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Articles

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The current issue is the second of the sixth volume of the *Athens Journal of Sports,* published by the Sports Unit of the Athens Institute for Education and Research (ATINER) under the auspices of the Panhellenic Association of Sports Economists and Managers (PASEM).

Gregory T. Papanikos, President
Athens Institute for Education and Research

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13-16 May 2019, Athens, Greece

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- Submission of Paper: **15 April 2019**

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Dr. Maria Konstantaki, Academic Member, ATINER & Senior Lecturer, Buckinghamshire New University, UK.

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On The Number of Top Sport Teams in a Town

By Seppo Suominen[*]

Top teams in sports typically are located in large towns since the junior teams of a top team have a bigger number of talents available and a large proportion of top players come from own junior team. This is especially true in women sport. A large town is able to support a large number of fans and visitors to a game, which results in higher ticket revenue. A large majority on the location of top teams uses male sports and there is no evidence concerning whether female sports follows the same structure. Is it so that if there is a top team of men located in a town, there is also a top women team? Are there any differences across genders in the location? The aim of this study is to include women sport and compare income elasticity of men sport and women sport. The variable to be explained is the cumulative amount of top teams located in a town. Top teams in this setting means that the team is playing in the highest league. Six different sports are included: ice hockey, football, (Finnish style) baseball, floorball, basketball and volleyball. The data covers 28 seasons from 1990 (or 1990/91) to 2017 (or 2017/2018). The Poisson regression and negative binomial regression results show that the cumulative number of male sport teams is positively related to population and negatively to average incomes. The negative income elasticity is weaker in the case of women sports. The coefficient is not significant in negative binomial regression model. Some prescriptive analysis concerning location correlation and autocorrelation is also given.

Keywords: *Top Sport Teams, Finland, Location, Poisson and Negative Binomial Estimation.*

Introduction and Motivation

Based on long run statistics (Itkonen and Nevala 1998) top teams in sports typically are located in large towns since the junior teams of a top team have a bigger number of talents available and a large proportion of top players come from own junior. This is especially true in women sport. A large town is able to support a large number of fans and visitors to a game which results in higher ticket revenue. The definition town here refers to an area where customers are able to choose different goods and visit different evens without restrictions from travel costs or travel time. However, there are some studies showing that the income elasticity of a game is negative indicating that high-income towns are not able to support a same amount of top teams than otherwise equal town with lower average income level of the citizens (Borland and Lye 1992, Baimbridge et al. 1996, Falter and Perignon 2000). However, there are studies showing a positive income elasticity (Depken 2001, Coates and Harrison 2005, Coates abd Humphreys 2007), thus the result concerning income elasticity is

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mixed and might be explained with the particular sports and country in the study. A large majority on the location of top teams uses male sports and there is no evidence concerning whether female sports follows the same structure. There is not enough evidence concerning the situation with women sports. Is it so that if there is a top team of men located in a town, there is also a top women team? Are there any differences across genders in the location?

The aim of this study is get more information concerning average income sensitivity using a long data set of top teams in Finland. The study is an extended repetition to a recent study of the author (Suominen 2017) where it was shown that in Finland the cumulative amount of top men teams over a 26 year period is positively related to population statistics of the town but negatively to incomes of citizens in the town. The aim of this study is to include women sport and compare income elasticity of men sport and women sport. The variable to be explained is the cumulative amount of top teams located in a town. Top teams in this setting means that the team is playing in the highest league. In each year the best of these teams is the Finnish champion. Six different sports are included: ice hockey, football, (Finnish style) baseball, floorball, basketball and volleyball. The data covers 28 seasons from 1990 (or 1990/91) to 2017 (or 2017/2018).

Related Literature

In the National Hockey League the teams are given franchise by the national league organisation. The main arguments of the franchise survival are population and location (Jones and Ferguson 1988). In the 1970's there were 16 teams in the NHL. During that time the league did not have a national US television contract and the teams did not have any ticket revenue sharing system. The location of the team was therefore very important for generating revenue. Quirk and El Hodiri (1974) showed that the greater the revenue processing ability of the team's location, the greater is the team's talent stock. The team is able to increase playing skills through acquiring top players if financial resources are adequate. Teams use more financial resources on talents if the league is open meaning that the weakest is subject to relegation than they do in closed, franchise system leagues (Ross and Szymanski 2002). The location is vital for generating revenues. However, (Coates and Humphreys 1999) show that sport stadia construction and economic climate of the area are negatively correlated. If the town receives a new sports franchise and as a result of that there is stadia construction, the impact on incomes of the town is negative. Moreover, (Siegfried and Zimbalist 2000, Siegfried and Zimbalist 2006) show that the argument of subsidising sports arena with tax revenue in order to generate economic benefits to the town is not valid. Sport facilities will not stimulate municipal economies.

Oberhofer et al. (2015) show following Quirk and El Hodiri (1974) that revenue generation or financial resources are vital for survival in the highest league in German football but the local market size measured by population

has a low negative effect on survival. A team's relegation is positively related to low budget, past performance and age. The author of this study (Suominen 2017) has shown that in men sport the cumulative number of teams playing in the highest league over a 26-year period is positively related to town population but negatively to town average incomes indicating that the demand for team sport has a negative income elasticity. The data included Finnish ice hockey, football, floorball, (Finnish style) baseball, volleyball and basketball.

Income elasticity is positive in consuming sport. Using 13 different sports activities (Thibaut et al. 2017) show that exercising sports has a positive income elasticity. In general male sports participants and those with higher levels of education spend more time and money on sports while the effect of age and urbanisation is not so clear. The determinants of time spent on sports participation and sports expenditure have in general similar signs but this is not evident for household or personal incomes. If money spent on active sports participation or exercising sports has a positive correlation with money spent on watching sports in a spectators' hall, then the income elasticity should be positive for the demand for team sports. However, the many results propose that this is not the case. (Downward and Rasciute 2010) show that a higher income increases the ratio of exercising sports to leisure activities (like music listening, going to cinema or visiting museums). High income persons seem to increase exercising sports in the cost of other leisure activities. There are substantial differences across nations in exercising sports and watching sports as (Hartmann-Tews 2006) and the author of this study (Suominen 2017) have shown. The cultural dimensions as defined by (Hofstede 1980) are important.

A Model

A simple oligopoly model is suitable for analysing the number of top teams in a town. With the help of the model, the number of top teams in the long run is solved. The model assumes that different sports are perfect substitutes from the viewpoint of spectators, which is not a plausible assumption. However, the model is a method to receive theoretical results concerning the number of teams that a town can sustain. Since the weakest teams are subject to relegation and there is some variation in the location of the top teams during a long period, the long run equilibrium number of teams must be analysed. Following (Martin 1993: 175) we have n Cournot quantity setting firms in a market (town, region) with linear inverse demand curve.

$$(1)\ p = a - bQ\ , Q = q_1 + q_2 + \cdots + q_n$$

where q_i denotes the number of spectators over the season. We assume that all sports are perfect substitutes. Each team produces with a quadratic cost function.

$$(2)\ C(q) = F + cq + dq^2\ , c, d > 0$$

Marginal cost exceeds average costs since $d > 0$ and there are diseconomies of scale. The average cost minimising level of output (the output for which marginal cost equal average costs) with this cost function is:

$$(3)\ q_{MES} = \left(\frac{F}{d}\right)^{½}$$

Minimum efficient scale as a fraction of the market size $M = \frac{a-c}{b}$ is

$$(4)\ MES = \frac{q_{MES}}{M} = \frac{\left(\frac{F}{d}\right)^{½}}{M}$$

In the short run the number of firms n is exogenously determined and based on previous success in the league. The worst teams are subject to relegation while the better teams continue in the top (higher league). Solving the first order conditions of profit maximisation and assuming that all firms are identical, the Cournot equilibrium output of each team is:

$$(5)\ q = \frac{M}{n + 1 + 2(\frac{d}{b})}$$

The total number of spectators, Q are price, p are:

$$(6)\ Q = \frac{n}{n + 1 + 2(\frac{d}{b})} M \quad p = c + \frac{1 + \frac{d}{b}}{n + 1 + 2(\frac{d}{b})} bM$$

In the long run we assume that the number of teams, n adjusts so that each team earns zero profit:

$$(7)\ \pi = b\left(1 + \frac{d}{b}\right)\left(\frac{M}{n + 1 + 2\left(\frac{d}{b}\right)}\right)^2 - F = 0$$

We can solve (7) and the number of teams in the long run, n_{LR}:

$$(8)\ n_{LR} = \frac{M}{\left(\frac{F}{b+d}\right)^{½}} - \left(1 + 2\frac{d}{b}\right) = \frac{1}{MES} - \left(1 + 2\frac{d}{b}\right)$$

In the long run, the number of teams, n_{LR} is greater, the smaller is the fixed cost, F, or the smaller is the minimum efficient scale output as a fraction of market size. The model also proposes that the number of top teams in the

town is positively related to the market size (M). The model assumes that all sports are perfect substitutes but empirical data is not in line with the assumption. Therefore, the result above is just a rough theoretical model of the number of top teams in a town.

Data and Descriptive Analysis

Some descriptive analysis is first presented in Table 1. In one season the number of teams in the highest league varies from 6 to 16. In average the women leagues have had a lower number of teams playing regular season games. For example the overall number of female teams in ice hockey has been 215 (7.67 per season) and the corresponding figure for male teams is 370 (13.21 per season). But the variation of home towns is higher for women ice hockey. During the period 1990/91 to 2017/28 the number of different towns is 21 for women ice hockey while highest league ice hockey men teams have been located in 16 towns. The same is true with football, volleyball and baseball: more variation in the location of women teams while the opposite is seen in floorball or basketball. In these there is more variation in the location with men than with women.

Top female baseball teams have been located in 30 different towns during the 28 seasons which is the largest figure indicating that there has been a largest variation across different sports. Male baseball league on average has had more teams than female baseball and the number of different towns is lower (men 28, women 30). If autocorrelation statistics is used to stand for variation the above is verified. Women baseball and volleyball are geographically more spread. The base year in the autocorrelation statistics below is year 2003 (Table 2). If the location of top teams is the same in two seasons then autocorrelation statistics is one. A high autocorrelation means across years in relation to base year 2003 means that there is small variation between locations.

As shown in Table 2, the weakest team typically is relegated to a lower division or league therefore for example the correlation coefficient of female ice hockey in 2004 (vs. 2003) is 0.882 indicating that almost the same towns have a top team and almost the same towns do not have a top team during these two sequential seasons. If only female sports is observed approximately the lowest correlation coefficients can be found in baseball and volleyball. In baseball the autocorrelation coefficient is less than 0.500 15 times. In volleyball the same figure is 8 (8/28). Floorball and basketball have been geographically more stable based in autocorrelation coefficients.

Table 1. *Descriptive Analysis*

	IC, W	IC, M	FB, W	FB, M	BA, W	BA, M	FL, W	FL, M	VO, W	VO, M	BB, W	BB, M
Regular, #	6 - 9	12 - 15	10 - 12	10 - 14	10 - 12	11- 15	10 - 12	10 - 14	7 - 11	7 - 13	8 - 11	10 - 16
Towns, #	21	16	24	23	30	28	22	24	28	25	19	21
All, #	215	370	286	350	322	365	321	356	255	304	260	344

IC = Ice Hockey, FB = Football, BA = Baseball, FL = Floorball, VO = Volleyball, BB = Basketball, W = Women, M = Men, seasons 1990 - 2017 (or 1990/19 to 2017/18), 28 years, #Regular = the number of teams in the highest league, #Towns = the number of different home towns of the top teams throughout the 28 year period, #All = the cumulative number of top teams, note that it is possible the one team has alweays been in top.

Table 2. *Autocorrelation Coefficients of Home Town, The Base Year is 2003, Female Sports*

	IC, w	FO, w	BA, w	FL, w	VO, w	BB, w
1990	0.306	0.634	0.259	0.58	0.236	0.56
1991	0.306	0.528	0.259	0.611	0.346	0.742
1992	0.306	0.606	0.259	0.574	0.236	0.742
1993	0.496	0.707	0.358	0.645	0.346	0.787
1994	0.433	0.808	0.358	0.661	0.428	0.787
1995	0.559	0.687	0.457	0.665	0.553	0.858
1996	0.559	0.687	0.358	0.661	0.709	0.845
1997	0.72	0.687	0.358	0.772	0.553	0.768
1998	0.833	0.687	0.457	0.752	0.665	0.845
1999	0.858	0.656	0.556	0.705	0.709	0.922
2000	0.899	0.705	0.556	0.604	0.776	0.877
2001	0.858	0.813	0.655	0.774	0.888	0.835
2002	0.96	0.899	0.852	0.917	0.943	0.877
2003	1	1	1	1	1	1
2004	0.882	0.941	0.733	0.894	0.776	0.919
2005	0.939	0.941	0.794	0.81	0.776	0.835
2006	0.939	0.803	0.691	0.803	0.776	0.837
2007	0.804	0.877	0.691	0.721	0.826	0.784
2008	0.739	0.762	0.691	0.752	0.709	0.53
2009	0.559	0.669	0.754	0.639	0.76	0.427
2010	0.522	0.532	0.691	0.752	0.637	0.632
2011	0.604	0.564	0.626	0.752	0.637	0.632
2012	0.559	0.483	0.486	0.681	0.637	0.699
2013	0.559	0.363	0.358	0.506	0.592	0.686
2014	0.559	0.402	0.383	0.611	0.441	0.645
2015	0.559	0.564	0.486	0.54	0.519	0.528
2016	0.433	0.437	0.486	0.572	0.441	0.667
2017	0.575	0.483	0.589	0.477	0.358	0.667

Table 3. *Autocorrelation Coefficients of Home Town, the Base Year is 2003, Male Sports*

	IC	FO	BA	FL	VO	BB
1990	0.899	0.573	0.468	0.812	0.238	0.264
1991	0.832	0.651	0.468	0.75	0.352	0.264
1992	0.899	0.71	0.379	0.805	0.326	0.264
1993	0.899	0.676	0.379	0.865	0.329	0.285
1994	0.843	0.695	0.468	0.868	0.431	0.285
1995	0.843	0.621	0.468	0.892	0.385	0.32
1996	0.899	0.676	0.357	0.868	0.551	0.417
1997	0.899	0.583	0.357	0.868	0.551	0.538
1998	0.899	0.543	0.357	0.772	0.671	0.665
1999	0.967	0.748	0.678	0.624	0.837	0.615
2000	1	0.748	0.647	0.824	0.795	0.832
2001	1	0.682	0.647	0.824	0.961	0.832
2002	1	0.848	0.904	0.885	0.961	0.916
2003	1	1	1	1	1	1
2004	1	0.89	0.741	0.945	0.884	0.871
2005	0.968	0.816	0.741	0.837	0.884	0.736
2006	0.968	0.773	0.809	0.845	0.795	0.825
2007	0.968	0.695	0.71	0.845	0.573	0.736
2008	0.968	0.743	0.741	0.712	0.625	0.736
2009	0.968	0.669	0.754	0.771	0.71	0.647
2010	0.968	0.669	0.714	0.712	0.728	0.736
2011	0.968	0.573	0.556	0.741	0.728	0.592
2012	0.968	0.651	0.523	0.726	0.71	0.557
2013	0.968	0.573	0.523	0.726	0.661	0.647
2014	0.898	0.573	0.523	0.726	0.54	0.499
2015	0.867	0.573	0.523	0.756	0.573	0.342
2016	0.8	0.495	0.557	0.672	0.573	0.438
2017	0.8	0.417	0.647	0.538	0.573	0.499

Table 3 shows that male ice hockey has been the most stable in terms of home town. That be explained by the fact that ice hockey league has been closed. The weakest has not been relegated and some new teams have been given the top league position. Floorball and football are very close to ice hockey in the home town variation but these sports have never been closed. The variation of top basketball and baseball teams' location has been highest based on autocorrelation coefficients.

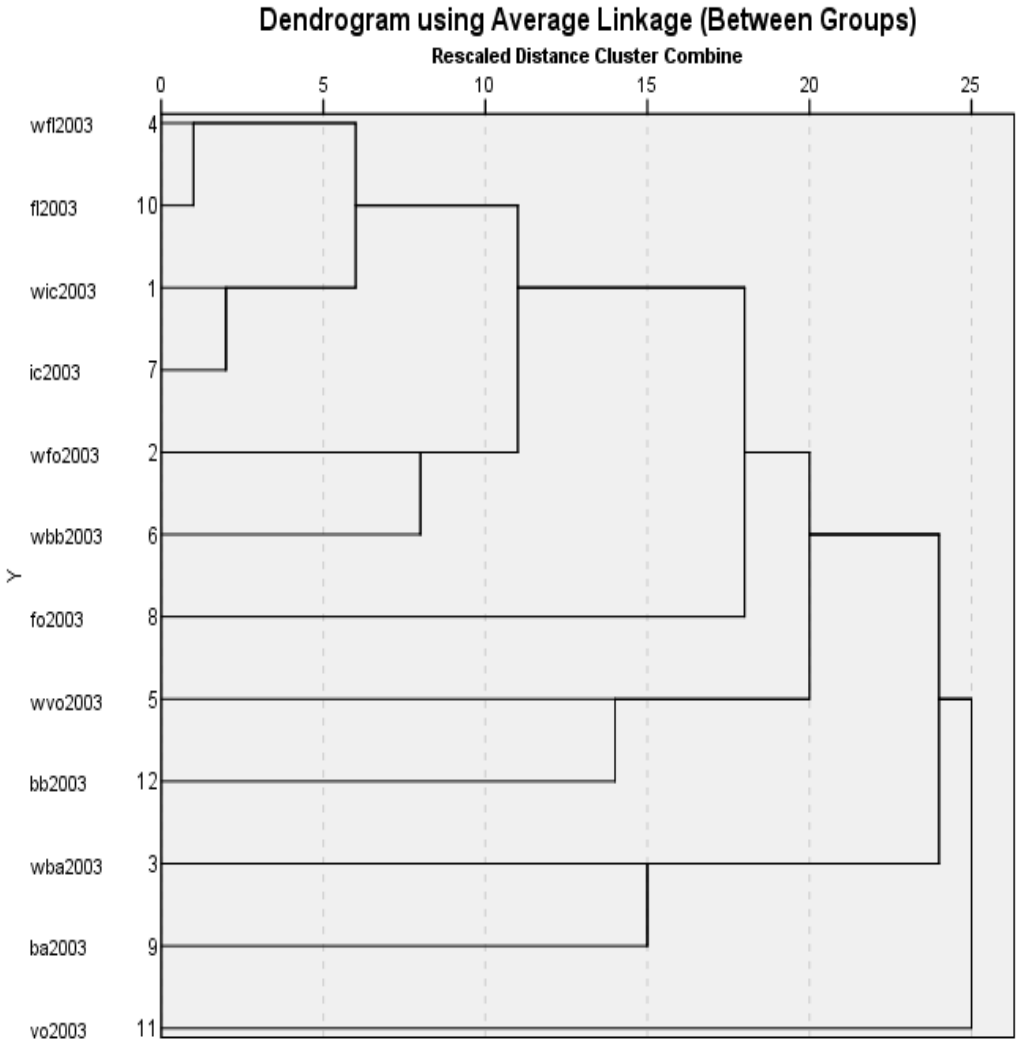
Table 4 presents the correlation coefficients of different sports location during the 2003 (or 2003/04) season.

Table 4. *Correlation Coefficients of Sports' Home Town during Season 2003*

	IC, W	FO, W	BA, W	FL, W	VO, W	BB, W	IC	FO	BA	FL	VO	BB
IC, W	1	0.522	0.131	0.573	0.145	0.311	0.707	0.193	0.013	0.728	0.193	0.295
FO, W		1	-0.089	0.514	-0.003	0.604	0.537	0.310	-0.018	0.663	0.109	0.108
BA, W			1	0.150	-0.015	-0.101	0.370	0.044	0.160	0.046	-0.043	0.036
FL, W				1	0.076	0.513	0.588	0.260	-0.031	0.791	0.186	0.420
VO, W					1	-0.096	0.140	0.151	-0.025	0.135	0.059	0.245
BB, W						1	0.401	0.354	-0.107	0.500	-0.027	0.284
IC							1	0.509	-0.049	0.677	0.087	0.304
FO								1	0.031	0.279	0.018	0.246
BA									1	-0.035	-0.053	-0.066
FL										1	0.151	0.285
VO											1	0.087
BB												1

The correlation matrix of season 2003 (2003/2004) reveals that male volleyball, basketball and baseball as well as female baseball and volleyball seem to have the lowest correlation coefficients with other sports. It shows that these sports are most separated. These are least played simultaneously in a same town with other sports on the top level. On the contrary, ice hockey and floorball, both female and male, seem to be played in the same towns where also top female football was played in 2003. It can be argued that the latter seem to cluster in rather large towns in Finland. The dendrogram of the cluster analysis (Figure 1) verifies the result of the average distances between sports. Male volleyball (vo2003) is the most separate in terms of location in 2003.

Figure 1. *Dendrogram, Season 2003*

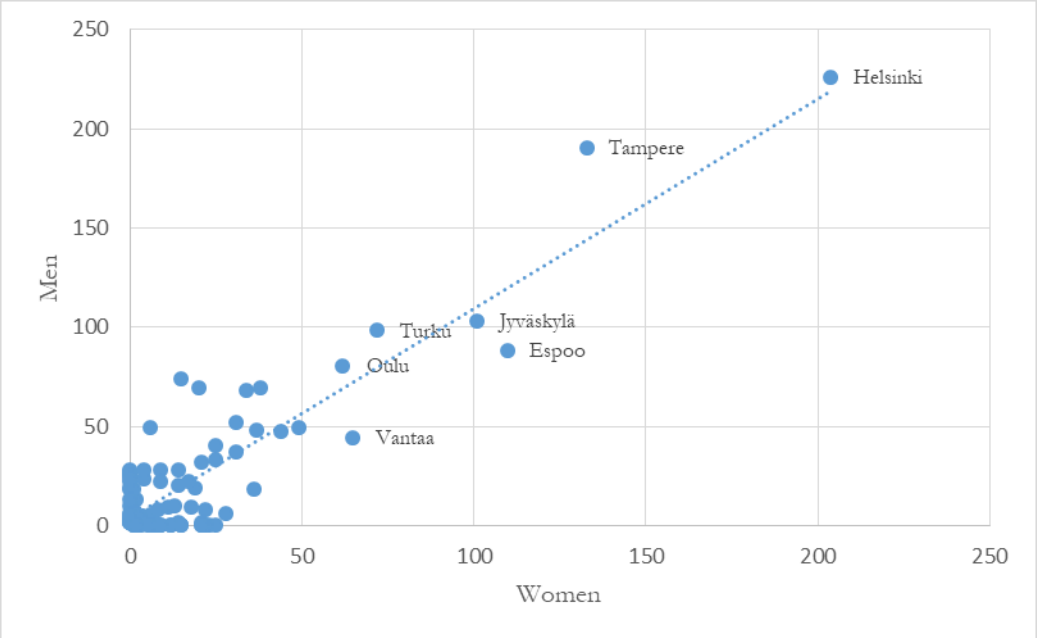


Estimation and Results

The oligopoly model above proposes that the number of teams in the long run and market size should be positively related. The cumulative number of teams over the years is negatively related with fixed costs of the team. A systematic cost analysis of the top teams has not been made with Finnish teams but based on newspaper articles it can be argued that female sports and only sports played in Finland, i.e. baseball (with Finnish rules) have lower fixed cost due to lower salaries we should see these sports in also smaller towns where the spectator number is smaller. Top Finnish ice hockey (football, volleyball, basketball) players have the option to get higher salaries in top professional leagues, like NHL or NBA. That leads to higher salaries in Finland that is the case with pure Finnish sports like Finnish rule baseball. Therefore we should observe that the variation of towns where baseball has been played throughout the history is higher. Table 1 reveals that baseball in top level has been played in a bigger number of towns than any other sports during the period from 1990 to 2017.

The output variable in the Poisson and Negative Binomial estimations is the cumulative number of teams in a town over a period from 1990 to 2017. In figure 2 the cumulative number is illustrated.

Figure 2. *Cumulative Number of Teams, 1990 - 2017*

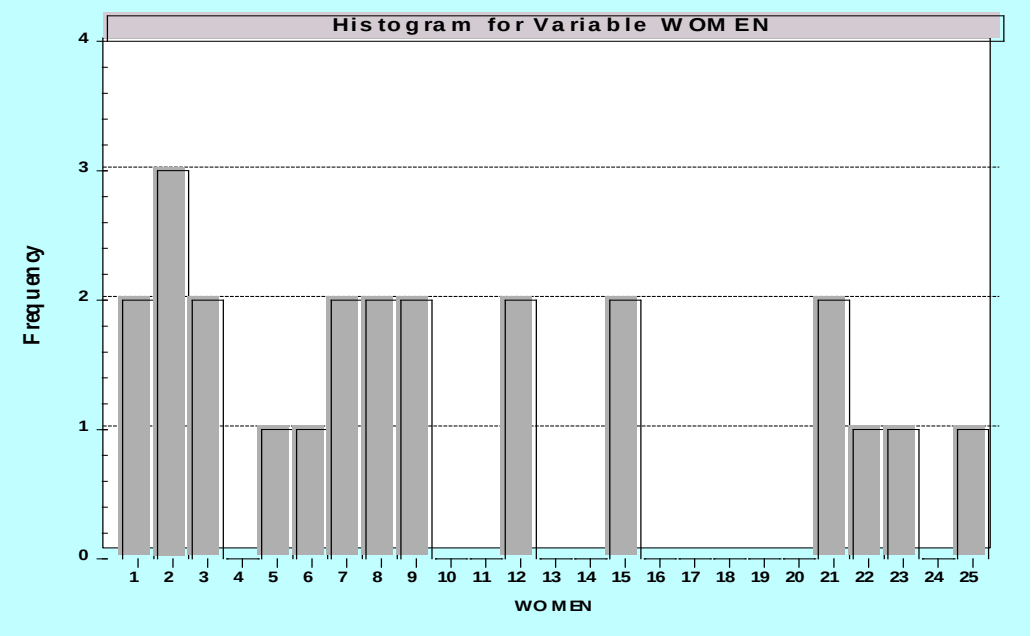


The cumulative number of male teams and female teams are correlated (r = 0.883). If the data is cut and only figures up to 50 are taken into account (in Figure 2 the lowest corner on the left) the correlation coefficient is 0.522. Below the regression line in figure 2, there are three large towns: Jyväskylä, Espoo and Vantaa that seem to have had a larger amount of female top teams

than an average large town. The population of Espoo and Vantaa are larger than that of Jyväskylä but they are neighbours of Helsinki which seems to have a negative impact on the cumulative number of teams of these two towns.

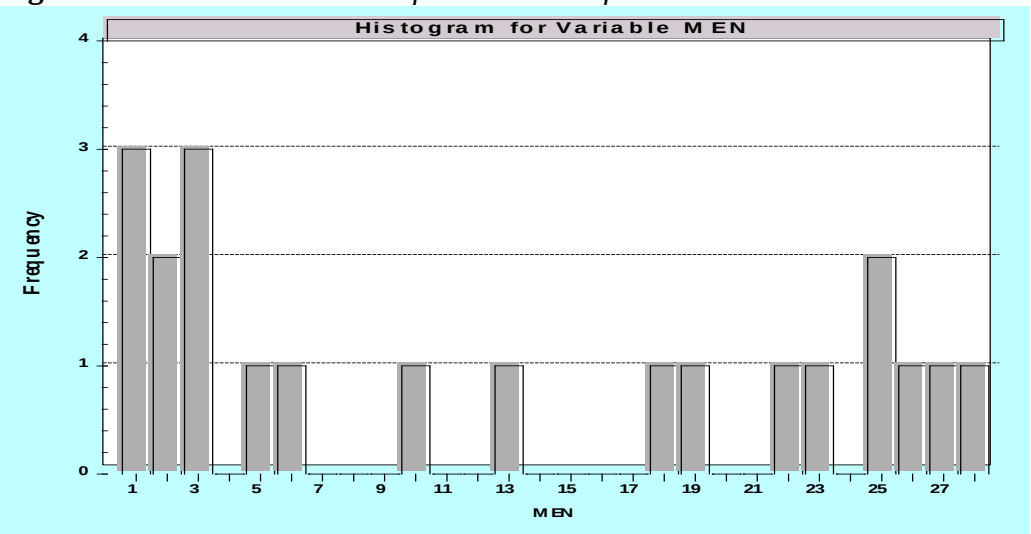
If the cumulative number of male teams is zero (n = 24), the cumulative number of female teams varies from 1 to 25 (Figure 3). The share of these observations in the whole sample (# towns 92) is 26 %.

Figure 3. *Cumulative Number of Female Teams if Male is Zero*



Correspondingly if there has been no female top teams over the 1990 - 2017 period the cumulative number of male teams varies from 1 to 28 (Figure 4). The number of these towns is 21 (23 %).

Figure 4. *Cumulative Number of Male Teams if Female is Zero*



The above statistics shows that in Finland approximately 25 % of towns are separated by gender: only top female or only top male teams. Rather often the towns with rather small population (less than 32000) have had a top team in volley ball but only women team or only men team.

The cumulative number of teams using Poisson and Negative Binomial regression analysis is presented below in table 5. The explaining variables are logarithms of median income of the town population and total population in 2007. Both the population and income statistics are highly autocorrelated over the period from 1990 - 2017.

Table 5. *Cumulative Number of Teams Using Poisson and Negative Binomial Regression Analysis*

	Women		Men		Both	
	Poisson	Neg.Bin	Poisson	Neg.Bin	Poisson	Neg.Bin
Log INC	-0.717** (0.226)	-0.472 (1.256)	-3.046*** (0.220)	-2.691*** (0.624)	-1.967*** (0.157)	-1.623** (0.609)
Log POP	0.992*** (0.023)	0.778*** (0.181)	1.100*** (0.022)	0.748*** (0.070)	1.049*** (0.016)	0.762*** (0.069)
Constant	-0.511 (2.151)	-0.805 (11.680)	21.807*** (2.075)	21.918*** (5.919)	12.182*** (1.489)	11.726* (5.799)
α		1.549*** (0.282)		0.653*** (0.074)		0.540*** (0.085)
McFadden pseudo R^2	0.6146	0.497	0.663	0.482	0.753	0.489
$R^2_{Pearson}$	0.7798		0.7980		0.8782	
$R^2_{deviance}$	0.6774		0.7182		0.8098	
χ^2	1068.61	629.75	1106.03	655.834	1184.49	
G^2	962.35		1050.36		1090.62	
Overdispersion: $g = \mu$	5.719		4.791		4.491	
Overdispersion: $g = \mu^2$	1.971		1.478		1.982	

*n = 28 years (periods), both Poisson and Negative Binomial regression. The critical value of the standard overdispersion test from the χ^2-table is 3.84. Negative Binomial form 2: $\psi_i = \theta$. *, ** and *** denote significance at 5 %, 1 % and 0.1 % level.*

The results in Table 5 indicate that Poisson regression which assumes that the mean equals the variance is not suitable due to overdispersion. Negative binomial regression shows that median income is significant in the case of men sports but not significant in the case of women sports. The latter has typically substantially lower spectator audience and therefore lower incomes from ticket sales. Population coefficient is positive but less than one indicating that larger towns have more top teams but the effect is diminishing.

The difference between female and male teams is next analysed. Since the difference can get both positive (more women than men teams) and negative (more men than women teams) values, a conventional regression analysis is carried out.

Table 6. *Regression Analysis: Difference between Women and Men Teams, Cumulative, Years 1990 - 2017*

Log INC	47.596*** (13.668)
Log POP	-8.295*** (1.846)
Constant	-395.496** (128.348)
R^2	0.183
F	11.25***

, ** and * denote significance at 5 %, 1 % and 0.1 % level.*

The regression analysis result in Table 6 indicates that women team dominance is positively related to higher income towns with a small population. The theoretical model outlined proposes that a larger number of teams is related with the smaller minimum efficient scale as a fraction of market size. Conventional observations suppose that women teams have lower costs than men teams and therefore a smaller town is able to maintain more women teams.

Conclusions

The purpose of this study is to analyse the location of top teams in six different sports over a long period from 1990 to 2017. Both women and men teams are analysed. The cumulative number of top teams over this period is positively related to town size. The number of men teams is negatively related to median incomes of the inhabitants of the town or county. This is not verified with women teams. The location of women top teams is less sensitive to low incomes. A smaller town in terms of population is related to women teams. Male teams seem to require a larger town over a long period. A larger town is able to support more often male teams since the teams need a larger spectator number due to financial reasons. The number of talents is bigger in larger towns.

The variation of locations in women ice hockey is higher than in men ice hockey. The same is true with football, volleyball and baseball: more locational variation in women sports. However, the opposite is more likely in floorball and basketball. Men volleyball, basketball and baseball as well as women baseball and volleyball have been more separated in terms of location. On the contrary top level ice hockey and floorball seem to have been located in larger towns in Finland.

It is possible that the largest towns and cities in Finland seem to reduce the possibility of the neighbour towns to sustain a top level men team. This is seen in the case of Espoo and Vantaa that are the nearest cities of Helsinki which is the largest city in Finland. Espoo and Vantaa have had more women top teams than men teams over the long period.

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Flexibility and Functional Asymmetry in Rhythmic Gymnastics

By Amanda Batista[*], Rui Garganta[†] & Lurdes Ávila-Carvalho[‡]

This study aimed to compare the flexibility level in Portuguese rhythmic gymnasts across competitive levels, investigate possible functional asymmetries in gymnasts across the competitive levels, and determine which flexibility variables better explain performance. Participants included young gymnasts (n=157) in three competitive levels (Base, 1st division and Elite), who performed ten specific passive and active flexibility tests were used. The asymmetry index was calculated and a limit of 15% bilateral difference was established as normal flexibility difference in the lower limbs. Upper and lower limbs, as well as multi-joint flexibility increased with higher competition level, although these differences were not significant between 1st division and Elite in upper limbs and multi-joint tests. All groups showed differences in passive and active flexibility between preferred and non-preferred lower limb. In addition, the higher the competition level, the lower the asymmetry level. Functional asymmetry was found in 69% and 71% of the gymnasts in passive and active flexibility, respectively. Finally, active flexibility with preferred lower limb explained 21.8% of the variance in performance with some differences in the variables explaining performance across levels.

Keywords: *Rhythmic Gymnastics, Portuguese Gymnasts, Flexibility, Functional Asymmetry, Performance.*

Introduction

In Rhythmic Gymnastics (RG), flexibility, strength, endurance, coordination, agility, balance and rhythm are essential to develop motor skills at a high level (Polat and Günay 2016) in order to perfectly execute body and apparatus movements (Bordalo et al. 2015). Thus, the development of gymnasts requires a particular training process and a specific theoretical and practical knowledge of the sport (Bobo-Arce and Méndez-Rial 2013).

Flexibility is one of main physical capacities that have been identified as contributing factors to performance in RG (Di Cagno et al. 2009, Douda et al. 2008, Miletić et al. 2004, Rutkauskaitė and Skarbalius 2009, 2011). It is characterized by the amplitude of the movements that depends on the joint mobility expressed by the anatomical properties of the joints, and the muscle elasticity expressed by the level of stretching of the muscles (Laffranchi 2001). Rhythmic gymnasts should have high levels of flexibility, especially in the hip,

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scapulohumeral and spine joints (Jastrjembskaia and Titov 1999, Stadnik et al. 2010, Volpi da Silva et al. 2008). In fact, flexibility increases, even if not linearly, the possibility of executing different movements, thus, providing a higher gymnasts' technical level and consequently an improvement in competition results (Boligon et al. 2015). In contrast, insufficient flexibility hinders the performance in certain body elements (Jastrjembskaia and Titov 1999) and makes it more difficult to perfect the technique, to educate the expressiveness and to demonstrate the lightness of the movements that are essential characteristics in this sport (Lisitskaya 1995). Appropriate levels of flexibility are a precondition for proper performance of all basic body elements (jumps, balance and rotation) (Miletić et al. 2004).

RG aims to exercise the body bilaterally, however, in reality, to achieve high performance, the gymnast often performs repetitive motor actions only with the preferred side, which eventually encourages unilateral training (Teixeira and Paroli 2000, Zaidi 2011). Thus, despite the natural asymmetry of the human body, it is suggested that the functional asymmetry in this sport is mainly the result of training (Lisitskaya 1995). According to Lisitskaya (1995), the apparent asymmetries may reflect negatively on the physical and technical preparation of gymnasts, which in the short-term become performance conditioning factors and in the long-term can produce pathologies. The importance of this study is justified by the necessity of more information about flexibility of rhythmic gymnasts from different competition levels, functional asymmetry and predictors of performance in RG. This information is a basic element of work to RG coaches, so they can to perform organizational and intervention strategies based on specific research.

The objectives of this study were: (1) to identify and compare the flexibility level in Portuguese gymnasts across competitive levels, (2) investigate possible functional asymmetries in gymnasts across competitive levels, and (3) determine the flexibility variables that better explain RG performance.

Material and Methods

Participants: 157 Portuguese gymnasts who participated in the district and or national competitions during the 2013/2014 season, in three different levels: Base, 1st division and Elite.

Age and Training Characteristics: chronological age, practice experience (number of years of RG training), age at the onset of training and training volume were collected using questionnaires (Table 1).

Table 1. *Age and Training Characteristics of the Sample Gymnasts*

Variables	Base (n=82)	1st Division (n=66)	Elite (n=9)
Age (years)	13.3±2.0	13.5±2.1	14.8±1.8
Training volume (hours/week)	13.9*±6.4	18.5*±6.4	31.2*±6.2
RG practice (years)	5.6*±3.2	6.6*±2.6	8.2*±1.9
Age at the onset of training (years)	7.2±2.6	6.4±1.9	6.0±1.5

**p≤0.05: significant differences*

Ethical Considerations: The study protocol was approved by the Ethics Committee of the Faculty of Sport, University of Porto – Portugal (CEFADE 20-2013) and Scientific Committee of the Portugal Gymnastics Federation. The assessments were performed in accordance with the ethical standards of the Helsinki Declaration.

Flexibility Measurements: The maximum passive and active flexibility was measured using ten specific RG movements of main joints: hip, shoulders and spine, according to the International Gymnastics Federation (FIG) recommended tests (Klentrou et al. 2010). The tests were grouped according to the anatomical region analyzed (Table 2). In brief, passive flexibility of lower limbs (LL) was assessed using leg up with help of the hand forward (PLF), sideways (PLS) and backward (PLB). LL active flexibility was assessed using leg up without help of the hand forward (ALF), sideways (ALS) and backward (ALB). Upper limb (UL) flexibility was assessed using shoulder rotation with stick in anteversion and retroversion (RUL). Multi-joint flexibility was assessed lying on the floor (face down) with lift of the trunk to the vertical (TLV) and maximum trunk lift (MTL), as well as using forward stand-and-reach test (FSR).

The majority of these tests (PL, AL and TL) assess flexibility by comparing each joint's range of motion with a reference chart. For each movement, the range of motion is scored using a scale from 0 to 4 points (0 = poor, 1 = satisfactory, 2 = good, 3 = very good and 4 = excellent). Since only whole numbers are used to score, for movements with a range of motion between two points of the assessment chart, the next lower value was registered. The remaining tests (RUL and FRS) are linear flexibility tests and the results are presented in centimetres (cm).

In the LL flexibility tests (PL and AL in Table 1), the gymnasts performed the exercises with preferred (PLL) and non-preferred LL (NPLL). The PLL is the leg that gymnast prefers to perform the task and the NPLL is the support leg. For the analysis of LL flexibility tests, the results were grouped according with the origin of action (passive or active flexibility) and the preference of LL in performing the movement (PLL or NPLL), i.e., it was assigned two values for passive flexibility (one value for PLL and one value for NPLL). The mean values of tests PLF, PLS and PLB were then used in the analysis for passive flexibility. Likewise, for active flexibility (one value for PLL and one value for NPLL) the mean values of tests ALF, ALS and ALB were calculated and used for analysis.

Table 2. *Summary of Flexibility Tests*

Test	**Leg up with help of the hand (PL)**	**Leg up without help of the hand (AL)**	**Rotation of the upper limbs (RUL)[1]**	**Trunk Lift (TL)**	**Forward Stand-and-Reach (FSR)**
Purpose	To evaluate the passive flexibility of the hip joint	To evaluate the active flexibility of the hip joint	To evaluate the active flexibility of the scapulohumeral joint	To evaluate the active flexibility of the spinal joints	To evaluate the active flexibility of the spinal and hip joints
Measure	Maximum amplitude angle of the hip joint	Maximum amplitude angle of the hip joint	Minimum distance of hands during the rotation of upper limbs	Amplitude angle of the spinal joints in extension movement (according to the defined limits: 90^{o} or maximum amplitude)	Maximum distance of fingers from the edge of the bench
Equipment	Table 5 points (chart for rating)	Table 5 points (chart for rating)	Ruler with scale (cm)	Table 5 points (chart for rating)	Measuring tape
Position	Standing straight (wall, bar or backrest)	Standing straight (wall, bar or backrest)	Standing with the ruler in front of the body with the minimum distance between hands	Lying on the stomach	Standing on the bench with knees fully extended and toes at the edge of the bench
Action	Leg up forward (PLF), sideways (PLS) or backward (PLB) to maximum with help of the hand. Perform with both legs	Leg up forward (ALF), sideways (ALS) or backward (ALB) to maximum without help of the hand. Perform with both legs	Rotation of the extended upper limbs back without trunk inclination (anteversion and retroversion)	Lift trunk upwards, without help until vertical (TLV) or the maximum extent (MTL)[2]	Leaning forward and reach toward the ground. Repeat 4 times; on the fourth trial, hold the position of maximum reach for one complete second

Source: Klentrou et al. 2010
[1]Test from Douda et al. 2008, [2]Test adapted from Klentrou et al. 2010

Furthermore, in the LL flexibility tests, a limit of 15% bilateral difference was established as the maximum value for a normal difference (i.e. no asymmetry) between PLL and NPLL (Marchetti 2009). The asymmetry index (AI) was calculated using the equation (Chavett et al. 1997): AI (%) = [(PLL-NPLL)/PLL]*100, where AI represents the asymmetry index, PLL is the preferred lower limb test result (mean value achieved in the active and passive flexibility tests with PLL) and NPLL is the non-preferred lower limb test result (mean value achieved in the active and passive flexibility tests with NPLL).

The flexibility tests were conducted in training environment following strictly the protocol proposed. Two cameras (Nikon D5300, Tokyo-Japan and Samsung VP DX 100, South Korea) were used to register the images and videos. The videos were then analyzed by two international judges in two different occasions 10 days apart. We observed high values of intra-examiner reliability (Kendall Coefficient of Concordance 0.83-0.97) and inter-examiner reliability (Intraclass Correlation Coefficient 0.84-0.97), which confirms a high quality of information.

Statistical Procedures: Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS 23.0). The significance level was set at 5%. Descriptive statistics were performed using the mean, standard deviation, median, minimum and maximum values. Kruskal-Wallis and Wilcoxon tests were used to compare flexibility scores across competition levels. Pearson correlation and linear regression were used to verify the variables that explain performance.

Results

Lower Limb flexibility tests: Table 3 shows that passive flexibility was higher than active flexibility with both PLL and NPLL in all groups ($p<0.001$). Furthermore, there is a high inter-individual variability in the groups in both flexibility analysis and LL. According to the asymmetry index, we found higher asymmetries levels in active than passive flexibility.

When we compared LL flexibility between competition levels (Table 3), we found that all groups had significant differences ($p\leq0.05$) in all LL flexibility tests (passive and active). Thus, the higher the competition level, better the flexibility results with both PLL and NPLL.

Table 3. *Mean, Standard Deviation and Range Values Achieved in the Flexibility Tests Performed with PLL and NPLL; Asymmetry Index by Competition Levels*

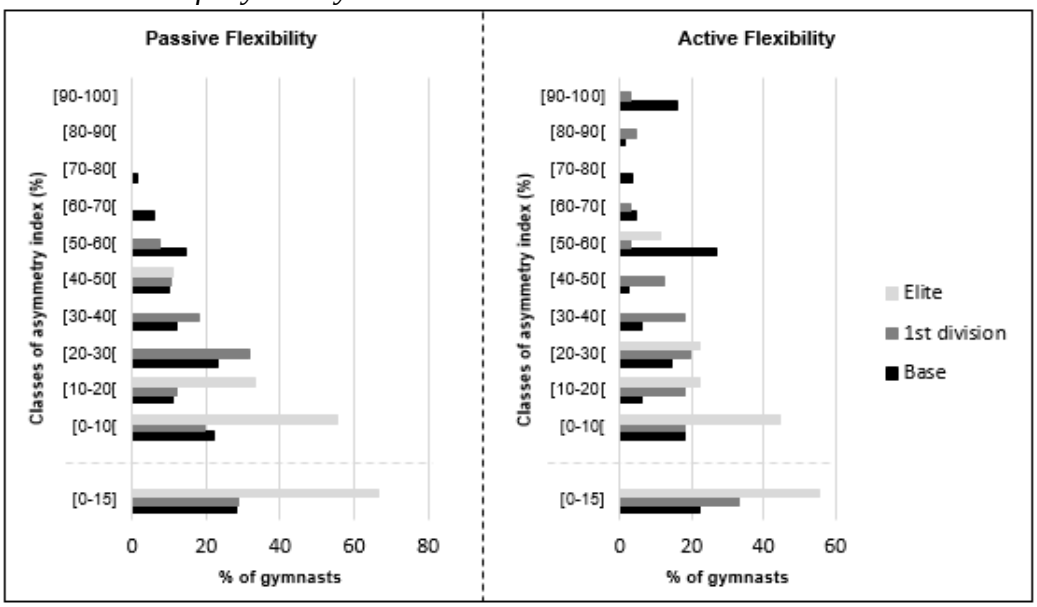
	Competition level	**PLL (x±sd)**	**NPLL (x±sd)**	**PLL Range (pts)**	**NPLL Range (pts)**	**AI (%)**
Passive Flexibility*[1,2,3]	**Base**	2.1 ±0.8	1.5±0.6	0.3 – 4.0	0.3 – 3.3	28.6%
	1st division	3.2±0.6	2.4±0.7	0.7 – 4.0	0.7 – 4.0	25.0%
	Elite	3.7±0.5	3.3±0.6	2.7 – 4.0	2.3 – 4.0	10.8%
	All groups	2.6±0.9	2.0±0.9	0.3 – 4.0	0.3 – 4.0	23.0%
Active Flexibility*[1,2,3]	**Base**	1.4±0.8	0.9±0.7	0 – 3.0	0 – 2.7	35.7%
	1st division	2.4±0.6	1.7±0.7	0 – 3.7	0 – 3.3	29.2%
	Elite	2.9±0.6	2.4±0.6	2.0 – 3.7	1.3 – 3.3	17.2%
	All groups	1.9±0.9	1.3±0.9	0 – 3.7	0 – 3.3	31.6%

*Legend – PLL: preferred lower limb; NPLL: non-preferred lower limb; pts: points; AI: asymmetry index; *[1]: $p\leq0.05$ – significant differences between all groups (base vs. 1st division; base vs. elite; 1st division vs. elite); *[2]: $p\leq0.05$ – significant differences between lower limbs (PLL vs. NPLL); *3: $p\leq0.05$ – significant differences in passive versus active flexibility with preferred and non-preferred lower limb in all competition levels.*

Furthermore, significant differences were found in PLL versus NPLL in all groups in both passive ($p<0.001$) and active ($p<0.001$) flexibility tests. According

to asymmetry index (Table 3), the higher the competition level, lower the functional asymmetries levels between LL. Figure 1 presents the flexibility asymmetry index by competition level. According to the recommended limit of 15% (Marchetti 2009) bilateral difference between PLL and NPLL, we observed high asymmetries levels in flexibility: overall, 69.4% and 71.4% of gymnasts in this study presenting different functional asymmetry levels in passive and active flexibility, respectively.

Figure 1. *Individual Analysis of Flexibility Level by Competition Levels according to the Classes of Asymmetry Index.*



Gymnasts in the Elite group had lower asymmetry and the majority of this group did not present the referred functional asymmetry. On the other hand, the 1st division and Base showed functional asymmetries of different and higher magnitude.

Upper limbs and multi-joint testing: The gymnasts presented the same performance for shoulder turn in anteversion and retroversion, therefore, only one value was presented in the results of RUL test. In the UL and multi-joint flexibility tests (Table 4), the higher the competition level, higher the flexibility in all tests performed. However, significant differences were found in all tests between the Base group and the other two groups, i.e., 1st division and Elite. No significant differences were found between 1st division and Elite: RUL ($p=0.393$); FSR ($p=0.195$); TLV ($p=0.349$); MTL ($p=0.468$).

Table 4. *Upper Limbs and Multi-Joint Flexibility Tests by Competition Levels. Range Values, CV Percentage, Mean, Standard Deviation and P Values*

	Base (n=82)			1st Division (n=66)			Elite (n=9)			Proof Value
Tests	**Range**	**CV(%)**	**x±sd**	**Range**	**CV(%)**	**x±sd**	**Range**	**CV(%)**	**x±sd**	
RUL (cm)	0 – 62.0	63.1%	$24.9^{1,2}$±15.7	0 – 61.0	106.7%	15.0^{1}±16.0	0 – 38.0	147.6%	8.2^{2}±12.1	*0.000*
FSR (cm)	0 – 38.5	40.4%	$18.3^{1,2}$±7.4	-13.0 – 34.8	35.5%	21.7^{1}±7.7	21.7 – 28.2	8%	24.7^{2}±2.0	*0.001*
TLV (pts)	0 – 4.0	51.9%	$2.7^{1,2}$±1.4	1.0 – 4.0	15.8%	3.8^{1}±0.6	4.0 – 4.0	0%	4.0^{2}±0.0	*0.000*
MTL (pts)	0 – 4.0	76.5%	$1.7^{1,2}$±1.3	0 – 4.0	31.3%	3.2^{1}±1.0	2.0 – 4.0	19.4%	3.6^{2}±0.7	*0.000*

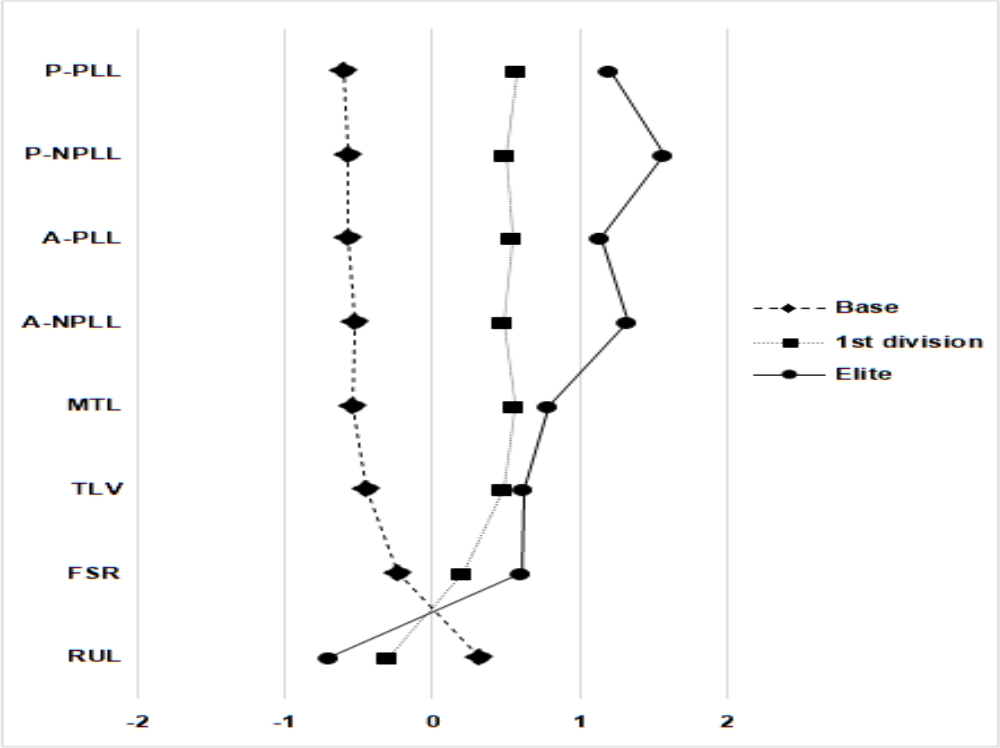
*Legend – RUL: rotation of the upper limbs; FSR: forward stand-and-reach; TLV: trunk lift vertical; MTL: maximum trunk lift; pts: points; *p≤0.05: significant differences – [1]: Base versus 1st division; [2]: Base versus Elite. CV: coefficient of variation.*

Furthermore, the range and standard deviation values (Table 4) evidence the high dispersion of results especially in Base and 1st division groups. The coefficient of variation (%) calculated using mean and standard deviation shows that the higher the competition level, lower the inter-individual variability, except in the RUL test, where the Elite group presented a higher dispersion around the mean.

In TLV, 69.4% of gymnasts reached an excellent level (4) and in MTL only 35% of gymnasts obtained the same flexibility level. This difference is more evident when we analyzed the results by competition level. As expected, excellent level was achieved by 48.8% (TLV) and 13.4% (MTL) of gymnasts from Base; 90.9% (TLV) and 57.6% (MTL) of gymnasts from 1st division; 100% (TLV) and 66.7% (MTL) of Elite gymnasts. Thus, significant differences were found in TLV versus MTL in Base ($p<0.001$) and 1st division ($p<0.001$).

Flexibility Profile: Figure 2 shows the flexibility profiles by competitive level. We confirmed a clear advantage of the Elite group in all flexibility tests. As expected, 1st division presented intermediate results, with higher values than Base and lower than Elite. This group also showed a lower variability in the results. The Base obtained the lower results in all flexibility tests and with below average values.

Figure 2. *Flexibility Profile by Competitive Level*

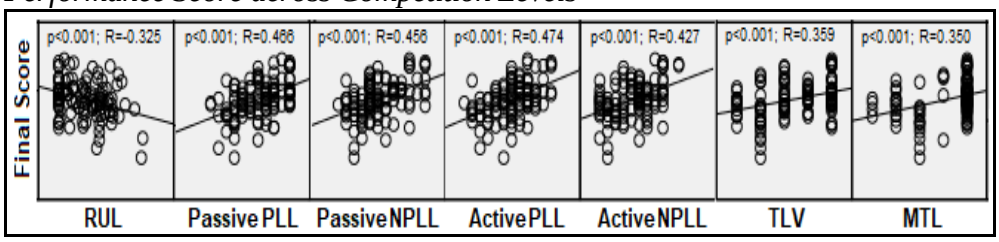


Legend – P-PLL: Passive flexibility with preferred lower limb; P-NPLL: Passive flexibility with non-preferred lower limb; A-PLL: Active flexibility with preferred lower limb; A-NPLL: Active flexibility with non-preferred lower limb; MTL: Maximum Trunk Lift; TLV: Trunk Lift Vertical; FSR: Forward Stand-and-Reach; RUL: Rotation of the upper limbs.

The analysis of RUL test is different from the other flexibility tests (Figure 2). The results in this test showed the same progression: Base with lower results, followed by 1st division and Elite with the best results.

Analyzing all flexibility variables and the competitive performance of gymnasts, the RUL, TLV and MTL, as well as the LL scores (passive PLL/NPLL and active PLL/NPLL) were significantly correlated with performance scores (Figure 3). Thus, the higher the flexibility in the LL tests, as well as in TLV and MTL tests, the higher the score in competition while the lower the values achieved in RUL test, higher the score in competition.

Figure 3. *Flexibility Variables with Significant Correlation with Final Performance Score across Competition Levels*



Legend – RUL: Rotation of the upper limbs; PLL: Preferred lower limb; NPLL: Non-preferred lower limb; TLV: Trunk Lift Vertical; MTL: Maximum Trunk Lift.

However, only the active flexibility tests with PLL (active PLL) presented statistical significance in the model of linear regression ($p<0.001$; $F=31.623$). According to R^2 adjusted, this variable explained 21.8% of variance of performance. The regression equation was: Performance Score = 45.919 + 4.884*Active PLL; therefore, the higher the active flexibility with PLL, the higher the score in competition. On the other hand, analyzing the groups by competition level, significant correlations of moderate intensity were found between the performance score and different flexibility variables: Base (Active PLL; Passive PLL and TLV); 1st division (all variables, except the FRS test); and Elite (Active PLL). Thus, there is no common pattern in the results of linear regression across competition levels. Specifically, only Active PLL explained part of the performance in the Base ($p=0.001$; $F=11.526$; R^2 adjusted=0.145; y=46.958+4.531*Active PLL) and Elite ($p=0.032$; $F=7.129$; R^2 adjusted=0.434; y=51.306+5.938*Active PLL) groups while for 1st division the predicting variables were Passive PLL and RUL ($p=0.001$; $F=8.958$; R^2 adjusted=0.295; y=38.412+5.850*Passive PLL – 0.168*RUL).

Discussion

The participants of this study were competitive RG gymnasts from three competitive levels in Portugal (Base, 1st division and Elite). The gymnasts competing in the Base and 1st division levels are selected by their coaches. Portugal Gymnastics Federation selects the Elite gymnasts through predefined criteria in the junior and senior categories. These gymnasts join the individual

Portugal National RG Team. To stay in the Elite group at the end of each sports season, the gymnast must keep scores previously defined and sufficient for to be considered able to represent Portugal in international competitions. As expected, the number of training hours per week are different between the Elite (31.2±6.2 hours per week) and the other groups (13.9±6.4 and 18.5±6.4 hour per week for Base and 1st division respectively). According to Ávila-Carvalho et al. (2013), in order to achieve the necessary preparation for a good performance in RG, elite gymnasts train 25-30 hours per week and in some cases, 40 hours per week. The Elite gymnasts also had more years of practice in RG. We observed that the higher the competition level, higher number of years of practice: 8.2±1.9 years (Elite), 6.6±2.6 years (1st division) and 5.6±3.2 years (Base). In addition, the higher the competition level, lower the age of training onset: 6.0±1.5 years (Elite), 6.4±1.9 years (1st division) and 7.2±2.6 years (Base). The age of training onset in elite gymnasts is in accordance with indications by several authors (Georgopoulos et al. 2012, Law et al. 2007 Poliszczuk and Brod 2010), who suggest that the RG training begins at the early age of 5–6 years and continues throughout childhood and adolescence. Thus, the training onset, training years and training volume are related to deliberate practice and the necessity of athletes to have a minimum time of experience in order to be successful in the sport (Ericsson et al. 1993). In this sense, to make a National Team demands a hard work and effort over many years.

Therefore, to achieve great performances in RG, the daily work should be detailed, planned, organized and multilateral towards the harmonious development of the gymnasts' body, and the adaptations of their body to the requirements of this sport (Laffranchi 2001). Indeed, the multilateral and harmonious development is very important in the flexibility work (Lisitskaya 1995). The flexibility assumes a determinant role in RG performance because high ranges of motion are required in this sport (Sands et al. 2016). Furthermore, the flexibility is essential also in the execution of most body difficulty elements present in the RG Code of Points (Douda et al. 2008, Fernandez-Villarino and Sierra-Palmeiro 2013).

In RG, the gymnasts should have flexible joints, especially in the hip, shoulders and spine (Jastrjembskaia and Titov 1999, Stadnik et al. 2010, Volpi da Silva et al. 2008). Thus, the maximum passive and active flexibility was measured in our study in specific RG movements using these main joints. According to McGuigan (2014), the choice of tests should be specific to the sport, because general tests do not always correlate well with athletes' competitive performance. Therefore, we use tests recommended by FIG. The LL flexibility tests were performed on the bar and are composed by exercises daily used in the training sessions (Laffranchi 2001, Lebre and Araujo 2006). This justifies the familiarity demonstrated by gymnasts in most tests. According to (Laffranchi 2001), the exercises on the bar have as objective the development of the physical capacities and the assimilation of the basic positions of the RG to a correct and conscious postural attitude, facilitating, outside the bar, the execution of the movements. In the LL flexibility tests, we observed higher values in passive flexibility than active flexibility in all groups. However, these results were expected since the passive flexibility is typically higher than active flexibility (Weineck 2003).

Similar flexibility tests were performed by Batista-Santos et al. (2015b) in a longitudinal study with elite Portuguese gymnasts. The authors confirmed high homogeneity in the results achieved by gymnasts with both PLL and NPLL with a range of 3 to 4 points. On the other hand, Batista-Santos et al. (2015a) used the same tests in a study with gymnasts from different competition levels and found a high inter-individual variability in the results. Furthermore, the authors observed that 86.7% of gymnasts presented high indexes of flexibility asymmetry between the PLL and NPLL. In a study conducted by Douda et al. (2008) the following flexibility tests were used in elite and non-elite gymnasts: side splits with right and left leg forward, where the tester measured the distance of the middle of the inferior side of the lateral malleolus from the floor in centimeters; and leg-lift tests forward and sideward with the right and left leg, where a goniometer was used to determine the maximum amplitude in degrees. The authors confirmed higher flexibility values in elite gymnasts, although these gymnasts showed on average higher differences between the right and left legs in all tests. However, this point was not analyzed by the authors in the study.

Although, RG aims to exercise the entire body bilaterally, in order to achieve high performance, repetitive motor actions only with the preferred side are repetitively performed in training, which eventually characterizes a unilateral practice (Teixeira and Paroli 2000, Zaidi 2011) and may still cause muscle imbalances (Lisitskaya 1995). Thus**,** the analysis of LL flexibility in RG promotes a very important discussion about the functional motor asymmetries. Indeed, when we compared the flexibility between LL, we observed that in general, 69.4% and 71.4% of the gymnasts in this study presented different functional asymmetries in passive and active flexibility, respectively, according to a limit of 15% bilateral difference between PLL and NPLL proposed by (Marchetti 2009)**.** Furthermore, we found functional asymmetries of different magnitude among groups. However, higher the competition level, the lower the functional asymmetry**.**

Although the mean value of asymmetry index in passive flexibility in elite gymnasts (10.8%) was lower than the proposed limit (15%), significant differences were observed in PLL and NPLL probably because 33.3% of gymnasts presented asymmetry index between 16.7% and 41.7%.

Thus, the functional asymmetry is mainly the result of long-term RG training and generally the consequence of wrong work, which is identified later making its correction more complex (Lisitskaya 1995). Thus, the persistent asymmetric load, through the support mechanism in one leg, which is often used in the RG training, is one of the factors that make gymnasts more prone to scoliosis (Volpi da Silva et al. 2008). Lisitskaya (1995) suggests that when these differences exceed normal limits, they may cause imbalances in the physical development of gymnasts and in some cases can cause stretches of 2 or 3 cm of the LL most used, pelvic torsion or lumbar scoliosis.

The motor experience may either strengthen the preference for a particular body side or decrease the intensity of this preference to equalize the two sides, when the LL are appropriately stimulated (Zaidi 2011). Some studies (Andrade 2012, Cobalchini and Silva 2008, Teixeira 2001, Teixeira et al. 2003) support the idea that improving and increasing the use of NPLL through specific and targeted

training processes to this effect it promotes a reduction of the functional asymmetries. In this sense, Teixeira (2001) carried out a study to verify if functional asymmetries established during the long-term practice of motor skills in soccer could be modified as an effect of increased training with the NPLL. The author found that the differences were reduced with more targeted training for player necessities, showing the high potential of the emphasis in the practice on the NPLL to modify functional asymmetries in the performance. In Martins et al. (2009) study, the authors evaluate the amplitude of the hip flexion movement of 52 Brazilian gymnasts, and observed that the gymnasts presented higher flexibility level with PLL than NPLL. If we analyze the flexibility levels without considering functional asymmetry, we are promoting a strengthening of unilateral practice in RG. Therefore, the functional asymmetry evaluation is extremely important in this sport, once that it allows the analysis of the harmonious development of the gymnast's body (Batista-Santos et al. 2015a). Furthermore, the evident asymmetries can reflect negatively in the physical and technical preparation of the gymnasts and, in many cases, can cause changes in the posture (Lisitskaya 1995). Thus, to avoid the gradual development of functional asymmetries in RG, it is necessary to highlight the importance of bilateral work. The coaches have a fundamental role in the correct physical preparation of the gymnasts. In addition, they have the responsibility to motivate the gymnasts to work both LL with the same intensity in order to avoid the overload of one body side and decompensations that in the long-term can induce injuries and or high asymmetries levels (Batista-Santos et al. 2015a).

Frutuoso et al. (2016) studied the influence of lateral preference of the lower extremity on anthropometric, range of motion, and isokinetic torque measurements of RG athletes. The bilateral torque asymmetry was accepted as being normal up to a 10% level. The authors observed the preferred limb showed larger thigh girth and anatomical cross-sectional area, higher ankle dorsiflexor range of motion and higher torque production in some muscles (hip flexor at 60°·s-1 and plantarflexor at 180°·s-1) compared to the non-preferred limb. Thus, the authors considered that the bilateral differences seem to be strictly related to lateral preference and RG training.

Sometimes the shoulders flexibility training is neglected during RG training due to lack of time or even by other priorities of coaches (Santos 2011), although this joint is very important in RG (Palmer 2003). In our study, the higher the competitive level, better the results in the RUL test. Indeed, the higher the competitive level, the higher the training volume and, probably, the greater time dedicated to the training of physical capacities. The shoulder flexibility test used in our study was also used by several authors (Douda et al. 2008, Radaš and Bobić 2011, Román et al. 2012). These studies presented different types of samples: Douda et al. (2008) evaluated the shoulders flexibility in elite (16.0±11.5 cm) and non-elite (17.3±12.7 cm) gymnasts, Radaš and Bobić (2011) evaluated gymnasts (38.6±11.5 cm) and non-gymnasts (75.9±19.1 cm), Román et al. (2012) evaluated artistic (58.5±12.3 cm) and rhythmic gymnasts (24.0±22.4 cm). We observed that no result was higher than the Portuguese gymnasts from 1st division (15.0±16.0

cm) and Elite (8.2±12.1 cm). Furthermore, the results with high standard deviation values show that this test generally present a high inter-individual variability.

The other multi-joint test used in our study was the FRS test (forward stand-and-reach). We confirmed that the higher the competitive level, the higher the values achieved by gymnasts in this test. No studies were found with this test included in the flexibility evaluation. However, the sit-and-reach test (SAR) was used as a flexibility test for rhythmic gymnasts in some studies (Douda et al. 2008, Miletić et al. 2004, Miletić et al. 2004). The values reached in the SAR test are naturally higher than in the FRS test, once that the FRS test use the level of the feet as zero mark, while the SAR test usually have the zero mark before the feet. Therefore, the results of these different tests cannot be directly compared.

The RG also demands a high level of spinal flexibility, particularly flexibility of the lumbar spine, since the gymnasts present in their competition routines many movements and elements that require a great amplitude of spine joints (Santos 2011). Therefore, this capacity is trained intensively from very young ages (Sands et al. 2016).

Boligon et al. (2015) performed a study to evaluate the relation between flexibility and execution/validation of five elements of RG present in the RG-CoP (FIG 2012). Among the flexibility movements used in the analysis, the gymnasts performed the trunk hyperextension (the gymnast stood in lying prone, with the legs closed, overstretched the trunk with the arms outstretched, and held this position for five seconds without assistance). High correlations ($r = -0.76$) were found between the score of technical elements and trunk flexibility. The negative sign of the correlation means that the higher the score, the lower the trunk angle, which means a higher range of motion. These authors concluded that the trunk flexibility has a great importance in perfectly executing the technical elements evaluated, and suggested that it is also important for other flexibility elements that use this multi-joint body segment.

The test proposed by FIG to assess the level of spine flexibility corresponds to a body difficulty element included in the current Code of Points (FIG 2016), but are not usually used in the competition routines because of its low value. However, this movement is widely used in RG training for the work of flexibility and strength, performed through of exercises with repetitions and or position maintenance. Although it is a test with the objective of evaluating the flexibility level of the spinal joints, strength is also important in the execution of this movement. Thus, we felt the need to include another test with the same movement, but with a higher amplitude degree, in which we could get a greater discriminatory power between gymnasts of our study. Therefore, we applied the TLV test with trunk lift until to the vertical as well as the MTL test with maximum trunk lift. As expected, many gymnasts reached level 4 in the TLV test and obtained lower results in the MTL test as the extension movement of the spine to the maximum amplitude necessitates a high level of spine flexibility. The TLV test implies flexibility and strength for position maintenance and we verified that there were gymnasts with limited flexibility levels in the spine joints that have been able to achieve the excellent result (level 4) in this test, probably due to the sufficient combination of flexibility and strength. On the other hand, many gymnasts with

high spine flexibility failed to achieve the higher level in the MTL test. This result is probably due to the gymnasts showing high flexibility in spine joints, but not yet presenting sufficient strength to maintain the determined position.

Del Vecchio et al. (2014) evaluated the spine flexibility with the same movement of maximum spinal extension used in our study (in MTL test) but with hands behind the head and in degrees. The authors observed that the higher the age category, better the results in this test: young 115.2±26.2 degrees, junior 101.2±16.6 degrees; and senior 93.8±29.3 degrees.

The spinal extension movement with the extended arms or with hands behind the head have different difficulty levels. This movement performed with the extended arms as is defined in the test of spine flexibility used in our study, increase the intensity muscular contraction in the exercise. Since it departs the weight of the UL of the spine and the hip, i.e., it departs the weight of the centre of mass, and the higher the distance, the higher the difficulty of performing the exercise (Campos 2000).

Kritikou et al. (2017) developed a study to examine the association between artistry score, physical abilities and anthropometric characteristics in 46 national level competitive rhythmic gymnasts (aged 9.9±1.3 years). Among the physical tests, the authors used tests to main joints: hip (straight leg raise and sideways leg extension in degrees), spine (spinal flexibility ratio in percentage) and shoulders (shoulder flexion in degrees). These variables presented a significantly negative correlation with artistry score and or to its separate sub-components, expression, music and movement (in deduction points). Thus, the authors verified that the higher the flexibility level, lower the artistry penalization, showing the importance of flexibility in these joints. Furthermore, the sideways leg extension was the variable that demonstrated the higher contribution to the variance of the artistry score and its sub-components unity and music and movement.

Finally, all flexibility variables used in our study (except the FRS test) were significantly correlated with the score in competition. However, only the active flexibility tests with PLL (variable Active PLL) presented statistical significance in the model of linear regression and explained 21.8% of variance of performance. This result shows the essential importance of active flexibility in RG, once that the flexibility and strength in this sport must have a closely connected work and are considered essential to achieve a high-level performance (Cantó et al. 2009, Di Cagno et al. 2008).

Analyzing the groups by competition level, we found different variables explaining the variance in performance in each competition level: Active PLL in Base (14.5%) and Elite (43.4%); Passive PLL and RUL in 1st division (29.5%). Therefore, in addition to the active flexibility of LL, the passive flexibility of LL and shoulders flexibility are essential for success in RG. Indeed, it is important to note that all variables (except the FRS test) presented statistical significance in the simple regression model, demonstrating the high relevance of all flexibility tests performed in our study. However, probably due to the collinearity observed in some variables, not all of them were significant in the multi-linear regression model. The FRS test was not "sensitive" to the analysis of the competitive results, according to the non-significance presented, probably because the rhythmic

gymnasts have already acquired a high level of hamstrings and lower back flexibility (Kritikou et al. 2017).

Conclusions

In the upper limbs, lower limbs and multi-joint flexibility tests, we observed that the higher the competition level, better the flexibility results, although significant differences were not found between 1st division and Elite groups in upper limb and multi-joint flexibility tests. In the lower limb flexibility tests, all groups showed differences in passive and active flexibility between preferred and non-preferred lower limb. In addition, the higher the competition level, lower the asymmetry level. Only 30.6% of gymnasts in passive flexibility (28.1% in Base; 28.8% in 1st division and 66.7% in Elite) and 28.7% of gymnasts in active flexibility (22.0% in Base; 33.3% in 1st division and 55.6% in Elite) presented bilateral differences according to the limits considered normal. Therefore, 69.4% and 71.4% of gymnasts in this study had functional asymmetry of different magnitude in passive and active flexibility, respectively. Finally, we observed that among the variables analyzed in the study, the active flexibility with preferred lower limb explained 21.8% of variance of success in competition. Analyzing the groups by competition levels, different variables explained the success in competition: active flexibility with preferred lower limb in Base and Elite; passive flexibility with preferred lower limb and rotation of the upper limbs in 1st division.

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Adherence to Physical Activity in an Unsupervised Setting: The Case of Lapse and Return to Practice in a Brazilian Fitness Center

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This study aims to evaluate adherence, dropout, lapse and return rates of members of a fitness center in the city of Rio de Janeiro, Brazil, and the potential explanatory variables for these phenomena. The study was exploratory and observational, using a retrospective longitudinal frame of reference. The records of 5242 individuals, members of the fitness center between Jan-2005 and Jun-2014, were monitored for 12 months after cancellation of membership or until re-enrolment, whichever occurred first. A Cox proportional hazard regression model was adjusted to identify variables associated with higher probability of returning to activities. The general survival curve shows that 38% of members who drop out will return to activities within 12 months. Of those who return, more than half return within the first month. The regression model showed that age, previous level of physical activity and length of membership before dropout are related to the probability of returning earlier to activities after an interruption. Combined, those variables represent an important difference between individuals with the best and worse combination of significant variables. Our results can assist in the identification of high risk individuals and therefore help in the development of strategies to prevent abandonment of physical activity and to increase return after interruption.

Keywords: *Exercise, Chronic Disease, Health Clubs, Survival Analysis.*

Introduction

The most recent report by the International Health, Racquet and Sportsclub Association (International Health Racquet and Sportsclub Association 2018) confirms that Brazil presents the second highest number of health clubs and fitness centers (HCFC) per capita in the world (34,000 HCFCs), sitting only behind the United States of America with about 38,500 HCFCs. The report indicates that more than 9 million Brazilians belong to private and public HCFCs. Despite the impressive numbers, the same report suggests that the retention rate in these facilities is less than 4% (International Health Racquet and Sportsclub Association 2018), a worrying statistic given that it is well established that only continued physical activity (PA) practice provides the desired physiological and psychological benefits (Biddle and Mutrie 2007, Kubo et al. 2010). In fact, individuals who train for a very short period of time

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may not even reach the desired physiological adaptations, which disappear wholly or partly after discontinuation (Kubo et al. 2010). For this reason, adherence, retention and dropout rates in PA programs have been increasingly researched internationally (Cañamero et al. 2019, Clavel San Emeterio et al. 2019, Hooker et al. 2016, Kinnafick et al. 2014, Masuki et al. 2015, Teychenne et al. 2015, Viljoen and Christie 2015).

Progress has been made in understanding the motivational factors associated with adoption of PA practice generally (Courneya et al. 2012, Jones et al. 2005, Pridgeon and Grogan 2012, Smith and Biddle 1999), but much remains to be learned about the factors underpinning consistent and long-term adherence to PA (Kinnafick et al. 2014, Viljoen and Christie 2015). It is well established in the literature that personal factors play a role in the adoption and maintenance of recommended levels of PA (Hooker et al. 2016, Jones et al. 2005, Vlachopoulos and Neikou 2007). For instance, research suggests that PA rates decrease with age and differ across gender, social status and educational attainment – with women, low socio-economic status individuals and individuals with less formal education tending to face more constraints to participation (McNeill et al. 2006, Mullen and Whaley 2010, Trost et al. 2002). Social and environmental factors also are important contributors to PA adoption and adherence (Titze et al. 2005, Vieira et al. 2013), with research suggesting that, for instance, women favor group exercise programs because of the social support system developed in these settings (Hanlon et al. 2014, Viljoen and Christie 2015).

However, despite the growing popularity of HCFC worldwide, and in Brazil in particular, these spaces have not received a great deal of attention from researchers investigating adherence, retention and dropout rates in PA programs, with most efforts in this field being concentrated on supervised interventions, randomized controlled trials, and established group exercise programs outside HCFC settings (Berry et al. 2018, Kuehl et al. 2016, Lorenz et al. 2015). Alternatively, some research has looked at these rates within HCFC settings but from a marketing perspective, establishing satisfaction levels and intention to repurchase as some of the main variables to understand PA adherence as consumer behavior (Cañamero et al. 2019, Ferrand et al. 2010, Gonçalves et al. 2016, Hurley 2004). While this body of work has provided invaluable insights into external and internal factors impacting on individual's initiation, adherence and long-term maintenance of PA practice, still very little is known about dropout, lapse and return patterns and its implications on adherence to exercise programs in the unsupervised setting of a HCFC (Clavel San Emeterio et al. 2019, Costa et al. 2009, Garay et al. 2014).

Recent research by the authors involving a sample of 5240 members of a fitness center in Brazil found that the timeframe in which engagement with PA takes place is an important factor when considering adherence to an exercise program (Sperandei et al. 2016). For instance, the study found that even though weight loss was the most prevalent motivation to start the PA program, it was also significantly related to presenting a greater probability of an early drop out. This result suggests that identifying motivation for initiation alone is not

enough to achieve a more complete understanding of what is involved in long-term adherence to PA practice, and that including temporal aspects in the analysis, particularly the timeframe comprising adoption, adherence, dropout, lapse and return, may help in this process (Kinnafick et al. 2014).

The present study aims to analyze the explanatory variables related to return to an exercise program after interruption. The study intends to close an important gap in the literature, namely the temporal dynamics of adherence to exercise programs. The study was conducted in a fitness center in the city of Rio de Janeiro and is intended to provide researchers with further insights into the subtleties involved in long-term adherence to exercise programs. For many years, research has consistently shown that at least 50% of adults who initiate an exercise program will abandon the activity within one year of commencement (Dishman et al. 1985, Sperandei et al. 2016). What researchers have not yet looked into is what happens afterwards – do these dropouts return? If so, after how long? What variables impact on the chance of return?

Methodology

A medium-sized fitness center, with a monthly number of users ranging between 550 and 700 members, located in the central business district of the city of Rio de Janeiro, Brazil, was selected for the study. It operates between 6am and 10pm, Monday to Friday, and offers a variety of fitness-related equipment and facilities, such as resistance training and cardio rooms, as well as group fitness classes. Members pay a monthly fee for access to all equipment and classes offered any time of day or day of the week.

The study was exploratory and observational, using a retrospective longitudinal frame of reference. It is based on data collected by the fitness center enrollment system and includes all individuals (appropriately de-identified) who enrolled between January 2005 and June 2014. It comprises demographic information as well as details of the initial physical and motivational assessment (i.e. reasons for joining) completed within the first week of membership. Given data was collected from, and included, all enrolled individuals, there is no potential source of bias in the selection or participation criteria for this study. All database entries were used, with no missing data being present.

Only individuals who registered for the first time in this period were included in the sample. Additionally, only the first dropout and re-enrolling process was considered in the analysis. The interruption of monthly payment records was used as indicative that a dropout occurred, and the re-start of payments was considered as re-enrollment. All temporal analyses were measured in months. Each individual was monitored for 12 months or until re-enrollment, whichever occurred first. The time during which the individual remained away from the fitness center was considered, regardless of the year or month the drop out or re-enrollment occurred.

A total of 5242 individuals, with a mean age of 31.1 ± 8.23 years, were included in the study.

The following data were selected as co-variables:

- Sex.
- Age (up to 25 years, 26-35 years and over 35 years). The division of this variable was established to create categories with representative size, avoiding spurious results associated with very small categories.
- Level of PA before commencement (inactive or active). This variable was established through self-reporting, where inactive was defined as not having engaged in any form of regular PA for at least the preceding 30 days.
- Smoking habit (smoker, former smoker or never smoked).
- Body Mass Index (BMI) (normal - up to 25 kg/m^2; high - above 25 kg/m^2). Height and weight were obtained by standard methods, using a mechanical Welmy 110 CH scale.
- Motivation for practicing PA at the fitness center (weight loss, physical fitness, physical training, leisure, wellness, hypertrophy, health, musculoskeletal rehabilitation, posture and aesthetics; allowed multiple answers).

Except from height and weight, all variables were obtained by self-reporting.

The Kaplan-Meier method (Kaplan and Meier 1958) was used to establish the overall survival curve in the first step of the nonparametric analysis. Following, a series of Harrington-Fleming (Harrington and Fleming 1982) tests was performed, with the r parameter varying between 0, 0.5 and 1. This procedure is equivalent to executing the log-rank, Tarone-Ware and Wilcoxon tests, respectively. Those variables with P-value equal or less than 0.25 were included in a Cox Proportional Hazards model (Bendel and Afifi 1977). Variables that were not significant ($p > 0.05$) were subsequently removed, one by one, until the most parsimonious model was obtained (Sperandei 2014). A likelihood ratio test was used to assess the significance of the final model.

Results

Table 1 presents the general characteristics and distribution of the sample according to the selected 16 variables. Following a general trend in the HCFC sector (International Health Racquet and Sportsclub Association 2018), membership of the fitness center comprised mostly women (58.8%). Conversely, the general trend of an increasing membership rate for individuals aged 55 years and older to reach up to 25% of HCFC members worldwide (International Health Racquet and Sportsclub Association 2018, Mullen and Whaley 2010) is not evidenced in this gym, with results showing a clear predominance of the 26-35 years age group (50.1%). Similar to findings from a

study in the city of Pelotas (Da Silva et al. 2008), in the southern region of Brazil, the vast majority of fitness center members were non-smokers (83.3%), a result which aligns also with previous research that suggests fitness center membership is associated with healthy behaviors (Ready et al. 2005, Schroeder et al. 2017).

Table 1. *Sample Characteristics*

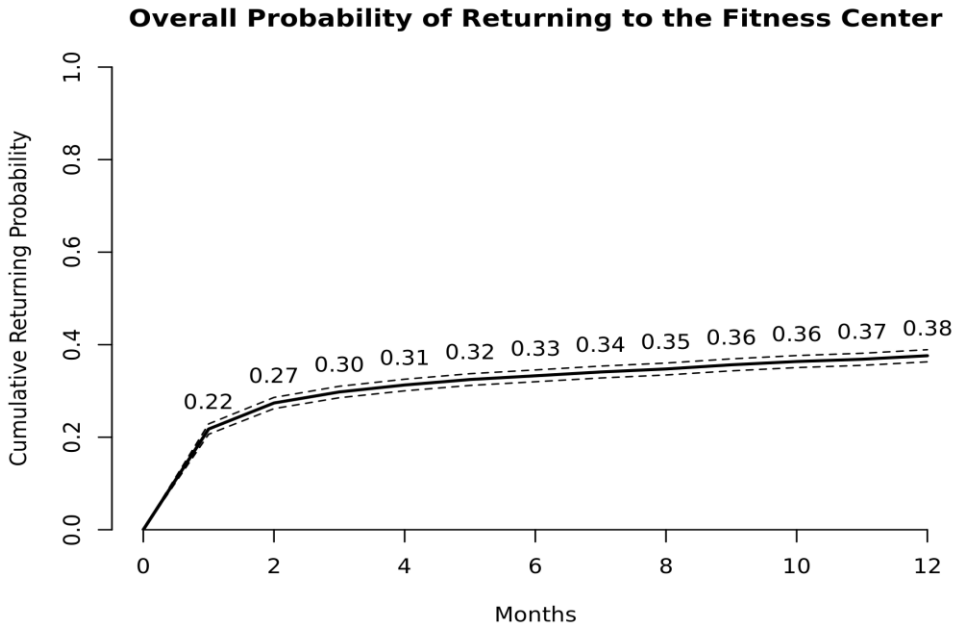
				Final Model		
Variables		**n**	**%**	**exp(Coef)**	**CI-95%**	***p***
Sex						
	Female	3,081	58.8			
	Male	2,161	41.2			
Age						
	Up to 25 years	1,399	26.7	1	---	---
	26-35 year	2,627	50.1	1.14	1.02 – 1.27	0.021
	36 years and older	1,216	23.2	1.34	1.18 – 1.52	<0.001
Level of Physical Activity Before Joining						
	Inactive	3,916	74.7	1	---	---
	Active	1,326	25.3	1.34	1.22 – 1.48	<0.001
Length of Membership Before Dropout						
	Up to 6 months	4,530	86.4	1	---	---
	More than 6 months	712	13.6	1.59	1.42 – 1.78	<0.001
Smoking Habits						
	Smoker	528	10.1			
	Former Smoker	346	6.6			
	Non-Smoker	4,368	83.3			
Body Mass Index						
	High	2,360	45.0			
	Normal	2,882	55.0			
Motivation: Weight Loss						
	No	1,662	31.7			
	Yes	3,580	68.3			
Motivation: Physical Fitness						
	No	3,559	67.9			
	Yes	1,683	32.1			
Motivation: Physical Training						
	No	5,078	96.9			
	Yes	164	3.1			
Motivation: Leisure						
	No	5,179	98.8			

	Yes	63	1.2			
Motivation: Wellness						
	No	4,736	90.3			
	Yes	506	9.7			
Motivation: Hypertrophy						
	No	3,557	67.9			
	Yes	1,685	32.1			
Motivation: Health						
	No	4,139	79.0			
	Yes	1,103	21.0			
Motivation: Musculoskeletal Rehabilitation						
	No	4,976	94.9			
	Yes	266	5.1			
Motivation: Posture						
	No	4,963	94.7			
	Yes	279	5.3			
Motivation: Aesthetics						
	No	2,815	53.7			
	Yes	2,427	46.3			

Other highlights of the sample's characteristics include a high proportion of inactive individuals before starting their activities, weight loss being the most cited motivation for enrolling in the fitness center – a finding consistent with a population study in southern Brazil (Da Silva et al. 2008) – and physical training and leisure being cited by only 3% of individuals as their motivation for joining.

The overall analysis of individuals' return to the fitness center is presented in Figure 1. Here, the cumulative returning probability is used instead of the traditional Kaplan-Meier survival curve because the event of interest (i.e. returning) is desirable, unlike the usual "death event" used in this kind of analysis. In total, only 38% of individuals who dropped out in the period of analysis returned to the fitness center within 12-months. The curve shows that the probability of an individual returning to the fitness center after an interruption of one month was 0.22; for a period of two months, the probability was 0.27, and so on. In summary, the probability of an individual returning by the end of 12 months was only 38%. Of those who return, more than half (22%) return within the first month after cessation, which means that after the first month the probability of an individual returning is approximately only 16%.

Figure 1. *Overall Probability of Returning to the Fitness Center. Dashed Lines Represent 95% Confidence Intervals*



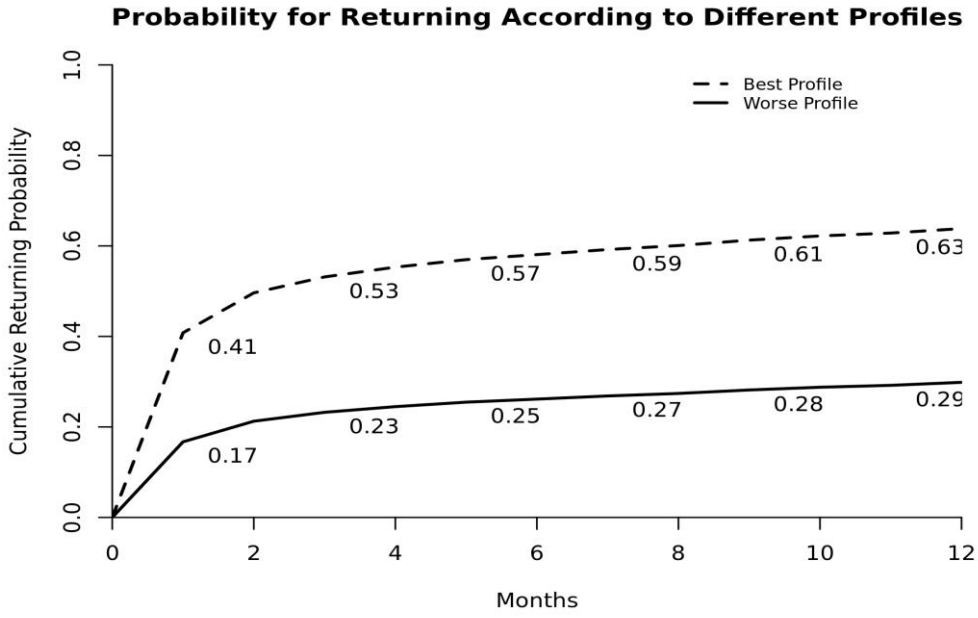
The final model fitted to these data presented the following variables as significantly related to the likelihood of an individual returning to the fitness center after dropout: age, being physically active before joining the fitness center, and length of membership before dropout. No other variable, including the motivational factors, significantly impacted on return rates.

Results show that older individuals (36 years and older) have a higher chance of returning to their exercise program after an interruption of their membership. Individuals who were inactive before starting at the fitness center have a lower chance of return. In addition, the longer the individual stays active the higher the chance of them returning to the fitness center.

A profile of representative individuals who possess the significant characteristics was created to determine the probability of return of different profiles. Figure 2 presents the estimates for the profile of the best prognosis (aged over 35 years, active, and a member for more than 6 months) and of the worst prognosis (age up to 25 years, inactive, and a member for no more than 6 months).

Figure 2 shows that less than 30% of individuals fitting the worst prognosis profile will return to the fitness center within 12 months after cessation. On the other hand, approximately 63% of those who fit the best prognosis profile are likely to return within 12 months. In addition, 41% of those who fit the best prognosis profile return within the first month after cessation, a rate considerably higher than those with the worst prognosis profile can achieve within 12 months.

Figure 2. *Probability of Returning According to Different Profiles*



Discussion

Among the drop out group, only 38% returned to fitness center activities in a 12-month period. The majority of those (57.9%) returned within one month. Depending on personal characteristics, the overall 12-month return rate was as low as 29% of individuals, or significantly higher, with more than 60% of individuals returning to the fitness center.

Research by the American College of Sports Medicine (2013) has found that only 5% of sedentary adults who initiate an exercise program in a HCFC setting adhere to the practice. A population study conducted in a Brazilian city found that 60.1% of individuals had been members of a HCFC in the past but only 7.8% were members at the time of the study (Da Silva et al. 2008). These numbers highlight not only low adherence rates but also point to the fact that there is a high turnover of HCFC members, a scenario that McCarthy (2007) labels as a triple loss: financially, for HCFCs owners, an opportunity loss for HCFC managers and an experiential loss for members. We add that, significantly, it is also a lost opportunity for achieving personal and public health goals.

Findings from a previous study investigating the factors contributing to dropout among this sample (Sperandei et al. 2016) found a very similar pattern to the one described above for return rates. In the former study, the best prognosis profile associated with adherence was also composed of individuals aged over 35 years and who were active before becoming a member of the fitness center, although motivational factors such as hypertrophy, health and aesthetics were also positively related to longer-term adherence, while weight loss as a motivation negatively impacted on adherence. At the other end of the

spectrum, the worst prognosis profile associated with adherence was composed of individuals aged up to 25 years who had never engaged in PA before joining the fitness center, a similar profile to the one found here for lower likelihood of return after interruption. The combination of the two sets of findings suggests that younger and previously inactive individuals not only have a higher chance of dropping out from their exercise program, but also a lower chance of returning after an interruption. This outcome is aggravated by the fact that, given they have a higher chance of dropping out and they are likely to stay active for a shorter period of time, this will further reduce the chance of their return. It is important to highlight that this cohort represents more than one fifth (20.5%) of the total membership, showing how significant this group is to the fitness center as a sustainable business.

Furthermore, combining the present findings with those previously published that showed that less than 5% of members stay active for more than 12 months (Sperandei et al. 2016), the present results suggest that the fitness center will lose almost all its membership within 12 months, as those who dropout are not likely to return. This means extensive resources need to be constantly invested by the business to attract new members who may never reap the benefits associated with PA, given they are likely to dropout within 3 months of commencement (Hurley 2004, Sperandei et al. 2016). Studies conducted in HCFC settings have found similar dropout rate patterns and have reported on investments made by managers to continually recruit new members (Gonçalves and Diniz 2015, Gonçalves et al. 2016, Hurley 2004). Surprisingly, however, previous research has found that only half of senior HCFC managers reported being more concerned with keeping customers than with attracting new ones (Hurley 2004), a worrying statistics that suggests a disregard by HCFC managers for the benefits their service is supposed to deliver.

Interestingly, return rates were not impacted by motivational factors for initial adherence, suggesting that once the individual drops out, the motivation to initiate in the first place becomes less relevant, emphasizing the significance of establishing a habit or routine in maintaining long-term adherence (Cañamero et al. 2019, Kinnafick et al. 2014, Neal et al. 2013, Pridgeon and Grogan 2012, Teychenne et al. 2015), even when an interruption from practice is experienced.

In addition, common barriers to PA practice identified in previous studies include lack of time, lack of enjoyment, lack of social support and, significantly for this study, lack of past exercise behavior (Trost et al. 2002). Our results show that individuals who maintain their membership for longer, and who therefore are expected to have developed a habit of exercising, are less likely to dropout and more likely to come back to activities after an interruption. Cañamero et al. (2019) highlight that individuals who attend a HCFC with the purpose of staying fit or having a healthier lifestyle were more likely to continue membership than those whose objectives were to lose weight or improve their body image. These results reinforce the importance of creating mechanisms to help individuals sustain PA practice for longer than 6 consecutive months to ensure long-term adherence to exercise practice. Our

results emphasize also the need for HCFC to create strategies to re-attract quickly individuals who interrupt membership, as the longer they are away from their spaces of practice the less likely they are to return.

In regards to the association between demographic variables and the likelihood of return after an interruption in PA practice, in contrast to other studies that indicate women face more barriers to engage in PA (Cousins and Gillis 2005, Sørensen and Gill 2008), our results did not show a significant difference in return rates between males and females. Indeed, the previously published study using the same database also did not find sex to be correlated to dropout. One potential explanation for such difference is that previous studies have focused more on adoption and adherence than on dropout, lapse and return (Kinnafick et al. 2014), which, this study suggests, may present differing patterns. Also, given that HCFCs tend to attract more women than men, as industry data confirms (International Health Racquet and Sportsclub Association 2018), it might be a setting that not only presents more appeal to this group but also offers services that support adoption and adherence, such as childcare facilities, for instance. It is an issue, however, that deserves further investigation.

It is important to note that this study did not explore the reasons for drop out/interruption, or the motivation to return, although we have taken into account the initial motivation to join the fitness center. Gjestvang et al. (2019) found that, in a population of 125 HCFC members in Europe, 44.2% reported dropping out from the previous HCFC due to lack of motivation, which the authors suggested could be explained by little to no change in physical fitness, body composition and weight. A report by IHRSA suggested that almost 30% of former HCFC members intend to join another similar establishment within 12 months of discontinuing membership with their former club (Hurley 2004), although there is no confirmation that this intention will translate into actual behavior. In addition, marketing research at HCFCs has suggested that satisfaction with service delivery, among other service-related variables, affect membership (Ferrand et al. 2010, Gonçalves et al. 2016, Hurley 2004), implying that members might leave a fitness center to move to another one, and therefore continue their practice, as IHRSA's report suggests. It is recommended, therefore, that future research should explore these temporal dynamics now incorporating information on subsequent movement of members to other HCFCs or other PA practices and settings to confirm if these dropout rates reflect only a short interruption in practice or long term cessation.

Other important limitations of the present study are that data on frequency of attendance were not recorded and that monthly payment of fitness center fees was used as the measure of adherence. In regards to the former, research has consistently shown a correlation between frequency of participation and adherence to PA practice (Clavel San Emeterio et al. 2019, Ferrand et al. 2010, Garay et al. 2014, Tsitskari et al. 2014). However, a study conducted in a fitness center in Portugal found that weekly frequency of attendance did not predict retention (Gonçalves et al. 2016), emphasizing the need for further work in this field. Regarding the latter, although it is possible that individual

members make payments for one or more months but not attend the fitness center before cancelling their membership, we assume that not a considerable number will do so, being negligible in a sample of more than 5000 individuals. If that is the case, however, it only provides further evidence of lack of continued engagement in an exercise program, making our results even more alarming.

Overall, although data presented here were obtained from only one fitness center, similar results from a similar study (Garay et al. 2014) conducted in a different fitness center in Brazil confirm findings. The results also align with general predictions found in the international literature reviewed above. Even though some probabilities and percentages may vary from one fitness center to another, the robustness of the data presented here suggests that the profiles described above will be consistent across locations and should be taken into consideration by managers and trainers. Nonetheless, given the paucity of research investigating the temporal dynamics associated with adherence, dropout, lapse and return to exercise programs in unsupervised settings, it is recommended that more studies in this field be conducted to further corroborate our findings.

Conclusion

In this paper, we have presented data that provide a novel contribution to research in the field of adherence to PA practice. In particular, we have brought to the fore the temporal dynamics associated with adherence, dropout, lapse and return to exercise programs in the unsupervised setting of a fitness center.

A ten-year analysis involving more than five thousand individuals showed that the probability of members of a fitness center returning to activities after an interruption was less than 40%. More than half of returning individuals will return in the first month after dropout. After the first month, the probability of returning is approximately 16% only. The study found that young adults, who comprise a considerable proportion of fitness center membership, are less likely to return to their activities once they dropout. This situation is aggravated by other characteristics, namely level of prior PA engagement and length of membership of the fitness center. In addition, this study found also that the profile of those less likely to return was very similar to that of those more likely to dropout, as presented in previous work using the same dataset (Sperandei et al. 2016). It is therefore very important that PA professionals and managers working in HCFC settings pay especial attention to those presenting the characteristics described here and develop strategies to prevent, first, the dropout and, second, to achieve a swift return, given that the probability of returning after the first month's absence is very low.

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The Role of the Ministry of Law and Human Rights of the Republic of Indonesia in the Competition of Professional Football League in Indonesia

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The Implementation of professional football competition has a positive contribution to the objectives of the state, particularly efforts to promote the general welfare. The Implementation of professional football competition is associated with the legal system of transnational FIFA and the national legal system of Indonesia. The two legal systems have points of contact in which potential conflicts emerge. This paper tries to explain how exactly the position and role of national legal system in the professional football competition in order to support the realization of common prosperity, by comparing the function and role of the legal system in the implementation of the football competition. It turned out that the national legal system and FIFA legal system have their respective roles, the two are complementary. If both are in harmony and synergy, they will contribute positively to the promotion of the general welfare.

Keywords: *Transnational Law, FIFA, Football, National Law, The General Welfare.*

Introduction

One of the most important goals of the formation of a country is to prosper its people; even the Republic of Indonesia affirms it in the state constitution. The 1945 Constitution of the Republic of Indonesia is also called an economic constitution. One of its most important characteristics as an economic constitution is that it contains the idea of a welfare state. The main objective of the Indonesian state in the Republic of Indonesia's 1945 Constitution is to advance public welfare. The state is obliged to promote public welfare (promoting public welfare) and maximize social welfare (maximizing social welfare). The state has the function of creating sufficient terms and conditions and infrastructure to obtain its welfare (Yamin 1960: 298). The government is formed not to create public welfare, but to promote public welfare. Public welfare is something that is to be pursued continuously in the context of the development of the times (Goodin 1988: 22). The parameters also involve many aspects, but certainly the most important is the economic aspect. In the context of the welfare state, the state is obliged to ensure the availability of access to prosperity for its citizens. The state's efforts to realize public prosperity cover various fields of life in broad perspectives and dimensions, including guaranteeing activities that stimulate the economy of society, professional sports activities, sports in a global context that are increasingly modern and penetrate the industrial and economic sectors, as well as being a

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means of advancing public welfare through income distribution and economic determination from various walks of life through various sectors.

The theory of legal pluralism recognizes what is called a transnational legal system in addition to national and international legal systems. The transnational legal system that was used as a guideline by the communities in the world turned out to be in accordance with the sports law system implemented by international sports federations to carry out their activities, including the organization of professional football competitions controlled by a legal system established by FIFA. In its implementation, it turns out that this transnational legal system has an interface with the applicable national legal system. In ideal conditions, these two systems should support and complement each other. Moreover, the state and FIFA actually have the same goals in the context of advancing and improving welfare.

Based on the above explanation, it is interesting to examine the position of the national legal system and the FIFA legal system whose existence is recognized in the transnational legal system. Football is regulated, controlled and subject to FIFA regulations (Pandjaitan 2011: 210-116). On the other hand, football cannot be carried out without permission from the state, because football is played on stadium fields in the sovereignty of a country. Synergy between the state and federation is very important in the implementation of a football match, especially the state and FIFA that also have the same goal of advancing well-being. Professional football competition can be a rational solution to strive for that goal. If FIFA and its legal system regulate the implementation of professional football competitions around the world, then what is the real role of the national law in the implementation of professional football competitions in Indonesia?

Research Methods

The research method used in this paper is the normative legal research method. The normative legal research method basically examines the rules of law and legal principles (Manan 1993: 7). Normative research will try to find a rule of law, legal principles, and legal doctrine to answer legal issues that are faced specifically related to theories about legal pluralism and the existence of a transnational legal system that is the basis for the enactment of the FIFA legal system in the context of universal football implementation throughout the world. It explains how the implementation of professional football competitions has contributed positively to one of the country's goals stated in the constitution, which promotes public welfare. This study examines the problem by referring to secondary data carried out by literature studies of legal materials and non-legal materials relating to the research title. Secondary legal materials in question are doctrines, teachings of experts, scientific work of experts, news and results of interviews of related parties obtained from newspapers and internet sites that are relevant to the research title (Soekanto 2001).

The above data is collected through library research, research through internet media, in this case the author focuses on the context of football competition in

order to advance public welfare, then explains what and how the role of the national law in the implementation of football competitions is.

Discussion

Legal Pluralism and FIFA Legal System

Legal Pluralism

As explained earlier, in many ways the implementation of professional football competitions has a positive correlation with efforts to promote the general welfare. It is important to understand that professional football competition is not controlled by the state, football has its own rules that make football have sovereignty and a system controlled by FIFA as the main football organization. The FIFA system operates in a transnational system and needs to be understood in terms of its boundaries and state jurisdiction. It is because if there is a conflict, the existence of professional football competition is threatened and efforts to promote public welfare through football are disrupted (Kristiyanto 2015a).

According to Jimly Asshiddiqie in today's modern democratic system, the power system in the life of the state can be distinguished in three regions or domains, namely the state (state), market (market), and society (civil society). The three regions or domains of power have their own logic and law. This is what Jimly calls an organizational imperative theory. The organizational imperative theory is closely related to pluralist sovereignty theory, which states that sovereignty does not always have to be interpreted absolutely and belongs to the state alone. Sovereignty can be decentralized to communities that are able to do so to advance public welfare without having to harm sovereignty itself (Ashiddiqie 2005: 43).

The theory of pluralist sovereignty gave birth to legal pluralism, namely the presence of a transnational legal system other than the national legal system and the international legal system. Transnational law is a law formed by an international community that is not a state (international society) and applies to its community across administrative borders. The view of sovereignty and legal pluralism is a criticism of the views of absolute sovereignty as well as criticism of the view of monism because the existence of a legal system originating from sources other than the state is a reality (Pandjaitan 2011). The legal view of pluralism recognizes that every community or organized social group also has a system and legal system in accordance with their needs and are autonomous. In the context of globalization like now, the relevant sovereignty theory is not an absolute sovereignty theory but a pluralist sovereignty theory in which the state is not the only important role in carrying out state dynamics, the principle is that the implementation of sovereignty can be decentralized to society. This is in line with what was expressed by Yudha Bhakti Ardhiwisastra, namely that the jurisdiction in its implementation will be limited by the rules that apply in relations between countries (Ardhiwisastra 2003: 13)

If state power exceeds the power of civil society and markets, democracy will not grow because it is too dictated and controlled by state power. If market power is too strong, it is the power of money or capitalists that determines the life of society and the state. Meanwhile, if the one that is too dominant is the power of civil society while the state and the market are weak, what will happen is chaos, mess, less government, which develop without clear direction. Therefore, democracy will grow ideally if the three things grow in a balanced manner, equally strong and mutually influential in functional and synergic relationships.

Then it can be concluded that the transnational legal system is formed as a consequence of the birth of a global society that eliminates administrative boundaries of a country (borderless), which then gives birth to agreements and international cooperation in all fields including sports such as football. In this context, the so-called transnational legal system in the field of sports is commonly referred to by experts as Lex Sportiva, in the football sports branch known as the FIFA legal system, which includes statutes and all derivative regulations formed to organize integrated football matches universally, including professional football competitions in each FIFA member state.

FIFA Legal System

In the context of pluralist sovereignty theory and the theory of organizational imperatives described earlier, FIFA as an international football federation and all its confederations and associations can be referred to as a civil society and the market as well as the state that is the government in the context of the Indonesian government. The Federation Internationale de Football Association (FIFA) is an organization whose legal entity status as a single international football federation that was established on 21 May 1904 in Paris France and registered under article 60 of the Swiss Civil Code (William 2015). FIFA has a special and unique institution, the International Football Association Board (IFAB), as the only institution that has the absolute authority to make and or update the laws of the game for organizing football matches in the world, which Ken Foster calls Lex Ludica. All FIFA members must obey and implement the laws of the game in every professional football match. This applies universally to any party that plays football as Sui Generis. Lex Ludica is part of Lex Sportiva, Lexica Ludica ensures that football is carried out according to the rules while Lex Sportiva ensures the organizing process so that Lexus Ludica can run according to the mechanism. Unlike Lex Ludica, Lex Sportiva can be in contact with the national legal system of a country where football is carried out, especially things that are licensing because after all football can only take place in a field that is the territorial jurisdiction of a country. Lex Sportiva is part of the global sports law regime, global sports law is defined as an independent and transnational legal order created by global private institutions to regulate, manage and organize global and sovereign football competitions. Ken Foster formulates that Lex Sportiva as a global sports law is an autonomous and independent legal regulation, which crosses state jurisdiction, which is formed by global private institutions that regulate and control sport internationally (Foster 2003). Its main characteristic is

that global sports law is a contractual rule with its binding power based on an agreement to hand over power and rights to the authority and jurisdiction of the international sports federation. In addition, Lex Sportiva as a global sports law is not regulated by the national legal system.

Football and General Welfare

In the concept of the welfare state, the task of government in the rule of law is not only to run the government, but more than that it must improve the welfare of the community in order to achieve the goals of the state. These efforts are carried out through national development that is multi complex. The state is obliged to the terms and conditions and infrastructure needed so that its citizens have adequate access to their welfare, including in terms of sports. Sports in the global context are increasingly modern and not merely becoming activities related to health but also industry and economy, as well as being one of the factors or means to advance public welfare through the distribution of income at the grassroots level to the elite level (Anggriani 2003: 41).

The latest phenomenon related to the relationship between sports and the economy is the holding of the 2016 National Sports Week (PON) event in West Java. The economic benefits that occured during the operation of the PON are estimated to reach 1.6 trillion rupiahs. Business fields affected by sports events include hospitality, infrastructure, culinary, transportation, convection, crafts. Economic distribution does not only involve large entrepreneurs but involves MSMEs. This does not include informal matters that are considered trivial such as parking, guide services, etc. In the long run, even professionally managed sporting events can be directed to sport tourism. According to the world tourism organization namely United World Tourism Organization (UNWTO) and International Olympic Committee (IOC), the synergy between tourism and sports has the ability to grow a sustainable economy by creating jobs and increasing people's income. Sports tourism is now recognized as a multi-billion dollar business. The economies of cities, regions and even countries are affected. Even in some countries, sports can contribute 25 percent of all income generated by the tourism industry. For example, the 2014 World Cup event in Brazil was able to reap economic profits of around 34 trillion from the tourism sector (Simatupang and Pariwisata 2016).

The sports industry is an industry with great potential to mobilize the economic behavior of the community collectively. Thus, the sports industry has the potential to be a sector that can have a significant impact on poverty reduction and overcoming unemployment. The sports industry needs to be encouraged and supported through a series of systematic policies from central and regional governments, communities, and investors.

Professional football competition as a competition involving the most popular sports throughout the world contributes a huge opportunity for the promotion of public welfare, not only in countries where football competitions are rolled out, but also in countries that make football competitions an economic commodity. For example, the English Premier League is able to provide the economic

determination for other countries, including Indonesia, through live television broadcasts.

Professional football competitions create enormous employment opportunities for football players, football managers, football businessmen, culinary entrepreneurs, convection entrepreneurs, transportation entrepreneurs, media entrepreneurs, hotel entrepreneurs, infrastructure entrepreneurs, and other economic actors. There are more than 270 million people in the world active in football, including football players and devices. Of the 85 million players active in Asian football, there are around 7.094,000 players in Indonesia.

The Tangent Point between the FIFA Legal System and the National Legal System

Professional football competition is run with a set of rules that are universal. These rules are derived from the FIFA legal system consisting of FIFA statutes and all derivatives called Lex Sportiva, which consists of the laws of the game as Lex Ludica and Lex Sportiva itself, which is enforced to ensure that professional football competitions in each country run according to the mechanism.

In its implementation it turns out that this FIFA system has intersection, intersections of laws with national law. The intersection does not occur in the context of enforcing the laws of the game as Lex Ludica that is fully FIFA authority but occurs in the enforcement of Lex Sportiva in general, namely things and mechanisms and ways to organize football competitions in addition to the laws of the game. The thing meant is related to licensing and other administrative matters. The condition is when a provision has been regulated by the FIFA legal system, but it turns out that the provision is also related to the legal system in the country of Indonesia. For example: FIFA requires that every professional football club becomes a legal entity and corporate/corporate, it turns out that the legal entity referred to by FIFA has been regulated by the Indonesian national law through Law Number 40 of 2007 concerning Limited Liability Companies, as well as other things that are desired by FIFA and also regulated by Indonesian national law. Then, it can be seen that the implementation of football competitions in a country intersects with two legal systems namely the national legal system and the transnational legal system (sports law). In this paper, it will be limited to anything football or the FIFA legal system must submit without conditions because de jure is the absolute jurisdiction of Indonesia's national legal system. It is because the legal world in the field of sports does not form a world of law that is completely separate from state law. If the rules governing sport are made by international private sports organizations, sports cannot avoid the application of state law where sports have competed. Sports actors are subject to general legal rules that apply in their country such as regulations on the legality of legal entities, health, security, contract law, laws related to tax provisions, labor law and so on. In the context of organizing football, the influence and jurisdiction of state law are inherent especially in matters relating to administration and licensing, which include, among others:

The Legal Entity Forms a Limited Liability Company for Professional Football Clubs

In the context of professional football, a football club is a profit / profit-oriented company. The status of a professional club legal entity as a corporation must be clear according to legal aspects related to football clubs regulated by FIFA regulations to federation technical rules in a competition, because what is desired is a company with a profit orientation. Therefore professional football clubs must be in the form of a Limited Liability Company (PT) in accordance with Law Number 40 of 2007. Then the management structure of professional football clubs is like PT in general, including editorial board and board of commissioners. These football clubs also have shared and held a GMS, not only that, programs related to corporate social responsibility as regulated by the Limited Liability Company Law also become a requirement that must be fulfilled by football clubs while undergoing verification as competition participants . Conventionally professional football clubs optimize revenues through match ticket sales, sponsorships, sales of knick-knacks, TV broadcasting rights, and buying and selling players. The status of a football club as a limited liability company is registered at the Directorate General of General Legal Administration-Ministry of Law and Human Rights of the Republic of Indonesia (Kristiyanto 2015a).

Immigration and Employment Status for Foreign Football Players

Foreign players in professional football competitions are a necessity, even the presence of foreign players is always the main attraction in a football competition. The origin of foreign players whose services are used by football clubs participating in football competitions in Indonesia covers four continents, there are foreign players from the continent of Africa, the Americas, the continent of Asia and some even from the continent of Australia. As foreigners working in Indonesia, of course these foreign players must submit to Indonesian national law that regulates immigration and employment. This is clear evidence that national law actually has an important role in professional football competition. The players who do not comply with the rules are not only unable to make a living freely but are also threatened with deportation. A concrete example is seen in the findings revealed in September 2016, that dozens of foreign players were playing for participating clubs in Torabika Football Championship without Temporary/ Limited Stay Permit (KITAS) which is a requirement for foreign workers to work in Indonesia. This finding is not disputed by PT. GTS (Gelora Trisula Semesta) as the operator of competition also by several clubs reinforced by troubled foreign players according to a list released by sports NGOs Save Our Football (SOS).

The majority of foreign players use visa on arrival, even though visa on arrival is only valid for 30 days and cannot be used for work, especially for the ISC competition which takes up to 9 months. Do not forget the immigration violations that they have committed at the same time also violate regulations in the field of employment, because the administrative requirements related to immigration are a requirement to get work permits in Indonesia.

Immigration-related violations are absolutely a state jurisdiction specifically enforced by the Directorate General of Immigration-the Ministry of Law and Human Rights of the Republic of Indonesia.

The threat of the government to deport illegal players is a logical consequence that must be accepted, based on Article 42 of Law Number 6 Year 2011 concerning Immigration, which states that administrative actions (including deportation) can be imposed to foreigners who do not respect or obey regulations or current regulation (Kristiyanto 2015a).

Match Permissions

The stage of the competition permit management really shows the condition of the enactment of the principle of "no football without state permission". Even though football is controlled and subject to the FIFA system, football matches require a field and stadium that are owned and are under the sovereignty of a country. The most important thing that must be obtained by the organizers of the match before starting a match is the permission of the crowd from the police. For regional matches, permits are issued by the local police through the intelligence department, but previously the organizers have to coordinate with the police station where the competition is held. When taking care of the permit to the police station, the organizing committee must attach a recommendation for permission to use the place, a readiness letter for medical personnel and the fire department. If the affairs in the police station are finished, the process will proceed to the regional police. The regional police will also request a letter from the center, namely the central organizer, namely the federation (PSSI) and competition operator. For class competitions at the national level involving competitions between regions / between provinces, those who issue letters of recommendation for permits are the National Police Headquarters, police and police stations only issue recommendations. The permission of the relevant regional government is issued by the youth and sports agency. The licensing process shows the country's sovereignty over football matches in its territory (Kristiyanto 2015b).

Registration of Exclusive Rights

In practice, football club get revenue from four sectors of income, namely advertising and sponsorship, match ticket sales, television broadcasting rights and merchandise sales that are closely related to brands. Branding or brand is one way for the football industry in the entire world to thrive. Almost every year, various institutions audit the football club brands in the world. Then the brand is capitalized. In the context of business, brands certainly have an important role to play, brands are associated with the exclusive rights of professional football club to optimize sales from official merchandise issued by the club in question. Institutions which currently have authority related to brand registration are the Ministry of Law and Human Rights, specifically the Directorate General of Intellectual Property. It could be that the brand or name of a football club is the only asset truly owned by a football club in Indonesia. It is obviously very difficult

to find football clubs in Indonesia that have physical assets such as stadiums or other facilities (Kristiyanto 2015a).

Role of National Law in Organizing Professional Football Competition

The main factor for the law to be able to play a role in economic development is whether the law is able to create "stability", "predictability" and "fairness". Therefore, the law should play a role in economic development, the law must be a guide and reference in development included in the implementation of professional football competitions that support the promotion of public welfare (Rajagukguk 2000).

FIFA has full authority and sovereignty in organizing systems, rules and mechanisms to ensure that the laws of the game are carried out and obeyed by all its members when conducting professional football competitions. This is what is called Lex Sportiva, including the laws of the game as Lex Ludica. On the contrary, the state does not have any authority regarding the laws of the game. Even though FIFA has full sovereignty over the football system, but FIFA still cannot hold football without the presence of the state. This is related to the existence of football fields and other supporting infrastructure which of course is in the territory of sovereignty and jurisdiction of a country, then it can be said that there is no football without state permission. In this context, there is a tangent point between the state and its national legal instruments, especially related to administration and licensing, with the FIFA legal system. Likewise, in the framework of relations between clubs, players with clubs, clubs and competition managers and other parties such as TV stations and sponsors; civil relations do not only refer to FIFA rules but also the principles of civil law in Indonesia.

So that in the implementation of a globally integrated professional football competition and the contribution to the promotion of general welfare, national law and transnational law are applied, both of these legal systems have their own sovereignty and jurisdiction. Although they have tangible points, they cannot intervene in the sense that they negate and deny each other because at the ideal level both will complement each other and support the implementation of professional football competitions. The state can intervene in terms of showing its influence but in matters that are very limited and truly necessary (Ashiddiqie 1994). In the context of football as a global sport run by society, the state should not interfere too far. State institutions should not be formed with the intention of taking transfer of functions that naturally can be done effectively and efficiently by society.

Closing Remarks

Professional football competition has an important meaning for Indonesia, especially related to the state's goal to advance public welfare. In professional football competition, national law has a strategic role, namely related to the provision of infrastructure, licensing and other administrative matters regulated by Indonesian law and related to professional football competition. In terms of this administration, it turns out that the Ministry of Law and Human Rights of the Republic of Indonesia has an important role because it handles three important things, namely the residence permit of foreign players, registration of professional football club legal entities, and brand registration as exclusive rights of professional football clubs. Football is regulated, controlled and subject to FIFA statutes so that the implementation of football is universally integrated through the FIFA legal system, but football players in Indonesia cannot privilege themselves regarding matters that have been regulated by Indonesian law such as taxes, employment, immigration, legality of legal entities, crowd permits and so forth. Government authority and intervention as a state must not violate the sovereignty of society, the existence of society. Its sovereignty has its own laws (the laws of the game) which ideally do not violate the sovereignty of the state and apply to the community to solve their own affairs, and require national law for matters that are not regulated by society law, such as the legality of club legal entities, taxes, immigration and so forth. The national legal system and the FIFA legal system should complement and support each other and do not cancel each other, because if both are harmonious and synergistic, they will contribute positive efforts to advance public welfare.

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