

Jockey injuries during the Siena “Palio”. A 72-year analysis of the oldest horse race in Italy



Mattia Fortina^{a,*}, Pietro Maniscalco^b, Christian Carulli^c, Luigi Meccariello^d, Giovanni Battista Colasanti^a, Serafino Carta^a

^a Department of Orthopaedics and Traumatology, University Hospital of Siena, V.le Bracci, n° 14-16, 53100 Siena, Italy

^b Department of Orthopaedics and Traumatology, Guglielmo da Saliceto Hospital, Piacenza, Italy

^c Orthopaedic Clinic, University of Florence, Florence, Italy

^d Department of Orthopaedics and Traumatology, Vito Fazzi Hospital, Lecce, Italy

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ABSTRACT

Introduction: Horse racing is a hazardous sport. We analyzed the incidence and characteristics of jockey injuries in a typical horse race.

Methods: We analyzed all injuries sustained by 14 jockeys in the last 72 years.

Results: It was found that in 6.1% of the races there was at least one fall and in 28.6% of the races 50% or more of the jockeys fell. In 4% of the falls the jockey was taken to the emergency room. Comparing the *Palio* with traditional races in other countries a higher injury incidence rate was observed for every 100 falls (109.884 vs 200) and a lower concussion rate/100 falls (0.97 vs 1.8–7.4).

Conclusion: The *Palio* is one of the most threatening races that continues today. Jockeys are at greater risk for a fall than any other in the world.

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Introduction

The “*Palio*” is the most ancient horse race in Italy, held each year around “*Il Campo*,” the main town square of Siena (Tuscany, Italy). The first documented circumscription in the present site took place in 1581, but other sites of the town were used for races as early as 1238 [1]. A more ancient document, a pediment dated to the sixth century BC, was located near Siena representing a series of aligned bareback mounted knights, equipped only with whips and caps, intent to mount a muscled horse. The city of Siena is divided into 17 districts named “*Contrade*”: each one has its own flag and Patron Saint. The districts’ pronounced competitiveness dates back a millennium and disputes among them were often settled by actual battles. The *Palio* is a vestige of this ancient period where 10 *Contrade* fought against each other. Today, the 7 *Contrade* that did not compete in the previous *Palio* are automatically included in the next race, while a drawing determines 3 additional *Contrade* to make a total of 10 per race.

The *Palio* is typically defined as a bareback race: stirrups and saddles are not allowed, and horses have only a bit and reins. Jockeys wear an old-style helmet and, in recent years, a chest protector. The only rule is that jockeys cannot grab the reins of other riders; otherwise they are allowed to do almost anything else during the race, such as whip other jockeys—and they usually do. If a horse finishes first, even without its rider, it wins the race and the represented *Contrada* wins the *Palio*.

Horse races are considered one of the most dangerous sports, with reported rates of accidental death higher than in motorsports [2]. Head trauma is reported to be one of the most frequent lesions for the jockey, being higher than reported in American football and boxing [3]. The *Palio*, in consideration with its rules and racetrack, is expected to be one of the most threatening and dangerous sporting events for jockeys.

The aim of this work is to identify specific patterns of injuries and to estimate the rate of injuries among professional jockeys, comparing the results with other traditional horse races.

Material and methods

All data from 1945 to 2017 was analyzed from the archives of the “Society for the Safeguard of the Palio of Siena,” who provided authorization to the authors. The Review Board of the authors’ institution, part of the state-run health care of the *Palio*, authorized

* Corresponding author.

E-mail addresses: mattiafortina@me.com (M. Fortina), p.maniscalco@ausl.pc.it (P. Maniscalco), christian.carulli@unifi.it (C. Carulli), dlordmec@gmail.com (L. Meccariello), colasanti.gb@outlook.com (G.B. Colasanti), cartaserafino@hotmail.com (S. Carta).

the retrospective study. No specific ethical approval was required since this is not a clinical study.

We performed a cross check with the medical records of the local hospitals to identify all admissions of jockeys on the day of the competition and the day after. Inclusion criteria: trauma derived from a collision against the border of the racetrack or from a fall off a horse for any reason during the race. Exclusion criteria: trauma derived from direct hits from another jockey or from spectators. For the purposes of this study, an injury is defined as one that required a transport to the hospital as a result of a fall. Injuries not treated at hospitals were not recorded, hence minor traumas were usually not reported. All the patients provided written, informed consent.

In the 72-years analyzed, 154 races were run by 155 jockeys performing, overall, a total of 1508 rides; on 32 occasions, one of the jockeys could not participate in the competition due to disqualification of the *Contrada*, or difficulties relating to the horse.

The *Palio* usually takes place two times a year on July 2nd and August 16th. Only an exceptional event could warrant an extra race in the same year. The race takes place in the external part of the town square, which has a unique, shell-like shape (Fig.1). The track measures 339 m in length with two main curves. The first curve, “*San Martino*,” is at a 95° angle with a downward slope of 8%, and an incline from the lateral border to the inner one between 95 and 100 cm; the second one, “*Casato*,” is at a 92° angle with an upward slope of 12.5%. The race consists of three laps and lasts an average of 75 s (range: 72–89 sec); however, the starting procedure named the “*Mossa*,” during which the jockeys fight to maintain their position on the starting line, can last even over an hour.

Only Thoroughbred horses have been ridden in competition; however, once the Quarter Horse was introduced in the 2000, Thoroughbred disappeared within a couple of years.

Statistical analysis

Descriptive statistics were used to summarize the data. Distribution of the variables is given as percentage, mean, range, and Standard Deviation (SD). Incidence rates were compared by calculating the incidence rate ratios (IRR) and 95% confidence intervals were provided for the IRR. Statistical analysis was performed using the free online Statistical Package OpenEpi, version 3.03.

Results

During the 154 races, 516 falls were registered, and the date of competition showed an increase in the number of incidents per races. The number of races with at least one fall was 148 (96.1%). The number of falls ranged from 1 to 10 per event, and 44 of these (28.6% of the total races) included 5 or more jockeys falling. The majority of falls happened during the first lap (247 - 47.9%), and the *San Martino* curve (301 - 58.3%) was the most dangerous turn (Table 1).



Fig. 1. The racetrack in the main town square “Il Campo”. 1: the starting zone, named the “Mossa”; 2: the “San Martino” curve; 3: the “Casato” curve.

Table 1
Falls distribution per site and lap, data from 1945 to 2017.

Lap	Mossa	1 st lap	2 nd lap	3 rd lap
Site	12	S Martino: 132 Casato: 109 Other: 6	S Martino: 102 Casato: 50 Other: 4	S Martino: 67 Casato: 31 Other: 3
Tot	12 (2.3%)	247 (47.9%)	156 (30.2%)	101 (19.6%)

Of the 155 jockeys followed, 132 (85.16%) reported at least 1 fall and 90 (58.06%) had two or more falls. The mean and median numbers of falls per jockey were 3.9 (SD +/- 3.69), and 3 (range 1–19) respectively. A jockey fall occurred at a mean of 2.92 rides. Only twenty-three jockeys never fell, but 67 of them ran only once in their career. Main causes of injury included: falls due to excessive g-force, the horse falling, hits against the borders of the racetrack or other horses or being trampled by other horses (Fig. 2).

Of all falls, 43.4% required transport of the jockey to a hospital, representing 224 riders who accessed the emergency room: 81 of which were hospitalized and the others were discharged the same day, with a mean of 2.5 injuries each (range: 1–7). Bruises and abrasions were the most frequent injuries (71.5% of the total), mainly located on the right side (58.6%) and on the upper extremities. Fractures and dislocations, classified as severe lesions, represented 14% of all injuries, equally distributed to arms and legs (Table 2).

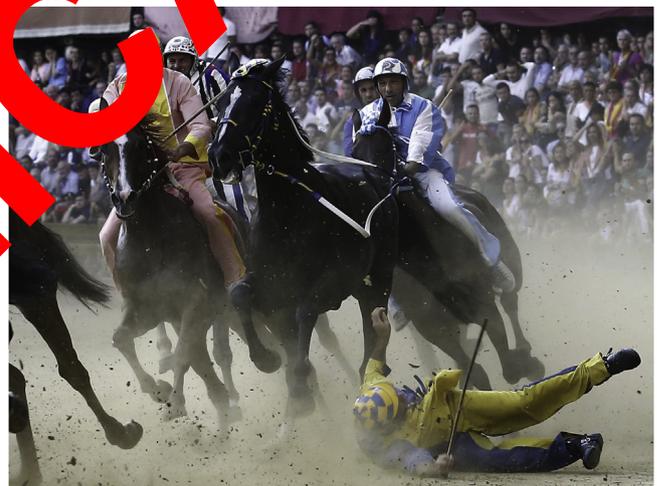


Fig. 2. Once fallen, the jockey could be trampled by other horses.

Table 2
Data related to injuries occurred at the 224 jockeys admitted to Emergency Room.

Type of injuries	n	% of total	Site of fracture	Right	Left
Bruises	251	44.3%	Ribs	3	2
Abrasions	154	27.2%	Clavícula	1	3
Fractures	62	10.9%	Forearm	1	3
Dislocations	7	1.2%	Wrist	2	2
Sprains	38	6.7%	Scaphoid	3	2
Wounds	39	6.9%	Fingers	4	3
Concussions	5	0.9%	Patella	5	0
Others	11	1.9%	Tibia	6	6
Tot	567	31.4% left 68.6% right	Ankle	5	7
Severe injuries (fractures, dislocations)	69	50.7% left 49.3% right	Pelvis	2	2

Table 3Injury statistics and injury rates for the *Palio*, compared with the professional jump and flat racing in Ireland (IRL) and Britain (GB). *: 95% CI.

	Palio	Flat Racing GB	Flat Racing IRL	Flat Racing Tot	Jump Racing GB	Jump Racing IRL	Jump Racing Tot
Races	154						
Rides	1508	317953	67808	385761	232539	127686	360225
Falls	516	1323	253	1576	15856	6093	21949
Injuries	567	535	101	636	2810	751	3561
Concussions	5			56			419
Dislocations	7			2			62
Fractures	62			64			614
Fall incidence/ride (%)	34.218 (31.33-37.30)*	0.416	0.373	0.409	6.819	4.772	6.093
Injury incidence/fall (%)	109.884 (101.00-119.00)*	40.438	39.921	40.355	17.722	12.326	16.224
Injury incidence/ride (%)	37.599 (34.60-40.80)*	0.168	0.149	0.165	1.208	0.588	0.989
Concussions/1000 rides	3.32 (1.22-7.35)*			0.15			1.16
Dislocations/1000 rides	4.64 (2.03-9.18)*			0.01			0.17
Fractures/1000 rides	41.11 (31.80-52.40)*			0.17			1.70

Table 4Comparisons of fall and injury rate ratios for the *Palio* with the professional jump and flat racing in Ireland (IRL) and Britain (GB).

		sd (lnIRR)	95% CI
Palio/Flat GB	Falls/rides IRR	82.23	0.05
	Injuries/falls IRR	2.72	0.08
	Injuries/rides IRR	223.45	0.06
Palio/Flat IRL	Falls/rides IRR	91.71	0.08
	Injuries/falls IRR	2.75	0.08
	Injuries/rides IRR	252.43	0.11
Palio/Flat TOT	Falls/rides IRR	83.75	0.05
	Injuries/falls IRR	2.72	0.08
	Injuries/rides IRR	228.06	0.06
Palio/Jump GB	Falls/rides IRR	5.02	0.04
	Injuries/falls IRR	6.20	0.08
	Injuries/rides IRR	31.11	0.05
Palio/Jump IRL	Falls/rides IRR	7.17	0.05
	Injuries/falls IRR	8.91	0.08
	Injuries/rides IRR	63.93	0.06
Palio/Jump TOT	Falls/rides IRR	5.62	0.04
	Injuries/falls IRR	6.77	0.08
	Injuries/rides IRR	38.03	0.06

The injury statistics are shown in Table 3 and compared with the results from a review of injuries from events of Great Britain and Ireland from 1992 to 2000 [4].

Discussion

Horse races have great popularity and diffusion worldwide, being a sport with high spectators. Despite the attractiveness of this sport, it is highly dangerous for riders; however, in literature, few papers report information about the incidence and type of injuries suffered by professional jockeys.

We found an incidence of falls/ride (%) of 34.218, which is very high if compared to the data reported by Turner et al [4], in which an incidence between 0.373 and 6.819 arose. Compared to the



Fig. 3. A jockey "flying" over his horse.

jump races in Britain, the *Palio* has a 50% greater risk of falling and reaches 91 times greater when compared to flat racing in Ireland. Of note, in the paper, authors considered injuries occurring before or just after the competition. Therefore, we decided to compare our data with this work since the *Mossa*, the starting procedure, can last an hour or longer, and the jockeys may incur injuries during this time. Comparing the present results with other works reporting only injuries during the race, the difference becomes even larger. In California, [5] Hitchens and colleagues reported an incidence of falls/ride (%) of 0.16-0.18, similar to rides in Australia [6] and Japan [7].

The injury incidence for every 100 falls during the *Palio* is 109.884, which is greater than in California (51–59), Europe (34–40), and Australia (27) [5].

Considering that 567 injuries occurred to 224 jockeys, the actual injury incidence/fall (%) is 43.411, which is similar to other countries.

The injuries reported during the *Palio* are distributed to every part of the body with varying degrees of severity. This could be explained by different mechanisms of injury such as: the presence of many competitors in close contact with each other or the height and speed reached (mean 48.8 kph) in a particularly narrow space (Fig. 3). In a video-analysis study performed in Australia, the registered impact velocities ranged from 30 to 50 kph, with heights up to 3.5 m [8].

The 62 fractures represent 10.9% of all injuries, which are less than the 29.7% reported for cross-country races [9] or the 46% registered in Australia [10]. The number of fractures for every 1000 rides (41.11) remains very high during the *Palio* if compared to flat (0.17) or jump racing (1.70). The number of ankle fractures (12, 17.4%) is very high if compared to other reports that, counting also soft tissue lesions, reach only 10.7% [11]. During the *Palio*, jockeys cannot use boots or saddles, wearing only light shoes to increase the feeling against the horse. Of all injuries, 0.88% involved a concussion, with a concussion rate of 0.97 per 100 falls: these values are lower than reported in the literature. Turner et al [4] reported a concussion rate for every 100 falls of 1.8 for jump racing in Great Britain and 7.4 for flat racing in Ireland respectively. Other data from Britain, France, and Ireland [12] state that of the 15% of concussive head injuries reported, more than half were associated with loss of consciousness.

A typical *Palio* injury, that is not reported in other races, is the fracture of the right patella (5 on 516 falls, 0.97%), which is caused by a direct hit against one of the several stone columns that outlines the inner border of the racetrack. No femoral neck fractures were recorded, even though flat jockeys appear to have a significantly lower femoral bone density with respect to male jump jockeys and female flat jockeys [13]. Therefore, proximal femoral

fractures, often burdened by severe complications, seem not to be a typical rider fracture [9,14]. Similarly, spine fractures and death were not reported during a *Palio* ride, while in Australia 0.16% of the falls resulted in death [6].

Injury risks for professional jockeys are higher than in other sports (0.88% per competitor per event) [9]: the *Palio* presents higher percentage of injury risk per jockey per event (1.45%) and risk per ride (14.8%), significantly more than other rates reported even for professional rodeo riders (11%) [15].

Conclusions

The *Palio* appears to be one of the most hazardous horse races ever, but its unpredictability is one of the most captivating aspects that attracts visitors from all over the world. Jockeys are exposed to the highest risk of a fall compared to any other race in the world. In the last few years, the safety of jockeys has become noteworthy and many improvements have been introduced to protect them. In the future, more comprehensive studies, with accurate identification of all risk factors, could contribute further to reducing the risk of severe injuries.

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