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ORIGINAL ARTICLE

## A success story: New rules and fewer injuries in traditional Leonese Wrestling (2006–2012)

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### Abstract

**Objective:** To analyse the effectiveness of a change in the rules on the incidence of injuries in traditional Leonese Wrestling (LW).

**Material and methods:** Cohort study, retrospective (2006–2007) and prospective (2008–2012). The population studied comprised all the male wrestlers over 16 years of age who took part in Winter League competitions in the seasons 2006–2012. Data collected included the number, location and severity of injuries. Classifying them according to location and severity, the incidence of injuries by bouts and falls before and after the change was calculated. The formula for calculating effectiveness was:  $1 - \text{relative risk}$ .

**Results:** Over the 7 seasons, a total of 34 injuries were reported – 9 in the seasons before the change and 25 afterwards. Since the introduction of the new regulations in 2008, no serious upper limb injuries have been reported. Before the change in rules there was an incidence of 10.4 per 1000 bouts and 3.9 for every 1000 falls, the differences being statistically significant ( $P = .002$  and  $P = .006$ , respectively). The effectiveness in reducing the incidence of serious injuries was 94% by bouts, and 91% by falls.

**Conclusions:** The results of this study confirm the importance of a methodological approach for the prevention of injuries; in this case a change in the rules.

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**PALABRAS CLAVE**

Epidemiología;  
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Salud pública;  
Estudios de cohorte

## Una historia de éxito: nuevas reglas y menos lesiones en la Lucha Leonesa (2005-2012)

**Resumen**

**Introducción:** El objetivo de nuestro estudio es analizar la efectividad de un cambio de reglamento en la incidencia de lesiones de Lucha Leonesa.

**Material y métodos:** Estudio de cohorte retrospectivo (2006-2007) y prospectivo (2008-2012). La población estudiada comprendió todos los luchadores masculinos de más de 16 años que participaron en las Ligas de Invierno en las temporadas del 2006-2012. Se recogieron datos sobre el número, la localización y la severidad de las lesiones, clasificándolos según su localización y su gravedad. Se calculó la incidencia de lesiones por combates y por caídas antes y después del cambio de reglamento. La fórmula para calcular la efectividad fue:  $1 - \text{Riesgo Relativo}$ .

**Resultados:** En las 7 temporadas, se registraron un total de 34 lesiones, 9 antes del cambio de reglamento y 25 después. Desde la introducción de las nuevas reglas en 2008 no se produjo ninguna lesión grave en los miembros superiores, mientras que antes del cambio de reglamento la incidencia de lesiones fue de 10,4 por cada 1000 combates y de 3,9 por cada 1000 caídas, siendo estadísticamente significativa ( $p=0,002$  y  $p=0,006$ ). La efectividad de la reducción de la incidencia de lesiones graves fue del 94% por combates y del 91% por caídas.

**Conclusiones:** Los resultados de este estudio confirman la importancia de un enfoque metodológico para la prevención de lesiones; en este caso, los cambios de reglamento.

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**Introduction**

Sport and physical exercise bring clear health benefits to those involved and if their number is significant, there will also be a positive influence on public health.<sup>1</sup> However, sporting activities, especially at competition level, can have negative effects on individual and community health.<sup>2</sup> The International Olympic Committee (IOC) has therefore ordered steps to be taken to prevent injuries in order to foment the practice of sport.<sup>3,4</sup> The protection of athletes' health by preventing injuries is a major task for sports federations. Although sporting injuries may never be completely eliminated, a rigorous research methodology could improve understanding of the causes of injuries and implementing programmes could reduce their frequency and/or severity.<sup>5,6</sup>

Among the possible strategies for avoiding injury are changes in the rules,<sup>7</sup> which in combat sports like karate have proven their efficacy.<sup>9,10</sup> The classic way to evaluate the success of these changes is based on the classic model of injury prevention in public health, moved to the sports world by Van Mechelen et al.<sup>11</sup> (Establish extent of the problem – Establish aetiology of injury – Introduce preventive measures – Assess their effectiveness). However, sports federations will not implement changes in rules until they are sure that the safety measures actually prevent injuries, are acceptable to their participants, do not change the essential nature or appeal of the sport, and do not adversely affect participation or performance.<sup>12</sup> For these reasons, the effectiveness of programmes can be affected, and Finch<sup>13</sup> recommended assessing prevention programmes in a real-world context.

The aim of this study is to ascertain the effectiveness in a real-world context of a change in the rules on the incidence of injuries in traditional LW.

**Methods****Study design**

The population studied comprised all the male wrestlers over 16 years of age who took part in Winter League competitions in the seasons 2006–2012. Retrospective (2006 and 2007) and prospective cohorts (2008–2012) were studied.

**Leonese wrestling**

LW, or Aluche, is a traditional combat sport indigenous to the province of León, in northwest Spain. It is registered with and officially recognized by the International Federation of Associated Wrestling Styles (FILA), the European Traditional Wrestling Association (AELT) and the International Belt Wrestling Association (IBWA). Like all styles of wrestling, especially traditional ones, LW is considered culturally important and a transmitter of values. In short, it is a sport with its own identity, deserving protection.<sup>14</sup> LW is a grappling sport, in which the wrestlers grip each other's belts (worn round the waist) with both hands during the entire bout (Fig. 1). By means of techniques known as mañas, each wrestler tries to throw his opponent in such a way that some part of his body touches the ground, thereby scoring points. Since the winner is the first one to score four points, and as the number of points depends on how contact with the ground is made, wrestlers try to avoid touching the ground with their back (full fall), as a full fall means two points to the opponent, the highest score for any single action. A half fall – one point – is scored otherwise. Furthermore, since the bouts are only three minutes long, if neither wrestler has scored 4 points before the end, the winner is the one



**Figure 1** Grip in Leonese Wrestling.

with the highest score. In the case of a tie, the winner is the one who scored first.<sup>15</sup>

### Definition of injury

Injury was defined as “any action arising in a bout and which by harming the wrestler prevents the bout from running its course or requires medical or healthcare intervention while preventing involvement in work, training or participation in other bouts or in activities of daily life for at least 24 h afterwards”.<sup>16</sup>

### Severity of injury

Three degrees of severity were established depending on the period of inactivity caused by the injury<sup>17</sup>: (1) minor injury between 1 and 7 days of inactivity, (2) moderate injury between 8 and 28 days of inactivity, and (3) major or severe injury over 28 days of inactivity.

### Information-gathering instruments

The researchers, all members of the medical team normally in attendance at competitions, registered all the injuries observed. The initial register was compared and enlarged with the review of all the minutes of competitions on record at the Leonese Wrestling Delegation, and with the injury reports of the insurers for the seasons under study. Every year, in a directed interview, each wrestler completed an ad hoc questionnaire on different aspects of LW including the incidence, type and severity of injuries and the area injured and possible causes.

### Van Mechelen model of injury prevention

#### Establishing the extent of the problem

In a preliminary epidemiological and recorded video study made in 2006 and 2007, it was observed that (a) the incidence of severe injuries in the winter league (a team league with little tradition) was three times higher than in the summer league (individual and with a long tradition) and

(b) voluntary releases might be the cause of 30% of injuries, especially serious ones and those to the upper limbs.<sup>18</sup>

#### Establishing aetiology of injury

The *voluntary release* is a strategy consisting in letting go of the opponent’s belt in order to minimize any possible penalty (i.e., by transforming a two-point full fall into a one-point half fall). So, if a wrestler finds himself at a disadvantage, especially when he sees that he is going to be thrown in a full fall, and wishes to prevent his opponent from scoring the maximum points, he releases his grip thus breaking the biomechanical movement of a *maña* with a sudden unexpected combat action whose force and thrust are not channelled through the normal ploys of wrestling (Fig. 2). Indeed, the voluntary release has been observed to increase the risk of injury in LW for the wrestler braces himself with the upper extremities, usually outstretched, which can cause dislocation of the shoulder and/or fracture of the humerus, dislocation or fracture of the elbow, contusion in the ribs and dislocation or fracture of the wrist (Fig. 2).

#### Introducing preventive measures

During the 2006 and 2007 seasons, bouts finished after three minutes or whenever one of the combatants had scored two falls or four points, as previously explained. After examining the preliminary results, the Territorial Leonese Wrestling Federation, at the proposal of the Medical Committee, decided to change the competition regulations for the 2008 Winter League as a pilot scheme. From 2008 onwards, the length of a bout was reduced to two minutes (since its original length was thought to be excessive by coaches and the wrestlers themselves) and all falls, whether half or full, were awarded one point. In this way the advantage of the voluntary release was eliminated, and it would become less common, as two-point full falls would no longer be avoided by it, while wrestlers also knew of its greater injury potential. The bout finished when a wrestler had two points.

A preliminary analysis showed a major reduction in serious injuries in that season, 2008, in comparison with 2006 and 2007,<sup>18</sup> although the results were not statistically significant, so the new rules were kept for 2009 to 2012.

#### Assessing their effectiveness

Incidences and 95% confidence intervals were calculated for all types of injuries along with their total as a function of the number of bouts and falls. The relative risks and their confidence interval of 95% were calculated by comparing the different incidences for the 2006 and 2007 seasons (henceforth called seasons before the modification of the rules, BMR) with those for the seasons 2008, 2009, 2010, 2011 and 2012 (seasons after the modification of the rules, AMR). Fisher’s exact test was used for the statistical analysis. The formula for effectiveness calculation was:  $1 - \text{relative risk}$ .

### Results

In the leagues studied, a total of 221 male wrestlers took part, with an average age of 25 years (mean 23, range



**Figure 2** Sequence of a voluntary release. The wrestler in white unbalances his opponent with a *maña* to obtain the highest score, a full fall. However, the wrestler in red releases his grip to change it to a minor penalty or half fall. This action can sometimes be very harmful.

16–53 years) with a standard deviation (SD) of 6.4 years and an average experience of LW of 11 years (SD 5.7 years, mean 11 years, range 0–26 years).

Over the seven seasons, a total of 34 injuries were reported, 9 in BMR seasons and 25 in AMR seasons (Table 1). Their distribution was 4 serious, 4 moderate and 1 minor in the BMR seasons (all the serious ones sustained in upper extremities), and 1 serious, 8 moderate and 16 minor in the AMR seasons, including 1 moderate and 4 minor ones to upper extremities.

The 34 injuries were sustained by 28 different wrestlers (28/221, 12.7%), 9 in the BMR seasons (9/94, 9.6%) and 25 in the AMR seasons (25/186, 13.4%). Four wrestlers were injured twice in the AMR seasons.

The incidence of injuries for all seasons studied was 18.1 injuries per 1000 bouts and 9 injuries per 1000 falls. No significant differences were observed between BMR and AMR ( $P=0.39$  and  $P=0.91$ ), by bouts, where the incidence was 23.3 (95% CI: 10.7–44.3) vs 16.8 (95% CI: 10.9–24.8), or by falls, where it was 8.8 (95% CI: 4.0–16.6) vs 9.1 (95% CI: 5.9–13.5).

Regarding the rate of injuries to upper extremities, it should be said that although the results were not significant, incidence also declined by 68% by bouts (95% CI: 91% to –20%;  $P=0.09$ ) and 53% by falls (95% CI: 87% to –74%;  $P=0.27$ ). Since the introduction of the new regulations in 2008, no serious upper limb injuries have been reported, while before the change there was an incidence of 10.4 injury per 1000 bouts and 3.9 for every 1000 falls, the differences being statistically significant ( $P=0.002$  and  $P=0.006$ ) (Table 2).

The incidence of serious injuries both by bouts and by falls in all locations, was significantly less in the AMR

seasons. Effectiveness was 94% (95% CI: 99–42%) by bouts and 91% (95% CI: 99–16%) by falls. The incidence of moderate and serious injuries was only significantly less in the AMR seasons by bouts, with an effectiveness of 71% (95% CI: 89–25%), but no significant differences were observed between BMR and AMR by falls, where effectiveness was of 58% (95% CI: 84% to –9%) (Table 2).

## Discussion

Sporting activities, especially combat sports, can have negative effects on participants' health.<sup>19</sup> Sports federations need policy strategies to prevent injuries in order to foment the practice of sport. In this regard, it has been observed that a change in the set rules is a positive strategy, especially in combat sports.<sup>9,10</sup> This study sought to analyse the influence of a rule change in the injury risk of a traditional combat sport (LW) with a structure and organization that made it possible to assess the effectiveness of this strategy.

From our results, it seems that LW keeps up with the injury pattern generally described in combat sports,<sup>20</sup> sprains, contusions and dislocations, which usually occur as a result of striking, gripping, throwing and falling,<sup>21,22</sup> being the most common injuries observed. Regarding injury location, it can be stated that in LW the upper limbs are frequently affected both in falls and in the movements of force occasionally occurring, as is the case with similar combat sports, such as judo.<sup>23</sup>

Since the introduction of the new regulations, especially the elimination of the advantage of the voluntary release, no serious upper limb injuries were reported and the injury rate per bout and per fall was also reduced. As we expected, this

**Table 1** Distribution of injuries by seasons, location, diagnosis and severity.

Season	Severity	Area	Diagnosis
2006 and 2007	Major	Elbow	Dislocation
	Major	Shoulder	Dislocation
	Major	Shoulder	Torn Ligaments
	Minor	Face	Burn/laceration/wound
	Moderate	Lower jaw	Contusion
	Moderate	Cervical vertebrae	Sprain
	Major	Wrist	Fracture
	Moderate	Cervical vertebrae	Sprain
2008–2012	Moderate	Ankle	Sprain
	Minor	Shoulder	Contusion
	Minor	Ankle	Contusion
	Minor	Thigh	Contusion
	Minor	Wrist	Sprain
	Moderate	Knee	Sprain
	Major	Knee	Sprain
	Minor	Thigh	Contusion
	Minor	Knee	Contusion
	Minor	Chest	Contusion
	Moderate	Knee	Sprain
	Minor	Chest	Contusion
	Minor	Knee	Contusion
	Minor	Ankle	Sprain
	Minor	Chest	Contusion
	Minor	Chest	Contusion
	Minor	Chest	Contusion
	Moderate	Chest	Contusion
	Moderate	Cervical vertebrae	Contusion
	Moderate	Leg	Distension
Minor	Knee	Contusion	
Moderate	Head	Contusion	
Minor	Wrist	Contusion	
Moderate	Knee	Contusion	
Minor	Elbow	Contusion	
Moderate	Shoulder	Distension	

finding is consistent with the mechanisms whereby upper extremity injuries are sustained by the elbows, shoulders and wrists.<sup>24,25</sup>

A reduction was not only observed in the incidence of serious injuries to the upper limbs but also in all locations, which could be explained by the variation of forces, rapid and unpredictable, caused by the release, whereby it may also become associated with injuries to the side or even the knee or ribs.

Our results agree with those stated by Macan et al.<sup>9</sup> and Arriaza et al.,<sup>10</sup> who, with a similar approach to ours, found that a change in the regulations regarding the awarding of points according to technique and the area of the body affected in karate reduced the incidence of injuries. Regarding other sports, a few studies have shown some substantial preventive effects through regulatory change.<sup>26,27</sup> However, it seems that this strategy will probably only be effective in the long term if accompanied by a change in culture and a redefinition of what is considered acceptable or unacceptable behaviour in that sport.<sup>7</sup> In our case, the link between voluntary releases and injuries was discussed in

LW circles and many trainers and wrestlers agreed that these releases were potentially harmful, which is a guarantee of further success.

Regarding the methodological approach of this study, and taking into account the characteristics of its design, two important points should be noted. Firstly, it has recently emerged that 74% of the original research published on sport injury prevention comprises descriptive articles, while of the remaining 26% intervention articles, less than 5% concerned rules and regulations.<sup>7,8</sup> Our study would therefore seem to fill a need in this field of science. Secondly, the system proposed by Van Mechelen et al.<sup>11</sup> and modified by Finch<sup>13</sup> for sport injury prevention research has been followed. The magnitude of the problem has been identified along with the associated risks, a pilot programme has been developed and its effect has been assessed under competition conditions. Moreover, the prevention programme was carried out in a real setting, with the analysis of an official league in which the highest level wrestlers were taking part. Our approach is therefore close to the “translating research into injury prevention practice” model described



**Table 2** Distribution of the incidence of injuries by locations and severity, per 1000 bouts and falls.

Season	Bouts	All locations							
		Major injuries				Moderate and major injuries			
		N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value	N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value
BMR	386	4	10.4 (2.8–26.5)	1	.007	8	20.7 (8.9–40.8)	1	.013
AMR	1490	1	0.7 (0.0–3.7)	0.06 (0.01–0.58)		9	6.0 (2.8–11.5)	0.29 (0.11–0.75)	
Season	Falls	All locations							
		Major injuries				Moderate and major injuries			
		N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value	N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value
BMR	1027	4	3.9 (1.1–10.0)	1	.022	8	7.8 (3.4–15.3)	1	.097
AMR	2735	1	0.4 (0.0–2.0)	0.09 (0.01–0.84)		9	3.8 (1.7–7.2)	0.42 (0.16–1.09)	
Season	Bouts	Upper limbs							
		Major injuries				All injuries			
		N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value	N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value
BMR	386	4	10.4 (2.8–26.5)	1	.002	4	10.4 (2.8–26.5)	1	.093
AMR	1490	0	0.0 (– to 2.5)			5	3.4 (1.1–7.8)	0.32 (0.09–1.20)	
Season	Falls	Upper limbs							
		Major injuries				All injuries			
		N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value	N	I (95% CI) <sup>a</sup>	RR (95% CI) <sup>b</sup>	P value
BMR	1027	4	3.9 (1.1–10.0)	1	.006	4	3.9 (1.1–10.0)	1	.267
AMR	2735	0	0.0 (– to 1.7)			5	2.4 (0.–5.5)	0.47 (0.13–1.74)	

<sup>a</sup> Incidence of injuries with 95% confidence interval.

<sup>b</sup> Relative risk with 95% confidence interval.

by Finch,<sup>13</sup> which is generally accepted as a trademark for good study design.<sup>7</sup>

In spite of our promising findings, some limitations should be duly noted before any conclusion can be made. Firstly, the small size of the sample of wrestlers and bouts and, consequently, the number of injuries, might have led to results being influenced by chance. However, the high relative risks observed speak more in favour of possible undetected differences. Secondly, it was not possible to establish the incidence of injuries by using combat time as the denominator, as it was reduced. This limitation led us to establish incidences not only on the basis of bouts but also on the number of falls. The fact that both denominators give consistent results speaks in favour of this measure, although the shorter length of a bout may have had some influence, basically because of participants' lower fatigue levels. Finally, the retrospective nature of the study of the BMR seasons should also be borne in mind, as it is possible that minor injuries, and perhaps some moderate ones, were not recorded. However, this possible information bias would underestimate the effect of the change in the rules, especially in the case of an analysis of all injuries.

## Conclusions

It can safely be stated that a change in the set of rules, when it is carried out following methodological standard

procedure and applied to the real setting is a useful strategy to reduce the risk of sport injury.

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## Conflict of interest

Authors declare that they do not have any conflict of interests.

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