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ORIGINAL

SPORT PYRAMID METAPHOR: TRICKLE DOWN AND UP EFFECT IN SPAIN

LA METÁFORA DE LA PIRÁMIDE DEPORTIVA: EL EFECTO *TRICKLE DOWN* Y *UP* EN ESPAÑA

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ABSTRACT

The sports pyramid metaphor (trickle down and trickle up effect) has been used by several governments to justify their public investments in elite sport. The scientific evidence of this effect is fragmented; previous studies question its veracity. This study examines the effect of the sports pyramid metaphor in Spain.

Using Spearman's correlation coefficient (ρ), we tested for possible relationships between sporting success and the evolution of the federation membership history of 23 sports modalities during 1992-2016. According to results, three different groups of sports could be identified: 1) those that could be assumed to present both trickle down and up effects; 2) those with negative correlations between sporting success and membership figures; and 3) sports that do not show any relationships between those variables. As a conclusion, it is stated that there is no clear and generalized evidence to confirm the existence of the sport pyramid metaphor in Spain.

KEYWORDS: Sport pyramid metaphor; trickle up; trickle down; elite sport; mass participation.

RESUMEN

La metáfora de la pirámide deportiva (efecto *trickle down* y *trickle up*) es utilizada por la administración para justificar la inversión en el deporte de élite. Las evidencias de este efecto son difusas y estudios previos ponen en entredicho su veracidad. Este artículo examina el efecto de esta metáfora en España.

Mediante coeficientes de correlaciones de Spearman (ρ), se estudia la relación entre el éxito deportivo y la evolución de las licencias federativas de 23 modalidades deportivas, desde 1992 hasta 2016. Los resultados muestran tres grupos distintos: 1) aquellos con indicios de la posible existencia de los efectos *trickle down* y *up*; 2) aquellos que muestran correlaciones negativas entre número de licencias y éxito deportivo; y 3) aquellos que no muestran ninguna relación entre variables. En conclusión, se corrobora que no existe una evidencia clara y generalizada que confirme la existencia de la metáfora de la pirámide deportiva en España.

PALABRAS CLAVE: Metáfora de la pirámide deportiva; *Trickle up*; *trickle down*; deporte de élite; deporte base

1 INTRODUCTION

Public Administrations (PA), national, regional or local, allocate part of their annual budget to elite sport. That sum is impossible to quantify given that in those budgets there are no specific economic headings to elite sport. PA investment in elite sport is carried out through different concepts, some with direct repercussion and some with an indirect one. Therefore, to know about public investment in elite sports, we should assess the sums allocated to:

1) *direct repercussion*: a) to the Sports Federations (SF), national and regional. Thus, for instance, the Sports Council (SC) allocated 46M€ to subsidize the elite competition during 2017; b) to specialized sports training centers and perfection centers, with sums that hasn't been published; and c) subvention to Olympic sportsmen and women through the ADO plan, promoted by the

Government through the SC (it provides part of the budget) and with the contribution of the public Spanish TV and radio, Radio Televisión Española, (it provides reports and/or competition broadcasts financed by the State), both sums that hasn't been made public.

2) *indirect repercussion*: a) the personal income tax exoneration to elite athletes (State competence) and high performance athletes (regional competence), a sum not quantified publicly; b) the corporation tax reduction to those corporations sponsoring sports events considered of general interest by the State (sum not quantified publicly); c) the contribution of State lottery benefits to some events; for instance, the Almeria Mediterranean Games in 2005 had a 4,7M€ contribution; d) direct help (investment) to the organization of international sports events, such as the Tarragona Mediterranean Games 2018, with 9M€ from the State and 14M€ from the catalan autonomous region (AR). In the Almería Mediterranean Games 2005 the sum increased to 40M€ from the State; e) the fight against doping, through the AEPSAD; f) the national and regional law enforcement expenses to assure the security and order in sports events; and g) the quantity paid by Radio Televisión Española as rights for the sports competition broadcasting.

The Spanish PA justify public spending in elite sports by assuring that sports success will generate positive effects on the population (*trickle down* effect): it consolidates and reinforces national identity (patriotism), improves the diplomatic acknowledgment (international prestige) and develops the mass sport (sports licences and sports habits; Houlihan and Green, 2008; van Bottenburg et al., 2011; De Croock et al., 2012). However, even if it is a widely used discourse, there are no scientific studies, international or national, that support or contradict that statement (De Bosscher, Sotiriadou and Van Bottenburg, 2014).

Thus, PA use the *trickle down* effect as an alibi probably because its effect is believed to be real and obvious and, therefore, it is not necessary to demonstrate it (Grix and Carmichael, 2012). But if we truly question why PA must allocate public spending to elite sports, we don't obtain a justified answer yet (Coalter, 2007). It is the reason why more and more voices argue this policy in favor of a spending aimed to the general population, the sports for everybody and the mass sport (Van Bottenburg, 2003; Houlihan and Green, 2008). This research aims to analyze the existence of the sports pyramid metaphor in Spain and the *trickle down* or *up effects*.

2 THEORETICAL FRAMEWORK

2.1 BASIC CONCEPTS DEFINITION

This paper's aim revolves around some concepts (high competition sport, elite sport, high level sport, high performance sport, mass sport, sport for all, mass participation sport and sport practice) that, basically, present us with two problems: 1) terminology, many of them lack a clear and unequivocal definition in all scientific fields: law, academics, sport, education, administration, which

generates conflicts and are normally used as synonyms; and 2) quantifying, it is very difficult to quantify, through objective data, the capacity of each type of sport. Therefore, to avoid confusion, we define the two basic concepts that are explored in this article:

HIGH COMPETITION SPORT, ELITE SPORT O HIGH LEVEL SPORT AND HIGH PERFORMANCE

They are legally indeterminate terms. There are legal definitions of high level athlete, high performance athlete (Royal decree 971/2007) and professional athlete (Royal decree 1006/1985), but there is no legal definition for high competition, elite or high level sport. From an administrative point of view, “*high level sport*” is considered “*of interest for the State, in so as it constitutes an essential factor in the sports development, for the incentive that it provides to the mass sport promotion, by virtue of the technical and scientific demands on its preparation and for its function representing Spain in the international official sport trials or competitions*” (Sports Law 10/1990 art. 6). From an academic point of view, all three concepts are used as synonyms. In Spain, the high level and high performance sport development lies in the SF in collaboration with the public administrations. It is mainly fund by the State.

For the purpose of this article, we will use the term elite sport as a generic for high competition or high level and performance sport and will convey an institutionalized sports practice (with existing regulated competition, records and rankings), with an international effect (acknowledgment), independently of the legal nature of the organization (federated or not) and athletes (professional or *amateur*), whose aim is sport specialization and obtaining the highest performance. Normally, the elite sport success is quantified by the number of medals.

MASS PARTICIPATION SPORT

It is also a legally indeterminate term. For the purpose of this article, we understand mass participation sport as the sport activity practiced in order to get into or get trained in a sport modality or even in a certain way of leisure, regardless of the participant’s age. It can, but doesn’t have to, imply participation in competition, official or not, and is aimed at the training of technics, tactics and strategies, and not at performance improvement or sport specialization. On most sport systems, it is the previous step to elite sport and it nourishes it. For the purpose of this article, it will be quantified through the number of sport licenses.

2.2 THE SPORT PYRAMID METAPHOR

The existing relationship between elite sport and mass participation sport has been historically connected through the sport pyramid metaphor. The sport pyramid metaphor links elite sport to mass participation sport through a mutual dependence relationship. Thus, the more followers there are (mass participation sport) the more success elite sport will have, on the grounds that the first will

nourish the latter (trickle up effect). Equally, the success achieved by elite sport will serve as inspiration for new adherents to join the mass participation sports (trickle down effect).

After an analysis of the international academic literature, we observe that it is contradictory and still doesn't provide clear evidence that justify the relationship between elite sport and mass participation sport (Heinilä, 1982; Renson, 2002; van Bottenburg, 2003; Green 2005; Sotiriadou *et al.*, 2008; Sotiriadou and Shilbury, 2009; Grix and Carmichael, 2012). The sport pyramid metaphor has been criticized because, on the one hand, many people practise sport without any intention to compete on elite (Eichberg *et al.*, 1998); and, on the other side, elite sport cannot be considered as a simple mass participation sport extension because it is possible to design an elite sport system without having a sports mass (van Bottenburg, 2003; Green, 2005; De Bosscher y van Bottenburg, 2011). Elite sport and mass participation sport can evolve independently and the connection between them is complex. This divergence allows questioning any public policy that uses the sport pyramid metaphor to legitimize its investments on public spending (De Bosscher *et al.*, 2008b). In the case of national academic literature, it is completely nonexistent, there are no previous studies aimed at analyzing the sport pyramid metaphor.

2.3 THE SEARCH OF EVIDENCE: THE TRICKLE DOWN EFFECT

The trickle down effect explains that the elite sport effect serves as inspiration to young athletes (van Bottenburg, 2001) and is based on the assumption that there is indeed evidence for that effect without really demonstrating it. (Weed, 2009). Thus, the trickle down assumption implies that the elite sport success has an inspiring function through: a) the performance of elite sport; b) the elite athletes (as stars or media celebrities); and c) the legacy of sport events.

These elements (independent factors) can affect the number of followers (dependent factors). The effects of independent factors can be examined regarding four areas: a) effects on sports participation: attraction (recruitment of new followers), retention (motivation or earning loyalty to continue with the sports practice), motivation (progress to higher competition levels) and sports mass (associated to increasing the compromise to progress in elite sport); b) effects of the sports modality election; c) effects on the sports behavior (i.e.; the election of a certain position in collective sports, the inspiration to imitate techniques or sports tactics, or even bad practices); and d) effects on the behavior outside sport (i.e.; outfit, haircut, music preferences, values related to drug use, racism or gender).

Following this scheme and after the literature review, it is clear that investigations so far tend to only lean on "grey" literature (conferences, nonscientific journals, opinion exposure without being revised externally; Grix and Carmichael, 2012). Carrying out an empirical study in order to determine the sport pyramid metaphor is not easy because it is very complex to check, filter and isolate the variables taking part (Wicker *et al.*, 2012). Thus, variability on participation can be explained through many factors in the short run

(Sotiriadou y Shilbury, 2009; Grix and Carmichael, 2012): a) changes on the availability of the sports infrastructure: Spanish swimming has been successful when Spain has had heated pool; b) life on a neighborhood prone to a certain activity: the city of Terrassa provides the field hockey Spanish selection with 80% of its players; Terrassa is the cradle of Spanish field hockey, with 4 hundred-year-old clubs that were at their peak during the Barcelona Olympic Games (OG), where the city held the headquarters of that modality. Thus, being a field hockey player in Terrassa is better acknowledged socially than becoming a football player; c) the effect of companions: the women water polo success can be explained by the determination of a group of athletes that were born in the atmosphere of the Barcelona OG; d) the consideration of a sport at a school: the Spanish badminton success is due to school plans; and e) activities organized to attract young people or even to increasing the income or the gross domestic product: the organization of trail running or triathlon competitions as a strategy to the development of territory tourism. Considering the complicated influence of all the factors mentioned above, the investigation carried out so far hasn't been able to find clear evidence to prove that elite sport success has an effect on mass participation sport (trickle down effect; Misener *et al.*, 2015; Storm y Asserhoi, 2016).

Next, we present the discussion regarding the evidence of the impact on the three independent factors.

THE INSPIRING FUNCTION OF ELITE SPORT

In the last few years some studies have been published in the field of politics and management through the correlation or regression analysis in order to determine the relationship between sports success and sports licenses mainly in only one sport (Frick y Wicker, 2016; Haut and Gaum, 2017). The results of the published articles are controversial; thus, several researchers identify counter-effects in some sports. These are sports that have had success at some point or have had outstanding athletes, but whose evolution of sports licenses have decreased (Stokvis and Minnee, 1986; van Bottenburg, 2003; Steward and Nicholson, 2004; Green, 2005; Feddersen *et al.*, 2009). This was, for instance, the case of tennis in Germany after the successful period of Boris Becker and Steffi Graff, or volleyball in the Netherlands after winning the gold medal at the Atlanta OG in 1996. Steward and Nicholson (2004) didn't find any meaningful positive correlation between the elite success and the evolution of sports licenses in six sports in Australia during a 14-year period. On the contrary, other studies have found positive relationships between sports success and the increase of sports licenses. For instance, Hanstad and Skille (2010) found positive correlations between the evolution of licenses and the medals obtained at OG and World cups ($r = 0,597$; $p < 0,05$) and the first 15 places ($r = 0,690$; $p < 0,05$) in sports modalities such as cross-country skiing and archery in Norway. A study by De Bosscher and De Knop (2003) reveals that tennis success in 43 European nations was highly correlated to the number of affiliated tennis players ($r = 0,724$; $p < 0,001$) and tennis courts ($r = 0,858$; $p < 0,001$). Finally, van Bottenburg (2002; 2003) found a significant correlation between the percentage of population participating only in one organized sport and the number of medals per million of inhabitants in 20 European states ($r =$

0,535; $p < 0,01$). Curiously, this correlation grew by increasing intensity and competitiveness.

If we consider the studies exposed above collectively, they suggest that there is no clear evidence of the trickle down effect, or simply that there is no trickle down effect at all. The results suggest that, if there is indeed a relationship, it can be specific to a sport, a country and a context. Weed (2009), in his study with 1509 rugby and cricket participants in New Zealand, concludes that the model effect as a consequence of elite sport success doesn't have a significant impact on those who hardly ever or never have participated and, thus, are no longer emotionally committed to that sport. Weed discovered that this effect did influence, indeed, those who were already participating in the analyzed sport, in three different ways: 1) it encouraged a new participation of participants that had retired; 2) provoked an increase of the participation frequency amongst current participants; 3) among current participants, it increased the probability of activity changes. Moreover, the model effect can be influenced, amongst others, by other variables like media coverage, funding and mass participation programs (van Bottenburg 2003, Feddersen *et al.* 2009).

As a consequence, the nature of this relationship is complicated and the factors are difficult to analyze. Therefore, questions related to mechanisms affecting the increase of mass participation sport are yet to be answered.

THE INSPIRING FUNCTION OF ELITE SPORT (ATHLETES AS STARS)

One of the most used and well-known explanations about the increase of popularity of certain sports modalities is that participation grows as a reaction to victories of champions that capture audience's imagination (van Bottenburg 2001). This investigation area is related to the effects that these models have. Literature in this area has been much more developed and originates mainly in the investigation on sports psychology, either in the context of individuals with outstanding achievements (for example: Lockwood and Kunda, 1997) or in the context of people possessing skills that we would like to have (for instance: Guiliano *et al.*, 2007). This literature offers ideas about which role models young people choose, why they choose them, whether these models influence Young people's behavior and, if so, how. As a consequence, parents, siblings, teachers, coaches, pop stars and sport heroes have been studied as models in various contexts: social learning theories (Bandura 1977; Jung, 1986, Lockwood and Kunda, 1997), behavior studies inside and outside sport (Biskup and Pfister, 1999; Carr and Weigand, 2001; Vescio *et al.*, 2005; Guiliano *et al.*, 2007; Lines 2011), sociology (Fleming *et al.*, 2005; Buford 2009), pedagogy (Bromnick and Swallow, 1999) and education (Nauta and Kokaly, 2001). An interesting discovery by Lockwood and Kunda (1997) is that superstars, as models to follow, cause inspiration and self-evaluation when their success seems achievable to the observer, but provoke self-deflation when it seems unreachable. Furthermore, several authors have found that men are more likely to choose an athlete as a model to follow, than girls (for instance, Ewens and Lashuk, 1989; Biskup and Pfister, 1999; Bromnick and Swallow, 1999; Jones and Schumann, 2000; Guiliano *et al.*, 2007; Lines 2011). Some authors also

stress the possible negative effects of heroes as models (for example, Hindson *et al.*, 1994; Globus, 1998; Payne *et al.*, 2003; Lines 2011) and how media broadcast and enlarge the impact of role models on young people (French and Pena, 1991; Biskup and Pfister, 1999; Fleming *et al.*, 2005; Lines 2011).

Although this literature provides information about the effects of the models to follow, very few investigations have examined the effect of elite athletes as models to follow in the sports participation or sports development. (Green 2005; Sotiriadou *et al.*, 2008).

THE INSPIRING FUNCTION AND THE LEGACY OF ELITE SPORTS EVENTS

The legacy of a mega sports event has turned out to be a result that is expected to happen and, besides, it has had an impact on how organizations plan and implement them. (Leopkey and Parent, 2012). In spite of the potentially demonstrable benefits of organizing a mega sports event, there isn't a reliable and largely accepted method to evaluate its effects (London East Research Institute, 2007; Veal *et al.*, 2012). On the one side, many authors question that big sports events really generate a positive impact on the sports participation (Coalter, 2007; EdComs, 2007; Girginov and Hills, 2008; Veal *et al.*, 2012); whereas, on the other side, only a few studies show positive effects and these are, predominantly, in the short run (Hanstad and Skille, 2010). For instance, Frawley and Crush (2011) and Veal *et al.* (2012) established that there was a rapid increase in the number of rugby players in Australia two years after the 2003 World Cup.

Finally, we can conclude that, in general terms, there isn't clear evidence yet of the consequences derived from the success of the trickle down effect after the elite sport success, the elite athletes and the sports events, and that determining a cause/effect relationship is particularly difficult.

This, our study examines the bidirectional relationship between the elite sport success and the mass participation sport, evaluating, thus, the existence of the trickle down and up effects. The article constitutes the first contribution made in Spain and, in turn, will increase the knowledge relating the sport pyramid metaphor beyond the State.

3 METHODS

3.1 DATA COLLECTION

We analyze 23 sports modalities that have obtained, at least, a medal in world championships or OG celebrated over the period 1992-2016.

Elite sports success is identified using the Elite Sport Index (ESI), similar to the one used in De Bosscher *et al.* (2013). The ESI is obtained by allocating 10 points to the gold medal, 8 to the silver medal and 6 to the bronze one. Likewise, following the reasoning of previous investigations (De Bosscher *et al.*, 2008, 2013) these values are multiplied by 6 (OG) or by 4 (world championships).

Summing these punctuations, we obtain a global mark of the sports success per year and sports modality. We must take into account that the celebration of world championships is not homogeneous amongst different sports modalities. (i.e.; some are annual -cycling-, others biannual -athletics, archery- and others biennial -football, basketball-). Therefore, ESI calculation is adapted to each modality considering the punctuation obtained in a championship until the celebration of a new edition. It has to be also noticed that, in the case of tennis, and for the purpose of this study, Grand Slams are counted like world championships.

To identify mass participation sport, for the purpose of this article we analyze the number of sports licenses of each modality studied. The number of licenses is obtained through the official data published by the CSD on its web page (<http://www.csd.gob.es/>). We exclude modalities in which the typology of sports license does not correspond to the typology of competition (for instance, swimming. There is one only sports license with different competitions: swimming, water polo, synchronized swimming or jump).

3.2 DATA ANALYSIS

The data analysis approach was based on the one developed in previous investigations (e.g.; De Bosscher et al., 2013). First of all, we make a descriptive analysis of the ESI punctuations and the number of licenses by calculating the average of both variables of each sport over the period 1992-2016. Then, we calculate the Spearman correlations (ρ) between the ESI punctuations and the number of licenses of each sport. We use Spearman correlation rate given the nonparametric nature of data in this study. The mathematical expression of this rate is the following:

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2-1)}$$

Considering that the effects were not expected to appear in the same year when an event took place, but in the previous or following years (trickle down or trickle up, respectively), ESI punctuations were matched with the number of licenses from that year (X), from previous years (i.e.; X-1, X-2, X-3, X-4) and from the following years (i.e.; X+1, X+2, X+3, X+5, X+8, X+10). By X we refer to any year between the ranges of years analyzed in our study (1992-2016). Matches are calculated only in those years with available data. These correlations are also suggested between the ESI punctuations and the annual increase/decrease in the number of licenses. A .05 significance level is used in all correlation analysis. Correlation rates have been interpreted following the Safrit y Wood (1995) criteria, according to whom these are classified in no correlation (0–,19), low correlations (,20–,39), moderate correlations (,40–,59), moderately high correlations (,60–,79), and high correlations (,80). All data analysis was carried out with statistical software PASW Statistics v. 17.

4 RESULTS

4.1 DESCRIPTIVE DATA OF ESI PUNCTUATIONS AND THE NUMBER OF LICENSES PER SPORT

Figures 1 and 2 show a general view of elite sport in Spain during 1992-2016. On the one side, figure 1 presents ESI average punctuations to each of the 23 sports during that period. It can be observed that sports such as cycling, sailing, taekwondo and canoe-kayak show the best sports results and, on the contrary, volleyball, weight-lifting, wrestling and rowing had scarcely any success. The ESI average for Spanish sport over the period 1992-2016 was 66,42 points ($DT = 72,70$). On the other side, Figure 2 presents the average number of licenses per sport during 1992-2016. Thus, football outstands as a widespread sport, followed by basketball and judo. On the contrary, weight-lifting and boxing are minority sports. The average of licenses per year and sport throughout the studied period was of 75000 licenses ($DT = 148188,09$).

Figure 1. Average Spanish punctuations in the elite sports index (ESI) to each sport during 1992-2016. Orange line marks ESI average punctuation to that period (66,42 points; $DT = 72,70$).

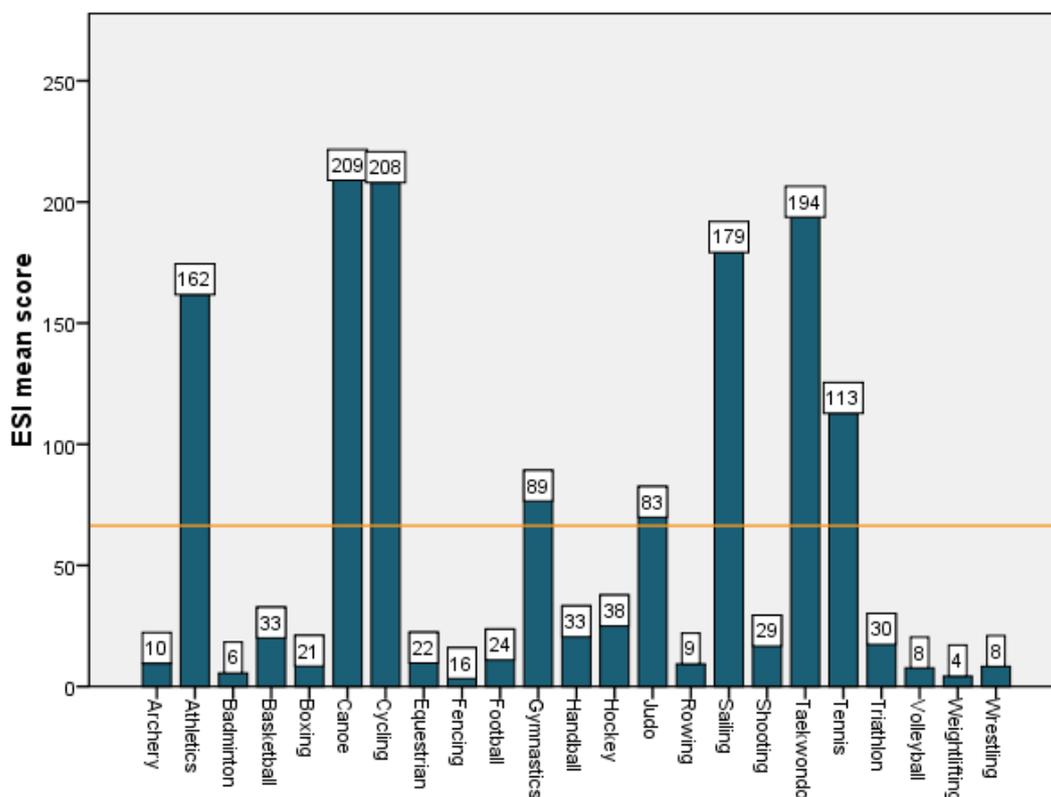
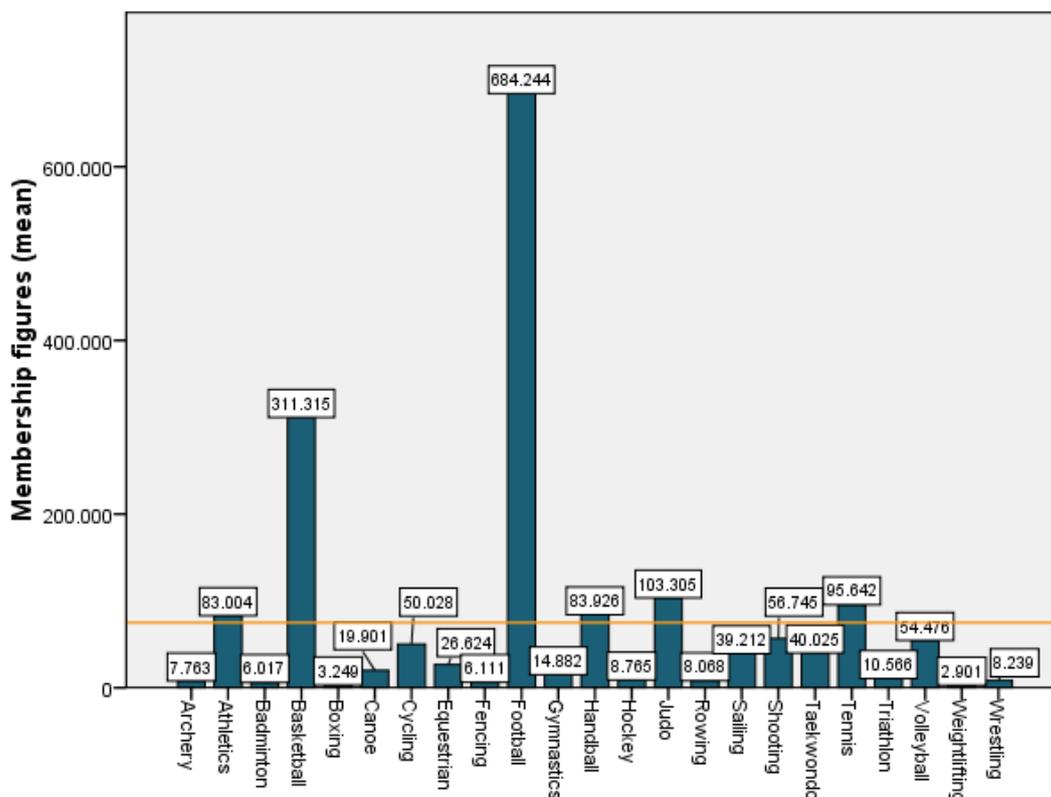


Figure 2. Average number of licenses per sport in Spain over the period 1992-2016. Orange line marks the average of licenses per sport during this period (75000; DT = 148188,09)



4.2 CORRELATIONS BETWEEN ESI PUNCTUATIONS AND THE NUMBER OF LICENSES IN SPAIN

Table 1 presents the correlations between ESI punctuations and the number of licenses, as much to that particular year as to previous years (trickle down effect) or following years (trickle up effect). As it can be observed, most sports show statistically significant correlations, at least relating one of the analyzed relations. It is interesting to stress that these correlations can be positive (i.e.; the fluctuation of the ESI punctuations and the number of licenses point in the same direction) or negative (i.e.; the fluctuation of the ESI punctuations and the number of licenses point in opposite direction). Thus, for instance, basketball shows high and positive correlations between both variables at different points in time, revealing both a trickle up and a trickle down effect. On the contrary, gymnastics show moderately high and negative correlations between ESI punctuations and the number of licenses, putting forth that both variables are related inversely (i.e.; moments of sports success are linked to years with a low number of licenses, and vice versa). For the purpose of identifying in which ways ESI punctuations can be related to the number of licenses, in the following section all 23 sports are grouped by the kind of fluctuations of the correlations presented.

Table 1. Spearman correlation rate between sports success (ESI) in a year X (any year in the period 1992-2016) and the licenses from that year X, in the previous years X -1, X - 2, X - 3, X - 4 (trickle up) and in the following years X + 1, X + 2, X + 3, X + 5, X + 8, X + 10 (trickle down).

	X	X-4	X-3	X-2	X-1	X+1	X+2	X+3	X+5	X+8	X+10
Athletics	,590**	,189	,342	,393	,518**	,573**	,564**	,152	,120	,194	,238
Badminton	,397*	,337	,288	,243	,313	,152	,022	a	a	a	a
Basketball	,821**	,858**	,853**	,832**	,822**	,833**	,831**	,787**	,561*	,089	-,062
Handball	,430*	-,027	,156	,362	,535**	,442*	,336	,304	,529*	,334	,586*
Boxing	-,052	-,028	-,077	-,053	,125	-,058	-,151	-,284	-,199	,123	,108
Cycling	-,269	-,486*	-,477*	-,410*	-,338	-,192	-,098	,032	,329	,871**	,685**
Fencing	,133	-,089	-,018	,053	,089	-,012	-,083	-,221	-,380	-,261	,013
Football	-,481*	-,446*	-,460*	-,512**	-,484*	-,457*	-,360	-,370	-,457*	-,630**	-,592*
Gymnastics	-,787**	-,581**	-,624**	-,658**	-,751**	-,733**	-,704**	-,655**	-,557*	-,135	-,379
Weight-lifting	,341	-,053	,196	,018	,233	,305	,419*	,361	,338	-,153	-,309
Equestrian	,004	-,552**	-,407*	-,237	-,094	,092	,143	,249	,565**	,686**	,531*
Hockey	-,410*	-,044	-,231	-,213	-,339	-,363	-,443*	-,401	-,437	-,744**	-,826**
Judo	-,548**	-,646**	-,589**	-,570**	-,681**	-,471*	-,398	-,453*	-,349	,531*	,585*
Wrestling	,240	,483*	,282	,373	,340	,301	,308	,056	,219	,306	-,371
Canoe-kayak	-,008	,218	,113	,001	-,053	,044	,094	,047	,072	-,407	-,681**
Rowing	,002	-,130	-,164	-,188	-,118	-,009	,028	-,024	,044	,194	,147
Taekwondo	-,405*	-,130	-,097	-,076	-,244	-,074	,272	-,116	,120	-,163	,350
Tennis	,401*	,355	,455*	,457*	,456*	,396	,169	-,165	-,704**	-,588*	-,046
Archery	-,560**	-,030	-,151	-,348	-,484*	-,646**	-,657**	-,650**	-,694**	-,651**	-,384
Olympic Shooting	,125	,100	,173	,056	,071	,130	,251	,458*	,189	-,241	-,563*
Triathlon	,766**	,720**	,754**	,769**	,764**	,740**	,693**	,694**	,568**	,641**	,449
Sailing	-,323	-,294	-,065	-,180	-,268	-,503*	-,544**	-,514*	-,056	-,052	-,047
Volleyball	-,287	-,106	-,424*	-,454*	-,393	-,129	,052	,074	,043	,226	,694**

Note. * $p \leq ,05$, ** $p \leq ,01$. ^aThe correlation couldn't be calculated because no sports success was found (i.e.; ESI punctuation different form zero).

4.3 ANALYSIS OF THE RELATIONS BETWEEN ESI PUNCTUATIONS AND NUMBER OF LICENSES

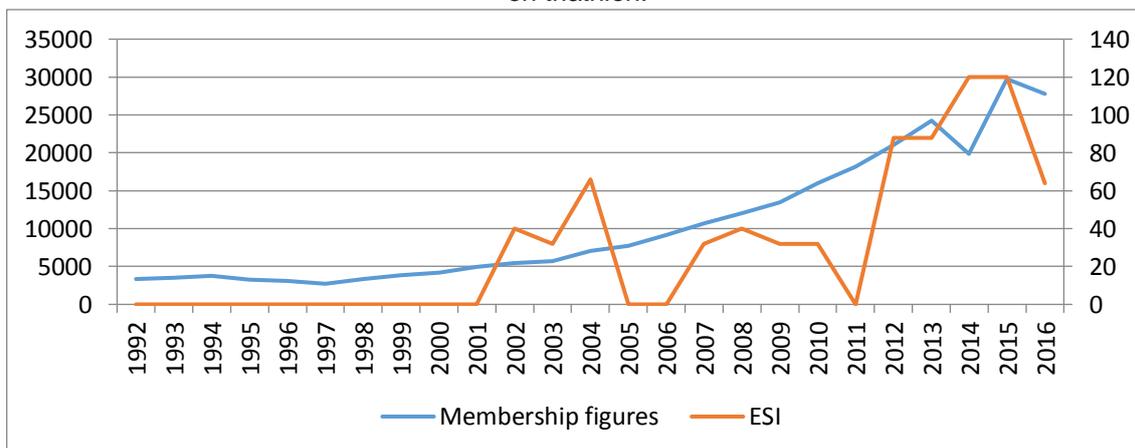
4.3.1 SPORTS THAT SHOW TRICKLE UP AND TRICKLE DOWN EFFECTS

The first subgroup includes sports showing high and positive or moderately high correlations between the evolution in the number of licenses and ESI punctuations. This group includes athletics, handball, basketball and triathlon, the last two being the clearest examples. Based on Table 1, we could deduce that wrestling could also be part of this group given that correlations would point in the same direction, in spite of being minor and statistically not significant.

In this first group we can observe both trickle up effect for the previous years and trickle down for the following years from a X year. Thus, these sports are characterized by an increase both in the number of licenses and in the sports success (i.e.; ESI punctuation). For instance, Figure 3 presents the evolution of

ESI punctuations and the number of licenses throughout the years in the triathlon. Thus, it can be noticed that the increase in the number of licenses goes hand in hand with the period having the best sports success (from 2001). In the case of triathlon, correlation between ESI punctuation and the number of licenses in that same X year was ,766 ($p \leq ,01$).

Figure 3. Evolution of the number of licenses and the ESI punctuations in the period 1992-2016 on triathlon.



Tennis is a special case in this group. (see Figure 4). As we see on Table 1, this sport shows only a trickle up effect, given that only correlations between the number of licenses in the previous years and ESI punctuations are positive and show statistical significance. This effect can be observed more easily in the periods 1992-1994 and 2002-2011, where the increase in the number of licenses comes before the increase of sports success. Furthermore, tennis shows negative and significant correlations in the long term (i.e.; $X + 5$ y $X + 8$), probably due to increases and decreases in sports successes that, after 5 and 8 years, coincide with an opposite evolution in the number of licenses. For instance, decrease in sports performance over 1995-1997 and 1999-2000 goes together with an increase in the number of licenses 5 and 8 years after. Finally, weight-lifting presents a light trickle down effect, being the correlation to the year $X + 2$ the only one presenting statistical significance ($\rho = ,419$; see Table 1).

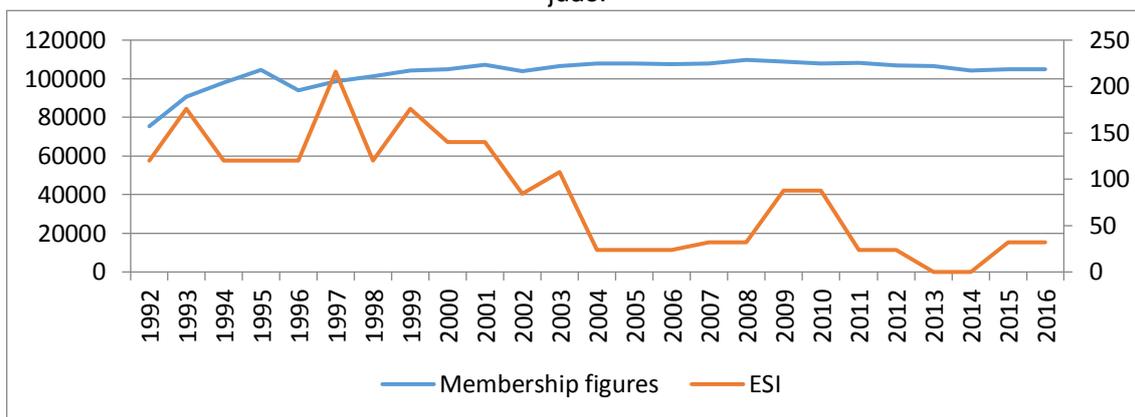
Figure 4. Evolution of the number of licenses and ESI punctuations over 1992-2016 in tennis.



4.3.2 SPORTS WITH A NEGATIVE RELATION BETWEEN ESI PUNCTUATIONS AND THE NUMBER OF LICENSES

A second group of sports includes those with a negative correlation between the number of licenses and ESI punctuations, both in the previous years to the X year, and in the following ones. This group includes football, gymnastics, judo and archery. In these sports, the evolution in the number of practicants and in sports success point in opposite directions. Thus, for instance, increase in the number of licenses is related to a smaller sports success in the following years, and a good sports performance in the previous years implies, paradoxically, a decrease in the number of licenses in the following years. In Figure 4 we can see the evolution of judo over 1992-2016. As it can be observed, the number of licenses increases slightly in this period, but sports success decreases as years go by. Likewise, in the period 2008-2010, the number of licenses decreases somewhat, but sports success increases. In addition, judo also shows moderated and positive correlations in the long term ($\rho_{X+8} = ,531$ y $\rho_{X+10} = ,585$; $p < ,01$). The global correlation between ESI punctuation and the number of licenses in that same year was $-,548$ ($p < ,01$). Finally, we must also include in this second group cycling, equestrian and volley ball, which show negative correlations between the number of licenses and the ESI punctuations only in the previous years to an X year, and hockey and sailing, which only present them in the following years (see Table 1).

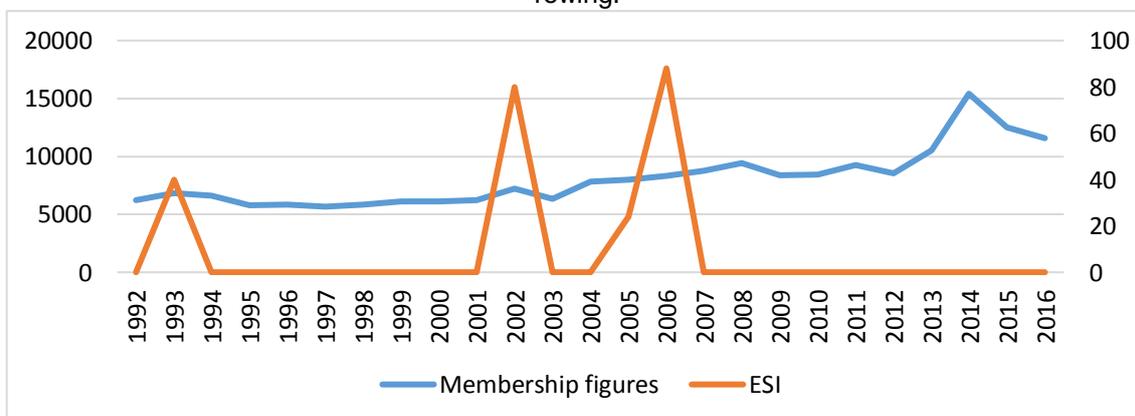
Figure 5. Evolution in the number of licenses and the ESI punctuations over 1992-2016 on judo.



4.3.3 SPORTS WITHOUT RELATIONS BETWEEN PUNCTUATIONS AND NUMBER OF LICENSES

The third and last group of sports includes those disciplines without statistically significant correlations between ESI punctuations and the number of licenses. In other words, it puts together sports whose success and evolution in the number of licenses are not linked, increasing or decreasing the values of the first without affecting the latter, and vice versa. This group includes badminton, boxing, fencing, canoe-kayak, rowing, taekwondo and archery. Except canoe-kayak and taekwondo, these sports are characterized by obtaining a low sports success (see Figure 1). As it can be observed on Table 1, one-time moments of sports success do not relate to the evolution in the number of licenses. On Figure 6 we present the evolution of ESI punctuations and the number of licenses in the period 1992-2016 regarding rowing. As it can be observed, sports success achieved in the years 1993, 2002 and 2006 doesn't have too much impact in the number of licenses. Likewise, the highest increase of licenses produced in the years 2012-2014 doesn't have impact on the future achievement of sports success. There was no global correlation between ESI punctuations and rowing licenses in a X year ($\rho = ,002$; $p > ,05$).

Figure 6. Evolution of the number of licenses and ESI punctuations in the period 1992-2016 in rowing.



5 DISCUSSION AND CONCLUSIONS

This study has tried to explore the sport pyramid metaphor in the context of Spanish sport. To accomplish this, we have analyzed the relation between success of elite sport and mass participation sport, through the analysis of the correlation between the results of international competitions and the evolution in the number of licenses in Spanish sport in the years 1992-2016 and, besides, we assume that, if this relationship existed, it wouldn't necessarily materialize immediately, but some years after the sports success.

After the statistical analysis of 23 sports modalities in Spain, we have identified three groups: 1) a first group formed by 4 sports modalities (athletics, handball, basketball and triathlon) with statistical signs revealing the existence of the trickle down and up effect; 2) a second group composed by 4 sports modalities (gymnastics, judo, football and archery) with negative correlations between the number of licenses and sports success; and 3) a third group formed by the remaining sports modalities that doesn't show any relation between the number of licenses and sports success.

Thus, this study corroborates that, in Spain and regarding the analyzed sports modalities, there is no clear evidence confirming the existence of the trickle down effect, as previous studies sustain (van Bottenburg, 2002; De Bosscher and De Knop, 2003; Stewart and Nicholson, 2004; Feddersen *et al.*, 2009; Hanstad and Skille, 2010; De Bosscher and van Bottenburg, 2011; De Bosscher *et al.*, 2014). It also manifests difficulties in distinguishing general tendencies, coinciding with the main conclusion of De Bosscher *et al.* (2014). And our research and analysis lead us to disagree with the statement, without scientific basis, that usually justifies the policies and investment of PA on elite sports and, as a result, shows the need to continue with the empirical exploration of the sport pyramid metaphor before affirming its acceptance and existence.

We must note some limitations in our study. Firstly, mass participation sport is identified through the number of federative licenses published by the CSD; this assumption being unreal, given that there are many practicers outside the federative area. Thus, federative licenses reflect participation in a mainly competitive environment and, following van Bottenburg (2003), they offer a limited view of reality. Secondly, carrying out the analysis in only one country, as it also occurs in most previous studies (i.e.; De Bosscher *et al.*, 2011), reduces the possibilities of generalizing results and, thus, being able to confirm the existence of the trickle up and down effects. Finally, the fact that there is statistical correlation does not mean that there is a cause relation, because there are multiple variables that can affect inevitably the possible relation between elite sport and mass participation sport, that haven't been taken into account in the present study, and some of which have been indeed studied in previous studies: 1) media coverage of athletes and sports disciplines (van Bottenburg 2003; Fleming *et al.*, 2005; Sotiriadou y Shilbury, 2009; Hanstad

and Skille, 2010; Lines, 2011); 2) The existence of organizations, programs, competitions or installations aimed at base sport promotion (van Bottenburg 2002, Sotiriadou *et al.*, 2008; Hanstad y Skille, 2010). Thus, future research should use more advanced statistical methods, such as the analysis with board data (e.g.; Weimar, Wicker, and Prinz, 2015) or linear regression (e.g.; Frick and Wicker, 2016), that permit including these covariates in the statistical analysis.

The results of this study allow generating new questions: what kind of characteristics have athletics, handball, basketball and triathlon to ease the sport pyramid metaphor?; ¿why do similar studies (De Bosscher *et al.*, 2014) carried out in other territories modalities presenting positive correlations are different (athletics, gymnastics, judo and tennis)?; ¿what features do gymnastics, judo, football and archery have so that they get a negative correlation in both sides? and ¿what features do the rest of analyzed modalities, in which there is no relation, have?

In conclusion, this article means the first study carried out in the Spanish sports context that has scrutinized the sport pyramid metaphor. The findings demonstrated are partial and do not show a definitive evidence of the sport pyramid metaphor. But a necessary precaution is reaffirmed when it comes to making definitive statements about the sport pyramid metaphor, its existence and effects. National sports institutions and organizations must be aware that the effects are not an obvious phenomenon that flows automatically from sports success, and it doesn't have to occur in all sports either.

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