.75	4	25.5 ± 0.58
+40	18	48.0 ± 4.95	4	46.4 ± 0.59

2.3. Procedure

One month prior to the event, each club was sent a letter requesting their collaboration. This letter outlined the objectives of the research and the fieldwork procedure and provided a sample of the instrument to be used. On the eve of the championship, the purpose of this study was reiterated, and the data collection method was specified. Informed consent was required from all participants, and for minors, from their parents or legal guardians, ensuring the confidentiality and anonymity of the data.

2.4. Instruments and Variables

For data collection on injuries, the self-report models on sports injuries as described by Olmedilla et al. were employed [17], as well as the questionnaire developed by Díaz et al. [18]. Both methods were utilized to assess the injury history of the participants and to gather information about their sport and personal data. For the collection and classification of injuries, the following criteria were considered: number and severity, type, area, and time of occurrence. This provided retrospective information about the number, body area, type, and severity of the injuries sustained during previous seasons, as well as other affiliation data. To verify the accuracy of the injury diagnosis, an additional item indicated which healthcare professional had made the diagnosis and whether medical tests had been conducted on the participant.

The severity of the injuries was determined based on the following classification: (a) mild: required treatment or not and interrupted at least one day of training; (b) moderate: required treatment and compelled the canoeist to interrupt six days of training, and possibly some competition; (c) severe/very severe: resulted in one or more months of sports injury leave and required treatment and/or hospitalization, surgical intervention, and rehabilitation.

2.5. Statistical Analysis

To investigate the impact of the sports mode of canoeing (SMC), age, and sex on the occurrence of injuries, four separate multiple linear regression models were employed. In these models, SMC and age were treated as independent variables, while the total number of injuries (NOI) served as the dependent variable, with adjustments made for sex. Furthermore, interactions between SMC and sex were examined within each regression model.

Predictive margins, derived from the statistical regression model, were calculated to estimate the mean predicted values of the NOI (number of injuries). These predictive margins offer insights into the average NOI values associated with varying ages and SMC levels, while controlling for the effects of the variable of sex included in the regression model. All statistical analyses were carried out using Stata version 18.0.

3. Results

Figure 1 and Table 2 show that the total number of injuries experiences a slight decrease with age in the case of canoeists, remaining stable in kayakers. The results establish a differentiation in relation to the number of injuries in both modalities, with injuries being more frequent in the canoe modality.

The regression results suggest that men are less likely to become injured throughout their sports career (coeff = -0.02) although the results are not statistically significant (p value = 0.894). In relation to the modality, the regression coeff. is -1.64 (p value < 0.001), indicating the lower probability of becoming injured for kayak practitioners. Data from Table 2 and Figure 1 illustrate that the probability of sustaining a minor injury in canoeing decreases over time, dropping from 1.39 during the age range of 14 to 16 years to less than 0.80 for those over 53 years. Conversely, in kayaking, the likelihood of a minor injury is consistently lower across all age groups, with probabilities decreasing from 0.31 in the 14-to-16-year age group to 0.28 for those aged 50 years and above. These findings confirm that, irrespective of age, the risk of minor injury is lower in kayaking compared to canoeing.

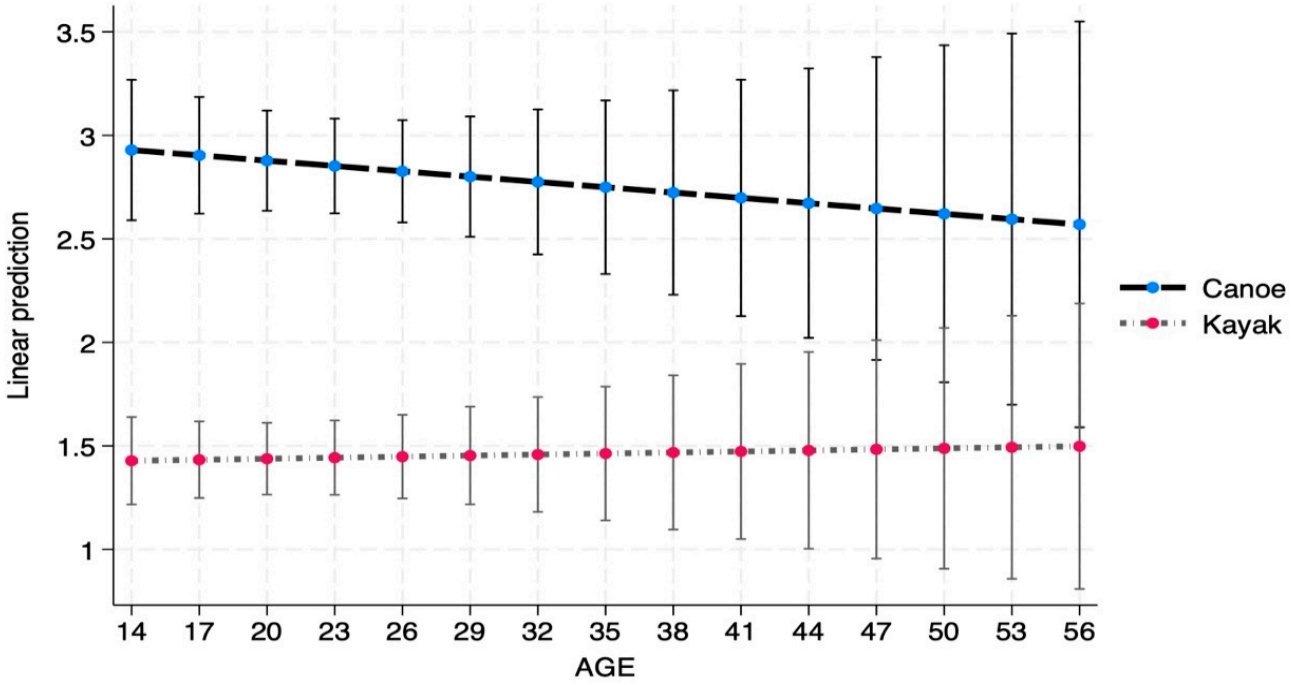

Figure 1. Graphical representation and trend of total injuries by modality and age, adjusted for gender.

Table 2. Marginal means of total injuries by modality and age, adjusted for gender.

	CANOE			KAYAK		
Age	**Mean**	**SE**	**CI 95%**	**Mean**	**SE**	**CI 95%**
14–16	2.93 *	0.17	(2.59–3.27)	1.43	0.11	(1.22–1.64)
17–19	2.90 *	0.14	(2.62–3.19)	1.43	0.09	(1.25–1.62)
20–22	2.88 *	0.12	(2.64–3.12)	1.44	0.09	(1.26–1.61)
23–25	2.85 *	0.12	(2.62–3.08)	1.44	0.09	(1.26–1.62)
26–28	2.83 *	0.13	(2.58–3.07)	1.45	0.10	(1.25–1.65)
29–31	2.80 *	0.15	(2.51–3.09)	1.45	0.12	(1.22–1.69)
32–34	2.78 *	0.18	(2.42–3.13)	1.46	0.14	(1.18–1.74)
35–37	2.75 *	0.21	(2.33–3.17)	1.46	0.16	(1.14–1.79)
38–40	2.72 *	0.25	(2.23–3.22)	1.47	0.19	(1.10–1.84)
41–43	2.70 *	0.29	(2.13–3.27)	1.47	0.21	(1.05–1.90)
44–46	2.67	0.33	(2.02–3.32)	1.48	0.24	(1.00–1.95)
47–49	2.65	0.37	(1.91–3.38)	1.48	0.27	(0.96–2.01)
50–52	2.62	0.41	(1.81–3.43)	1.49	0.29	(0.91–2.07)
53–55	2.60	0.45	(1.70–3.49)	1.49	0.32	(0.86–2.13)
56	2.57	0.50	(1.50–3.55)	1.50	0.35	(0.81–2.19)

Note. *: p value < 0.05.

The frequency of mild injuries decreases with age in the case of canoeists, while in kayaking, it remains constant over the years (Figure 2, Table 3). On the other hand, the confidence intervals increase as the age of the athlete progresses.

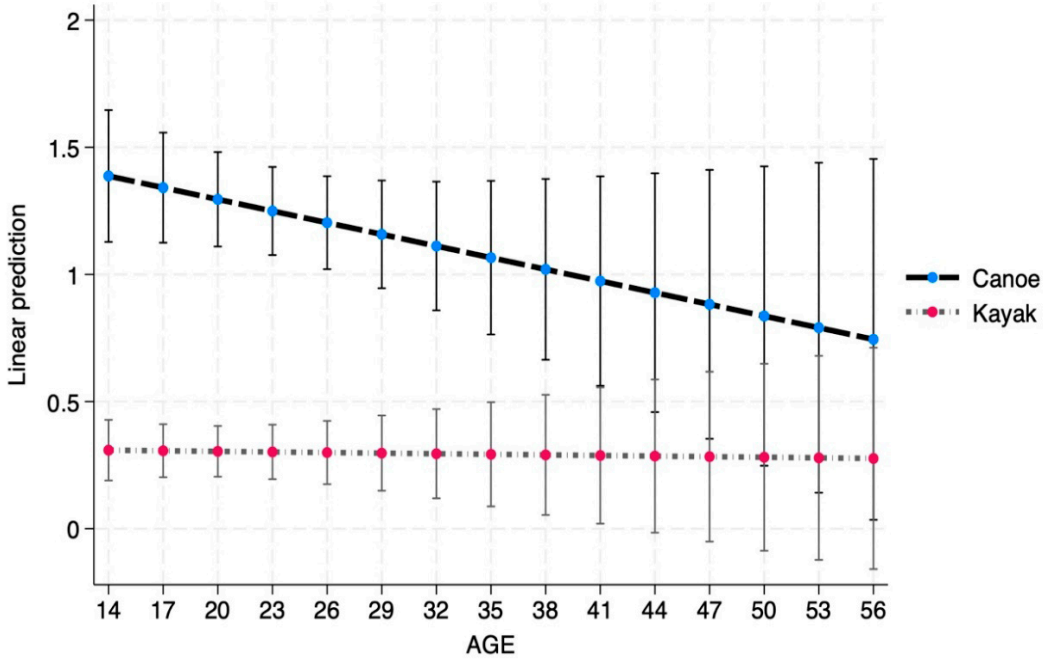

Figure 2. Graphical representation and trend of mild injuries by modality and age, adjusted for gender.

Table 3. Marginal means of mild injuries by modality and age, adjusted for gender.

	CANOE			KAYAK		
Age	**Mean**	**SE**	**CI 95%**	**Mean**	**SE**	**CI 95%**
14–16	1.39 *	0.13	(1.13–1.65)	0.31	0.06	(0.19–0.43)
17–19	1.34 *	0.11	(1.12–1.56)	0.31	0.05	(0.20–0.41)
20–22	1.30 *	0.09	(1.11–1.48)	0.30	0.05	(0.20–0.40)
23–25	1.25 *	0.09	(1.08–1.42)	0.30	0.05	(0.19–0.41)
26–28	1.20 *	0.09	(1.02–1.39)	0.30	0.06	(0.17–0.42)
29–31	1.16 *	0.11	(0.95–1.37)	0.30	0.08	(0.15–0.44)
32–34	1.11 *	0.13	(0.86–1.36)	0.29	0.09	(0.12–0.47)
35–37	1.07 *	0.15	(0.76–1.37)	0.29	0.10	(0.09–0.50)
38–40	1.02 *	0.18	(0.66–1.38)	0.29	0.12	(0.05–0.53)
41–43	0.97	0.21	(0.56–1.39)	0.29	0.14	(0.02–0.56)
44–46	0.93	0.24	(0.45–1.39)	0.29	0.15	(−0.02–0.59)
47–49	0.88	0.27	(0.35–1.41)	0.28	0.17	(−0.05–0.62)
50–52	0.84	0.30	(0.24–1.42)	0.28	0.19	(−0.09–0.65)
53–55	0.79	0.33	(0.14–1.43)	0.28	0.20	(−0.12–0.68)
56	0.74	0.36	(0.03–1.45)	0.28	0.22	(−0.16–0.71)

Note. *: p value < 0.05.

The highest frequency of injuries occurs in the age range of 14–16 years, when the athlete begins the activity (canoe); however, in kayaking, the marginal means remain constant, between 0.28 and 0.31. Differences are significant ($p < 0.05$) between 14 and 40 years.

Table 3 and Figure 2 illustrate that the likelihood of sustaining a moderate injury in canoeing decreases with age, from 0.89 between the ages of 14 and 16 years to less than 0.16 for those aged 53 years and older. In kayaking, the probability of a moderate injury

is lower than in canoeing until the age of 50, with values ranging between 0.12 and 0.22. However, this trend reverses after the age of 50, with the probability of injury increasing to 0.24 in kayaking and decreasing to 0.16 in canoeing. This suggests that kayaking is less likely to cause injury than canoeing until the age of 50 but becomes more injurious thereafter. Moderate injuries are more frequent in canoeists and decrease as age advances. Those in kayaking maintain a slight slope (Figure 3 and Table 4), with confidence intervals increasing with age. The marginal means of severe and very severe injuries increase with age, in both sports modalities, with confidence intervals overlapping in all age ranges (Figure 3 and Table 4).

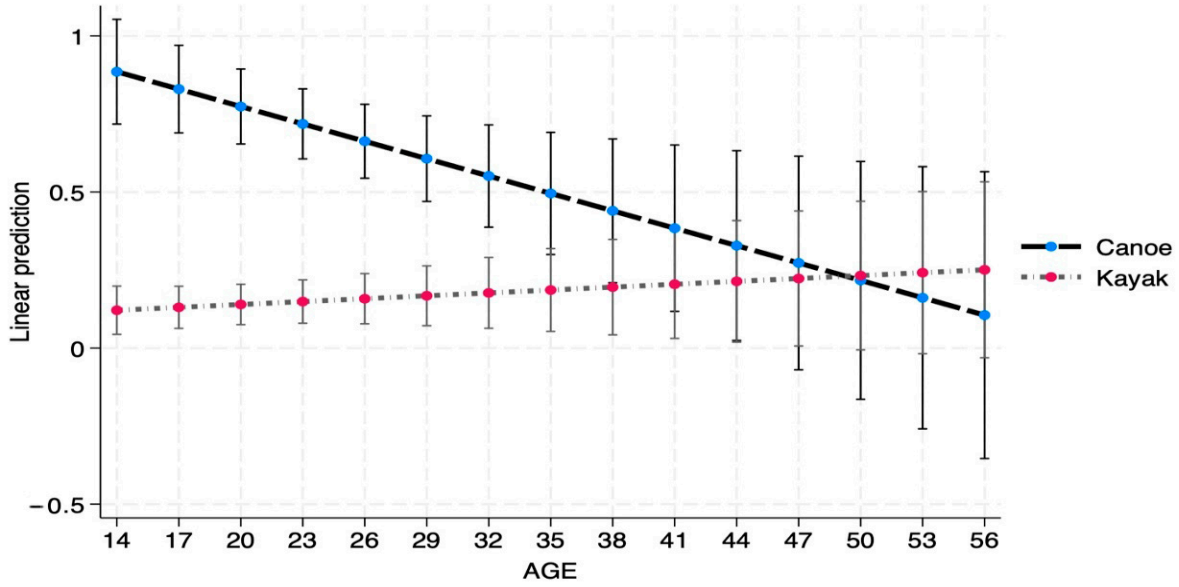

Figure 3. Graphical representation and trend of moderate injuries by modality and age, adjusted for gender.

Table 4. Marginal means of moderate injuries by modality and age, adjusted for gender.

	CANOE			KAYAK		
Age	**Mean**	**SE**	**CI 95%**	**Mean**	**SE**	**CI 95%**
14–16	0.89 *	0.09	(0.72–1.05)	0.12	0.04	(0.04–0.20)
17–19	0.83 *	0.07	(0.69–0.97)	0.13	0.03	(0.06–0.20)
20–22	0.77 *	0.06	(0.65–0.89)	0.14	0.03	(0.08–0.20)
23–25	0.72 *	0.06	(0.61–0.83)	0.15	0.04	(0.08–0.22)
26–28	0.66 *	0.06	(0.54–0.78)	0.16	0.04	(0.08–0.24)
29–31	0.61 *	0.07	(0.47–0.74)	0.17	0.05	(0.07–0.26)
32–34	0.55 *	0.08	(0.39–0.72)	0.18	0.06	(0.06–0.29)
35–37	0.50	0.10	(0.30–0.69)	0.19	0.07	(0.05–0.32)
38–40	0.44	0.12	(0.21–0.67)	0.20	0.08	(0.04–0.35)
41–43	0.38	0.14	(0.12–0.65)	0.20	0.09	(0.03–0.38)
44–46	0.33	0.15	(0.02–0.63)	0.21	0.10	(0.02–0.41)
47–49	0.27	0.17	(−0.07–0.61)	0.22	0.11	(0.01–0.44)
50–52	0.22	0.19	(−0.16–0.60)	0.23	0.12	(−0.01–0.47)
53–55	0.16	0.21	(−0.26–0.58)	0.24	0.13	(−0.02–0.50)
56	0.11	0.23	(−0.35–0.56)	0.25	0.14	(−0.03–0.53)

Note. *: p value < 0.05.

Table 4 and Figure 3 show that the probability of a severe or very severe injury in canoeing increases with age, from 0.12 at 14–16 years to more than 0.47 at 53 years or older. In kayaking, the trend is similar, but the probabilities are lower in all age groups until 50 years, ranging between 0.07 and 0.37. This suggests that the risk of severe or very severe injury increases with age in both sports, but more so in canoeing than in kayaking.

The marginal means of serious and very serious injuries increase with age, in both sports modalities, overlapping the confidence intervals in all age groups (Figure 4 and Table 5).

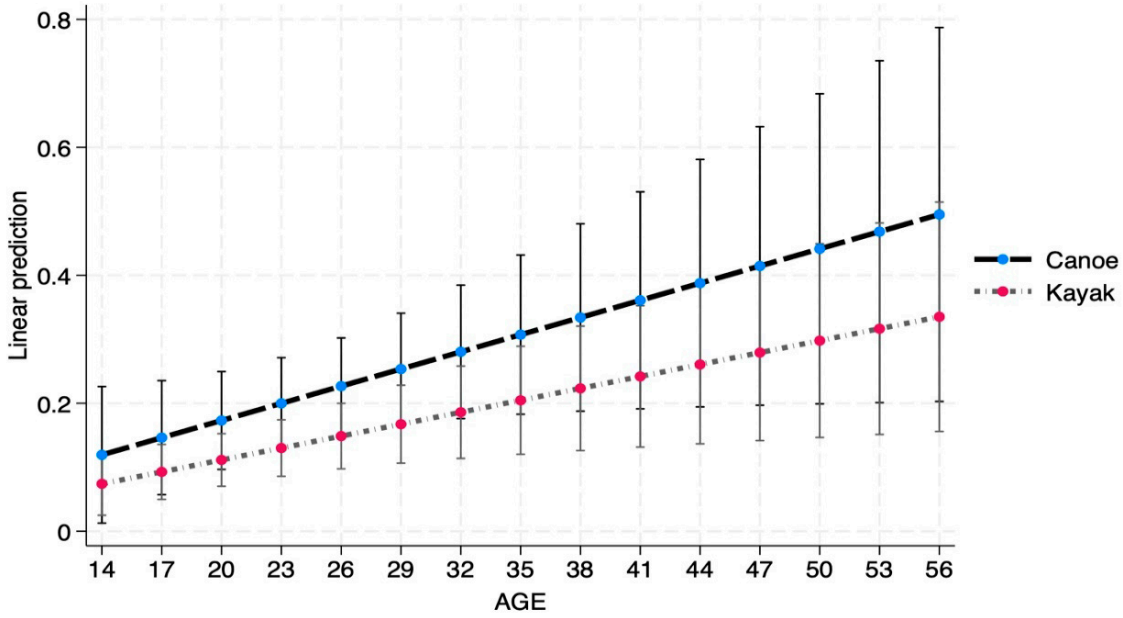

Figure 4. Graphical representation and trend of severe and very severe injuries by modality and age, adjusted for gender.

Table 5. Marginal means of severe and very severe injuries by modality and age, adjusted for gender.

	CANOE			KAYAK		
Age	**Mean**	**SE**	**CI 95%**	**Mean**	**SE**	**CI 95%**
14–16	0.12	0.05	(0.01–0.23)	0.07	0.02	(0.02–0.12)
17–19	0.15	0.05	(0.06–0.24)	0.09	0.02	(0.05–0.14)
20–22	0.17	0.04	(0.10–0.25)	0.11	0.02	(0.07–0.15)
23–25	0.20	0.04	(0.13–0.27)	0.13	0.02	(0.09–0.17)
26–28	0.23	0.04	(0.15–0.30)	0.15	0.03	(0.10–0.20)
29–31	0.25	0.04	(0.17–0.34)	0.17	0.03	(0.11–0.23)
32–34	0.28	0.05	(0.18–0.38)	0.19	0.04	(0.11–0.26)
35–37	0.31	0.04	(0.18–0.43)	0.20	0.04	(0.12–0.29)
38–40	0.33	0.07	(0.19–0.48)	0.22	0.05	(0.13–0.32)
41–43	0.36	0.09	(0.19–0.53)	0.24	0.06	(0.13–0.35)
44–46	0.39	0.10	(0.19–0.58)	0.26	0.06	(0.14–0.38)
47–49	0.41	0.11	(0.20–0.63)	0.28	0.07	(0.14–0.42)
50–52	0.44	0.12	(0.20–0.68)	0.30	0.08	(0.15–0.45)
53–55	0.47	0.08	(0.20–0.74)	0.32	0.08	(0.15–0.48)
56	0.50	0.15	(0.20–0.79)	0.07	0.02	(0.15–0.51)

Table 5 and Figure 4 indicate that the overall frequency of injuries is higher in canoeing, with values of 2.93 at 14–16 years and 2.57 at 53 years or older, compared to kayaking, which has values of 1.43 and 1.50, respectively. Therefore, canoeing has a higher probability of injury than kayaking across all age groups.

The marginal means of severe and very severe injuries increase with age, in both sports modalities, with confidence intervals overlapping in all age ranges. In relation to the modality, the probability of injury is higher in canoeists (mild injury: coeff. −1.28, p value −0.001; moderate: coeff. −1.06, p value < 0.001; severe/very severe: coeff. −0.01, p value 0.953). The differences are significant for mild and moderate injuries.

In all types of injury (mild, moderate, and severe/very severe), the probability of becoming injured is lower in men (mild injury: coeff. −0.107, p value 0.260; moderate: coeff. −0.054, p value 0.383; severe/very severe: coeff. −0.042, p value 0.279), although the statistical estimates are not significant.

Table 6 presents data on the average (mean and standard deviation) of training hours performed by week, according to the practice of canoeing or kayaking, the gender of the participants, and the presence or absence of mild, moderate, and severe/very severe injuries. In our study, we did not find a statistically significant relationship between the occurrence of injuries and the number of training hours carried out by canoeists and kayakers.

Table 6. Number of hours/week training and relation with injuries (Mild, Moderate and Severe/Very severe).

	CANOE				**KAYAK**			
	Men		**Women**		**Men**		**Women**	
INJURY	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
	9.2 ± 3.1	9.1 ± 3.3	8.7 ± 2.5	9.1 ± 3.4	8.7 ± 2.8	9.8 ± 2.5	8.6 ± 3.2	8.8 + 3.7
MILD	8.9 ± 3.2	---	8.6 ± 3.10		8.8 ± 2.8	---	8.5 ± 3.3	
1	---	9.6 ± 3.4	---	7.0 ± 3.6	---	9.8 ± 2.0	---	9.1 ± 3.8
2	---	9.2 ± 3.3	---	11.5 ± 1.7	---	9.1 ± 2.5	---	8.5 ± 4.3
3	---	7.7 ± 2.3	---	11.5 ± 3.5	---	13.5	---	---
4	---	9.9 ± 3.5	---	8.8 ± 2.5	---	---	---	---
5	---	9.0 ± 4.2	---	10.3 ± 4.6	---	---	---	---
MOD	9.1 ± 3.1	---	8.0 ± 3.5	---	9.2 ± 2.8	---	8.7 ± 3.3	---
1	---	9.1 ± 3.8	---	9.7 ± 3.4	---	8.6 ± 1.7	---	9.7 ± 3.3
2	---	9.1 ± 3.2	---	8.8 ± 2.5	---	7.5 ± 2.5	---	3.3 ± 0.9
3	---	8.8 ± 5.7	---	10.5	---	---	---	---
4	---	9.3 ± 2.0	---	13.5	---	---	---	---
SEVERE	9.3 ± 3.3	---	8.6 ± 3.2	---	9.0 ± 2.7	---	8.6 ± 3.5	---
1	---	7.9 ± 2.9	---	11.3 ± 3.8	---	9.8 ± 3.2	---	8.7 ± 3.6
2	---	7.6 ± 1.9	---	10.3 ± 4.6	---	---	---	10.5
3	---	2.5	---	---	---	---	---	---

4. Discussion

The purpose of this study was to analyze the relation between the number of injuries (in terms of frequency and severity) in canoe and kayak disciplines and their association with sociodemographic factors (age, gender) and sports variables (amount of training hours).

In the literature [1,15,19], it was found that older and younger kayakers experienced more frequent injuries compared to those in intermediate age groups. Specifically, younger kayakers tended to suffer more impact injuries, whereas expert kayakers were prone to overuse injuries. In our study, we observed that the likelihood of injury among kayakers was generally low across all age groups, with minimal differences between younger and older individuals. However, canoeists faced a higher likelihood of injury compared to kayakers in all age groups. Interestingly, this likelihood decreased with age, as evidenced

by the data we collected. Notably, the probability of sustaining a minor injury in canoeing decreased over time, spanning from the age range of 14 to 16 years to those over 53 years.

Conversely, in kayaking, the likelihood of minor injury remains consistently lower across all age groups, with probabilities decreasing from the 14-to-16-year age group to those aged 50 years and above. These findings [20,21] confirm that, regardless of age, the risk of minor injury is lower in kayaking compared to canoeing. These data align with previous research which discovered that most injuries among canoeists were of mild severity and short duration, unrelated to sex or age. They observed that paddlers participating in both long-distance and short-distance seasons experienced more injuries than those solely engaged in sprint races.

In our study, we found that female canoeists sustained more injuries than males, particularly between the ages of 14 and 40. In the literature [22,23], a higher injury rate is reported in women. The data illustrate that the likelihood of sustaining a moderate injury in canoeing decreases with age, from the ages of 14 and 16 years to those aged 53 years and older. In kayaking, the probability of a moderate injury remains lower than in canoeing until the age of 50. However, this trend reverses after the age of 50, with the probability of injury increasing in kayaking and decreasing in canoeing. This suggests that kayaking is less likely to cause injury than canoeing until the age of 50 but becomes more injurious thereafter.

Regarding training, in the literature [24,25], it was observed that the greater the number of high-intensity training sessions during the competitive period (per week), the higher the likelihood of athletes potentially suffering an injury. Results indicated that canoeists who engaged in three or more high-intensity training sessions per week were more susceptible to injuries, with the greatest risk occurring in the months leading up to competitions. Most injuries are attributed to overuse [21,26,27], and many can be traced back to training errors or equipment-related issues. These findings emphasize the critical role of effectively managing training loads and ensuring adequate recovery to mitigate the prevalence of injuries among canoeists [1,28,29]. For physicians caring for injured athletes, a comprehensive understanding of canoeing mechanics, equipment, biomechanics, and training protocols is essential [30,31].

In our study, we discovered that the likelihood of severe or very severe injuries during canoeing increases with age. A similar trend is observed in kayaking, although the probabilities remain lower across all age groups until 50 years. This implies that the risk of severe or very severe injuries rises with age in both sports, but more prominently in canoeing than in kayaking. Physically demanding and appropriately tailored training regimens may serve as protective measures against injuries [32]. However, one trade-off associated with high training loads is often considered to be an increased risk of soft tissue injuries. To mitigate this risk, training loads could be reduced to minimize the incidence of injury [33]. Nevertheless, it is essential to recognize that excessively low training loads have also been linked to a heightened risk of further injury. Notably, rapid, and excessive increases in training loads likely contribute significantly to non-contact soft tissue injuries [34].

Our data indicate that the overall frequency of injuries is higher in canoeing compared to kayaking across all age groups. However, we found no statistically significant relationships with the number of hours of training per week. Professional canoeists experience relatively fewer injuries than athletes in other water sports [26]. Although most of the injuries are not severe, a significant percentage of them range from moderate to severe. These researchers [31,32] found that sprains and strains are the most common injuries in canoeing, followed by spinal and arm or wrist injuries. Additionally, a higher percentage of injuries occur in long-distance canoeists compared to other reported injuries. Regarding the injury rate in men and women, it was higher in the latter.

Previous research has analyzed the potential causes of differences in injury rates [22,33], attributing them to intrinsic factors that often interact with extrinsic factors at the time of injury. Training and competing at the elite level impose significant stress on the individual.

Canoeists, especially elite ones, encounter many of the typical issues observed in sports medicine [4,11]. The specific medical challenges in canoeing are often linked to environmental factors, particularly accidental turnovers during training or competition. Many elite paddlers aim to train year-round on the water. Prolonged exposure leads to skeletal muscle weakness, diminished thermoregulation capacity, and the risk of hypothermia [1,4,15,33].

Some studies have established that older elite athletes experience a higher incidence of injuries due to the intense nature of their activities [31,34]. The substantial number of reported injuries in both men and women may be associated with the high training volumes undertaken [5,15,32,34]. More than half of women reported engaging in five or more training sessions per week, highlighting the significance of training frequency as a factor in injury etiology. This increased volume of workloads contributes to the injury risk [33,35,36]. Canoeing, a sport that primarily engages the upper body, has been extensively studied [20]. Competitions typically result in a pattern of mild injuries affecting the upper limb, which is the area with the highest reported injury rates in various studies [18,19,23], potentially leading to permanent damage. The results suggest that the number of injuries decreases as technical execution improves, a trend likely influenced by accumulated years of training [1,19–21].

Therefore, canoeing has a higher probability of injury than kayaking in young paddlers. Previous research has analyzed the potential causes of injury differences, attributing them to intrinsic factors that often interact with extrinsic factors at the time of injury [20,24]. The interplay of these risk factors predisposes athletes to common injuries in both kayaking and canoeing. Conversely, physical factors such as overtraining and fatigue are the primary causes of injuries in competitive sports [15,21]. In our study, we did not identify a statistically significant relationship between the occurrence of injuries and the number of hours of training performed by kayakers and canoeists.

Due to the retrospective nature of this study, it had some limitations that should be considered when interpreting the results. This study is based on a convenience sample, which limits the generalizability of the findings. Some canoeists (especially younger ones) did not recall the total number of injuries sustained at different stages of their lives, and some injuries were not diagnosed by specialized physicians. Consequently, these cases had to be excluded from the sample due to non-compliance with inclusion criteria. If objective measurements are taken and medical records are consulted at the same time as a questionnaire is administered, the accuracy of reported injuries could be improved, which in turn would reduce research bias. As demonstrated in Tables 2–4, the results are significant up to the age of 40. This may be attributed to the fact that the sample size (n) decreases from the age of 30, leading to overlapping confidence intervals. This overlap introduces a bias into the research results.

Nevertheless, this research undoubtedly provides contemporary insights into the typology of injuries and the socioeconomic factors influencing their occurrence in canoeists and kayakers. The study participants with very severe injuries constituted the smallest percentage of the sample. This phenomenon could be attributed to the possibility that most canoeists with severe injuries may have discontinued the sport, thus failing to complete the questionnaire. Although the sample was representative, encompassing nearly all individuals in Spain who participate in this discipline and meet the inclusion criteria, this population remains significantly smaller than the male population, particularly among female canoeists. This study did not specifically examine injury types or whether they resulted from traumas; these variables will be analyzed in future research.

Canoeists and kayakers require prevention programs specifically targeting injuries that can result in permanent damage. To optimize canoeing performance, it is essential to conduct larger studies that include enough participants across all age groups and genders from canoe and kayak competition categories. The results identified in this work serve as a starting point for future research aimed at identifying and quantifying performance predictors in kayak and canoe competitions.

5. Conclusions

- The frequency of injuries is higher in the canoe modality across all age groups.
- The number of mild and moderate injuries decreases with age in the canoe modality; however, the likelihood of sustaining a severe injury increases with age in both modalities.
- As our data and those of other researchers suggest, it is crucial to prevent the occurrence of various types of injuries, particularly mild ones, which are most observed in women engaged in canoeing. In this context, additional information is necessary to adapt training programs to meet the specific needs of canoeists and kayakers. This includes a focus on symmetrical compensation work, particularly for female canoeists. Coaches and athletes should be thoroughly informed about the insights provided by this study to implement targeted injury prevention strategies, especially as athletes age.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy.

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