University of Freiburg
Department of International Economic Policy
Discussion Paper Series
Nr. 1

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December 2007

ISSN 1866-4113

University of Freiburg
Department of International Economic Policy
Discussion Paper Series

The Discussion Papers are edited by:
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Institute for Economic Research
University of Freiburg
D-79085 Freiburg, Germany
Platz der Alten Synagoge 1

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Editor:
Prof. Dr. Günther G. Schulze

ISSN: *1866-4113*
Electronically published: 5.3.2008

What Does it Take to be a Star? –

The Role of Performance and the Media for German Soccer Players

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Abstract

We test existing superstar theories for the German soccer league. We use various measures for individual players' performance and media presence to analyze whether performance and popularity can explain salaries and superstars in soccer. Moreover, we argue that quantile regression technique should be applied to analyze superstar phenomena instead of OLS used hitherto.

Key words: Superstars, soccer, quantile regressions, Rosen, Adler

JEL classification: J3, J4, L83, Z1

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We are grateful to Egon Franck, Bernd Schauenberg, and seminar participants at the University of Heidelberg and University of Zurich for helpful comments. Daniel Werner provided excellent research assistance. The usual disclaimer applies.

1. Introduction

In the season 1998/99 the top five per cent of the players in the German soccer league earned 5.5 times as much as the median player. How is this skewness in income distribution explained since performances of professional soccer players in the first league seem not to differ so vastly? What does it take to be a superstar? In his seminal paper on "The Economics of Superstars" Rosen (1981) explains how small differences in talent translate into large differences in earnings. Spectators prefer high quality performances (of artists, athletes etc.) to lower quality performances of the otherwise same service; at the same time strong scale economies in consumption allow better performing artists or athletes to draw large audiences in soccer stadiums, concert halls or via TV. Therefore, only slight differences in quality and thus in individuals' willingness to pay are leveraged into large differences in earnings. To derive his result, Rosen assumes not only scale economies in consumption and imperfect substitutability of different qualities, but also perfect knowledge on the quality of the athletes.

Adler (1985) offers a different explanation: In order to value the performance of artists or athletes, people need to build up knowledge about them and they do so through communicating with others. Stars may thus be born because initially (slightly) more people happen to know one artist/athlete than any other artist/athlete of possibly equal talent and communicate about him or her more with others. Artist/athlete-specific knowledge is built up more rapidly through this positive network externality: this artist/athlete will snowball into a star. Following Adler's logic, the media have a decisive role in creating stars as they impart knowledge about individual artists or athletes that makes the public value their performances.[1]

In this short paper we analyze whether these two competing — although not mutually exclusive — superstar theories can explain the superstar salaries in German soccer. We use a unique dataset that combines the salaries for all players in the first division with a host of individual performance parameters. Furthermore, we include a measure for media coverage

[1] For the literature on superstars cf. Schulze (2003) and Adler (2006), for similarities of artists and athletes see Seaman (2003). Frick (2007) surveys the literature on labor markets for soccer players.

of each individual player to test for the role of the media for the making of superstars. That allows us to assess the relative importance of both lines of arguments: We are able to determine whether performance differences translate into more than proportional differences in earnings (the 'Rosen superstar explanation') or whether differences in popularity measured by media presence is able to explain the strong earnings differentials ('Adler's explanation for superstars'), and if so, what the relative contributions of both theories are.

Tests on superstar theories for the arts are plagued by the inability to measure the relevant performance parameters accurately,[2] direct tests on superstar theories in soccer, the largest spectator sport world-wide, have been almost impossible up to now due to the lack of data on individual salaries (Dobson and Goddard 2001:221).[3] Lucifora and Simmons (2003) are the first to analyze superstar effects in soccer. They find 'superstar effects' (in the Rosen sense) for the Italian Soccer League for some performance measures for forwards (assist and strike rate, but not goals) and midfielders (goals, but not assists). Unfortunately, their data set does not have a full set of performance measures that covers relevant performance measures for defense players and they do not test for the influence of popularity on players' remunerations.[4] Garcia-del-Barrio and Pujol (2007), which was published after our paper had been written, define superstars as those players with the highest internet exposure. They show in a log-log wage regression on a semi-subjective performance index by journalists, Google hits, and usual control variables that the superstars so defined earn a premium above what is explained by their performance, popularity, and other control variables.

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[2] For example Hamlen (1991) tests the influence of 'harmonic content of voice' as relevant performance measure of pop music stars on their record sales and thus their superstar status. It is however by no means clear that this is the only or the most important superstar factor as sex appeal, stage performance, video clips, or lyrics may play an equally important role. (Otherwise the success of Britney Spears or Bob Dylan could not be explained.) In sports, however, performance parameters are more easily identified and measured, making it more suitable for tests of superstar theories.

[3] The empirical literature on superstars is surveyed by Schulze (2003) and Adler (2006) for the arts and by Dobson and Goddard (2001) for sports.

[4] In a second equation they define superstars as those players that score more than 0.4 goals per match in the first division; the superstar dummy in the wage equation turns out significant. It is not clear that this definition is appropriate as a number of superstars in the past or presence have not been top scorers: For instance, Franz Beckenbauer has been defender (Libero) for most of his career and Michael Ballack has been a playmaker, but not the top scorer. They specify loglinear wage equations so that they can capture only convex influences on earnings according to the superstar theories; it is not clear whether insignificant variables turn out insignificant, because they do not exert any influence on salaries or whether this influence is significant, but non-convex.

We have a slightly different approach: In our reading of the literature superstars in the Rosen and the Adler sense are *defined* by their top income (not performance or popularity) which is very substantially higher than that of the following percentile of competitors and they are *explained* by a highly convex performance-income gradient (Rosen) or substantially higher popularity (Adler) *at the top end of the income distribution*. Thus, in order to identify superstar effects we need to give special consideration to the top end of the income distribution. Because the earnings-performance gradient increases sharply only at the top end of the earnings distribution an estimator such as the OLS procedure that regresses on the mean value will not be able to capture the phenomenon correctly. To find convexity (or a lack thereof) in performance measures through least squares regressions does not establish superstar effects (or their absence) as this result can be driven by the lower part of the distribution. Instead, the appropriate technique is a set of quantile regressions that uses a suitable set of measures on performance and media exposure and looks for a convex impact of those at high percentiles.

Our paper thus makes the following contributions. First, we are the first to test the superstar phenomenon for the German soccer league; thanks to our data set we are able to link individual players' salaries to a wide range of performance parameters. Second, we are the first to include the role of media for the emergence of superstars. That allows us to assess the relative importance of Rosens's and Adler's superstar theories. Third we make a methodological point: We argue that the superstar phenomenon has been tested with an inappropriate estimation technique. Instead, we use quantile regression technique to test for a convex gradient at the top end of the distribution.

2. Data

Our dataset includes all players who were employed by the 18 soccer clubs in the first division during the seasons 1998/1999 and 1999/2000. For those players we collected information about individual salaries, performance, and media presence. The endogenous variable WAGE contains the entire pay earned by each player in the season 1999/2000. This includes bonuses etc. but excludes advertising money.[5] Data were provided by magazine *Sportbild*.[6] We use the following explanatory variables: the position of the players as dummy variables (FORWARD, MIDFIELD, DEFENSE, and KEEPER). For all outfield players we included the number of goals scored (GOALS), the number of assists for a goal (ASSISTS), the number of shots on the goal (SHOTS), and the percentage of successful tackles (TACKLES) as performance measures, all for the season 1998/99.[7] All individual performance data were provided by *Kicker* sport magazine, the world's largest magazine in soccer. We also used interaction terms of the performance measures with the dummies for the positions as some performance measures may be more important for certain positions than others. For instance **F**GOAL denotes the number of goals scored by a **f**orward, **M**GOAL those by a **m**idfielder etc. In addition we included the variable AGE to account for seniority payment schedules or remuneration for experience as is typically found in normal wage regressions as well as in baseball (MacDonald and Reynolds 1994). We controlled for the origin of players and used dummies for Germany, EU, Eastern Europe, and overseas (OVERSEAS). To capture the effects of media presence we collected the number of "hits" of a player's name in the online version of *Kicker* sport magazine during this season (HITS).[8] All performance indicators (except for TACKLES as a percentage value) and the HITS were included as quadratic terms as well to see whether differences in performance and popularity translate into

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[5] Bonus payments were rather low at that time and counted for less then one percent of the monthly or annual salaries paid (Lehmann and Weigand 1997). Bonus payments included are on average 1500 DM (767€ or 818 US$ at that time) for every game won at that time.

[6] Germany is still the only country where salary information is available for every single player since the mid 1990s (Frick 2007). Sportbild was the first magazine which published individual player salaries. In the more recent past, the nationwide Sunday newspaper "Welt am Sonntag" and the highly respected soccer magazine "Kicker" started to collect and publish the same data.

[7] We do not have 1998/99 performance data for those players whose clubs played in the second division in 1998/99 and rose to the first division in 1999/2000. These players, however, are not the superstars. Cf. Szymanski (2003) for the design of soccer contests.

[8] Alternatively, we could have used citations in newspapers such as "*Frankfurter Allgemeine Zeitung*", "*Süddeutsche Zeitung*" or "*Tagesspiegel*", but even though these newspapers have national coverage they tend to favor the local sports clubs such as "Eintracht Frankfurt", "FC Bayern München" or "Herta BSC" respectively, thereby creating a biased picture. "*Kicker*" clearly has unbiased national coverage. We also decided against Internet hits such as Google hits (as used by Garcia-del-barrio and Pujol 2007) due to the inherent biases. Google hits cannot distinguish between older and newer websites and thus favour players with longer tenure while Kicker hits only report entries made in a certain time span. Popularity however is best measured by the frequency of reports within a given season. In addition, players migrating from a different league to the Bundesliga may be very popular in that league thus creating a lot of internet hits, but may be relatively unfamiliar for the German audience. What is more, we started working on this paper in 2004, but our data on individual soccer players refer to 1998-2000; thus Google hits measured in 2004 would clearly have been inappropriate. We preferred to use the "Kicker"-database from that time-period to guarantee that we only count entries for the time period for which we have performance data.

overproportional differences in pay as the superstar theories suggest. They are indicated by the ending -SQD. Descriptive statistics are provided in the appendix.

3. Results

We ran OLS regressions on the entire sample (651 players) and on the subsample of the 359 players who played at all in the season. As results do not differ significantly, we report only the latter.[9] Moreover we ran a quantile regression for the 95 percentile for the same sample to see whether performance and media presence have a different impact for the top earners than on average.[10] This is the appropriate regression technique because a strongly convex gradient may show up only at the top end of the income distribution – the superstars – and not for average players. Regression on the mean, as OLS does, or on the median may simply blur the underlying relationship. Moreover, OLS is inappropriate because of the skewness and excess kurtosis of the dependent variable (see appendix). This semi-parametric technique provides a general class of models in which the conditional quantiles have a linear form. In its simplest form, the least absolute deviation estimator fits medians to a linear function of covariates; in more general form quantile regressions minimize the asymmetrically weighted sum of absolute residuals with the weights indicating the percentile. The method of quantile regression is potentially attractive for the same reason that the median or other quantiles are a better measure of location than the mean. Other useful features are the robustness against outliers and that the likelihood estimators are in general more efficient than least square estimators. Besides these technical features, quantile regressions allow that potentially different solutions at distinct quantiles may be interpreted as differences in the response of the dependent variable to changes in the regressors at various points in the conditional distinction of the dependent variable. Thus, (a

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[9] We do not have performance measures for the previous season for those teams that played in the second division and only rose to the first division in 1999, and for other players who did not play in the German first division in the last season (rookies and those coming from different leagues). We are missing salary data for 160 players; but 157 of those did not play at all in the season under consideration (1999/2000) and are thus in all likelihood at the lower end of the skill and salary distribution. In any case, since we analyze only players that have played at all, our results are unaffected by this. As a consequence, our sample reduces to 264 players who have played in season 1999/2000 and for whom we have previous performance and current salaries.

[10] The 95 % quantile starts at an income of 7.5 million DM per annum which equaled US$4.1 million in 1991. (It would have been roughly equal to 3.8 million Euro.)

set of) quantile regressions reveal asymmetries in the data, which could not be detected by simple OLS estimations.[11]

Let (y_i, x_i), *i=1,...,n* , be a sample of observations (here players' pay), where x_i is a *Kx1* vector of regressors. Assume that $Quant_\theta(y_i, x_i)$ devotes the conditional quantile of y_i, conditional on the regressor vector x_i. The distribution of the error term $u_{\theta i}$ satisfies the quantile restriction $Quant_\theta(u_{\theta i}, x_i) = 0$. Thus, we estimate $y_i = Quant_\theta(y_i, x_i) + \mu_{\theta i}$, or, with $Quant_\theta(y_i, x_i) = x_i'\beta_\theta$:

$$y_i = x'_i \beta_\theta + \mu_{\theta i},$$

The estimator thus solves the following minimization problem (Buchinsky 1998: 95):

$$\min_\beta \frac{1}{n}\left[\sum_{i:y_i \geq x_i'\beta} \theta \,|\, y_i - x_i'\beta \,| + \sum_{i:y_i < x_i'\beta} (1-\theta) \,|\, y_i - x_i'\beta \,|\right]$$, where θ denotes the quantile.

We analyze the 0.95 quantile which weighs most strongly the players with the highest salaries $[\theta = 0.95]$. As one increases θ from *0* to *1*, one traces the entire conditional distribution of the endogenous variable *y*, the salaries, conditional on *x*. The quantile regression's coefficient could be interpreted using the partial derivative of the quantile of *y* with respect to one of the regressors, say *j*. This derivative can be interpreted as the marginal change in the *θth* conditional quantile due to marginal change in the *j*th element of *x*.

As performance measures we used the interaction terms which describe the relevant performance indicator for the position: goals by forwards (FGOAL), assists by midfielders (MASSISTS), and share of successful tackles for defenders (DTACKLES).[12] We also added team dummies as salaries may not only be influenced by individual performance (which in part is a function of team performance), but also by team characteristics not captured otherwise (such as team size or clubs' budget constraints).

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[11] See Buchinsky (1998) or Koenker/Hallock (2001) for a survey of the method and applications to labor markets.

[12] When we included all performance indicators for all positions, i.e. goal, assists, tackles, results were not as significant blurring the underlying relationships.

Results are summarized in Table 1 which allows comparing OLS results with those of the 95% quantile regression. For quantile regressions standard errors have been bootstrapped (1000 replications).

Table 1 about here

In the OLS regressions, performance parameters are highly significant and have the expected sign. This indicates that performance is a major determinant of players' salaries. However, better performance does not lead to a more-than-proportional increase in pay; if anything we observe diminishing returns to performance. This finding is in stark contrast to Rosen's theory on superstars which cannot explain the existence of German soccer stars. Likewise we do not find support for Adler's hypothesis in a strict sense. Media coverage does exert an important influence on players' salaries — the parameter is highly significant and positive and the explanatory power of the regression increases very substantially. Yet, there are also diminishing returns to media presence as indicated by the significantly negative sign of the number of hits squared. Media presence is thus important, but does not lead to superstar status (in terms of pay). If we look at the .95 quantile regression we find similar results — performance and media presence matter, but not more than proportional — as implied by Rosen's and Adler's theory of superstars. Thus there is no evidence for the existence of superstars in the Rosen or Adler sense, but salary differences can be explained by different performance and popularity.

There are other interesting findings: The impact of age on salary follows an inverted U-shape peaking at 25.4 years (other things being equal, model (2)). We also observe a positive discrimination of foreigners from overseas. While European foreigners, both from the EU and Eastern Europe, are paid no different than their German counterparts, players from overseas - most of whom stem from South America - are paid a premium which is not reflected in better performance.

We carried out a number of robustness checks. In particular individual media presence may itself only be a function of performance as those players who perform well tend to be mentioned more often. The significant increase in R^2 after the inclusion of the media parameter, however, indicates that media presence cannot be explained by performance alone. Indeed the regression of media presence on performance and the other control variables resulted only in an R^2 of .22 in a regression without club dummies and .42 in a regression with club dummies. Only FGOAL and MASSIST turned out significant as the news, of course, reported the goals including the scoring and assisting players. In order to address this endogeneity of the variable HITS we applied a two stage regression procedure: We ran an OLS regression of HITS on all explanatory variables in the second stage, i.e. all performance parameters, age, and their squared terms (except for DTACKLES as a share value), the dummy variable OVERSEAS, club dummies and a constant. We then used the residuals of this equation as the part of media presence which is not explained by actual performance, age, club, or origin, but rather by individual reputation or popularity and thus is able to portray the Adler effect. Results are given in Table 2.

Table 2 about here.

It turns out that the results of the OLS regression is largely unaffected by this procedure. We still find positive but diminishing returns on performance variables and media presence in the OLS regression and a relatively similar pattern in the 95 % quantile regression. Table 2 also provides some indication on the behavior of quantile regressions. We report the median regression and the 90 and 95 percent quantiles. The influence of performance parameters is largely unaffected by the percentile θ chosen for the quantile regression. AGE loses its significance. The more weight we give to the superstar bracket, the less media presence is able to explain income differences. For no quantile regression do we find a convex earnings-performance or earnings-popularity gradient. We do not find superstar effects as described by Rosen or Adler.

4. Conclusion

Individual performance and — and independently thereof — media presence explain a large part of German soccer players' pay. The strong influence of popularity is particularly noteworthy in soccer, for which the contribution to team success could be expected to be the dominant determinant of individual pay. Our results indicate that clubs profit also from the part of players' popularity that is *not* linked to measurable performance on the field, presumably through higher gate receipts, merchandise sales, sponsors' contributions, commercials, and broadcast revenues. However, we do not find superstar effects described by Adler's or Rosen's theories: neither differences in performance nor in media presence translate into more than proportional differences in the earnings of soccer stars.

Two lines of arguments may be put forward for this non-existence result: First, we capture only ex ante salaries of players from their clubs. As data are unavailable we do not include income from commercials which are concentrated with only a few players and thus the real income distribution is much more skewed. However, this should not prevent superstar effects in the salaries unless clubs anticipate this effect in their salary offers and are able to price this in which should be very difficult given international competition for stars. Second, because the Italian, English and Spanish top clubs are richer than their German counterparts due to the different marketing rights for TV transmission, 'real' superstars have an incentive to seek employment with them.[13] That might explain why Lucifora and Simmons (2003) and Garcia-del-barrio and Pujol (2007) find superstar effects for the Italian and Spanish premier leagues and we do not for the *Bundesliga*. Yet, it could also be that they find superstar effects because of their different methodological approach. Obviously there is a need for more research in this area.

Unlike previous contributions to the superstar literature, future research should use quantile regression techniques in order to seek to identify the determinants of the superstar phenomenon. Only this technique is able to measure appropriately the influence of talent and popularity for the top income earners – the superstars.

[13] This interpretation is in line with the recent development that in the past two years – especially after the World Championship in Germany in 2006 – more German players have been playing abroad. Michael Ballack and Jens Lehmann are the prime examples.

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Table 1: Regression results, endogenous variable: WAGE

	(1)	(2)	(3)
VARIABLES	OLS		quantile regression,[a] 95% quantile
AGE	792438.5** (2.45)	598928.5** (2.19)	1683468* (1.67)
AGESQD	-15405.94** (-2.56)	-11773.68** (-2.31)	-33070.15* (-1.74)
KEEPER	1099645** (2.09)	565798.7 (1.30)	1674404 (1.56)
MIDFIELD	-204850.7 (-0.41)	-303938.2 (-0.75)	328759.5 (0.34)
FORWARD	-904439[b] (-1.62)	-665347.7 (-1.45)	-1057635 (-1.15)
FGOAL	449946*** (3.61)	226102.2** (2.16)	596558** (2.17)
FGOALSQD	-4440.098 (-0.66)	-3862.711 (-0.70)	-17195.81 (-0.97)
MASSIST	747041.9 *** (4.39)	540681.1*** (3.84)	1233679*** (2.47)
MASSISTSQD	-43393.81*** (-2.61)	-41970.72*** (-3.07)	-93176.13** (-2.08)
DTACKLES	18673.23** (2.42)	9287.729 (1.45)	37712.7** (2.04)
OVERSEAS	489454.2* (1.35)	850207.1 *** (2.84)	1310638 (0.78)
HITS		60621.71 *** (9.40)	44477.61** (1.82)
HITSSQD		-162.9496*** (-6.02)	-120.3744 (-0.97)
Team-dummies	yes	yes	yes
constant	-8504594* (-1.95)	-6693148* (-1.83)	-1.87e+07 (-1.39)
R^2 / Pseudo- R^2	0.51	0.68	0.53
	F(29,234) = 8.46***	F(31, 232) = 15.59***	

[a] quantile regression with bootstrapped standard errors (1000 replications), [b] significant at the 11 percent level, t-values in parentheses, ***/**/* indicates significance at the 1%/5%/10%/ level, no. obs.:264

Table 2: Regression results, endogenous variable: WAGE

	(4)	(5)	(6)	(7)
VARIABLES	OLS	quantile regression		
		50% quantile	90% quantile	95% quantile
AGE	613230.5** (1.09)	233793.9 (0.45)	1145832 (1.32)	929858.8 (0.89)
AGESQD	-11862.73** (-2.17)	-4334.354 (-0.45)	-22354.88 (-1.36)	-17966.05 (-0.90)
KEEPER	1261176 *** (2.72)	1105528* (1.73)	1305183 (1.11)	947850.5 (0.83)
MIDFIELD	-153423.2 (-0.36)	71960.51 (0.12)	-97474.02 (-0.09)	-322082.1 (-0.27)
FORWARD	-873530.5* (-1.80)	-662194.9 (-1.06)	-1189450 (-1.21)	-1390813 (-1.57)
FGOAL	442148.5*** (4.08)	426621.8*** (3.01)	564792.5* (1.92)	535747.6 ** (2.11)
FGOALSQD	-4188.419 (-0.71)	-2411.079 (-0.25)	-9169.255 (-0.49)	-8345.439 (-0.56)
MASSIST	728706.9*** (4.93)	488205.7** (2.01)	1187399** (2.38)	1427821 *** (2.74)
MASSISTSQD	-40782.67*** (-2.82)	-14234.63 (-0.50)	-71666.57 (-1.46)	-91569.94* (-1.88)
DTACKLES	20243.07*** (3.00)	23134.71*** (2.53)	30329.97 (1.48)	32808.67* (1.77)
OVERSEAS	504998.5[b] (1.60)	415438.8 (0.93)	211320.1 (0.18)	246914.7 (0.20)
HITS (EXOGENOUS)	31447.71 *** (8.17)	38556.5*** (4.25)	28796.09* (1.71)	18111.48 (1.18)
HITSSQD (EXOGENOUS)	-104.5877** (-2.37)	-49.89813 (-0.30)	128.1668 (-0.42)	284.843 (1.11)
Teamdummies	yes	yes	yes	Yes
constant	-6189992 (-1.57)	-1844163 (-0.27)	-1.09e+07 (-0.94)	-7792228 (-0.57)
R^2 / Pseudo- R^2	0.63	0.47	0.52	0.54
	F(31, 232)=12.96***			

[a] quantile regression with bootstrapped standard errors (1000 replications); [b]significant at the 11 percent level

t-values in parentheses, ***/**/* indicates significance at the 1%/5%/10%/ level, no. obs.:268

Appendix: Descriptive statistics

1. Endogenous variable: Wage in season 1999/2000

PERCENTILES	WAGE IN DM
1%	100,000
5%	250,000
10%	500,000
25%	800,000
50%	1,500,000
75%	3,000,000
90%	5,500,000
95%	7,000,000
99%	10,000,000

Obs.	493
Mean	2,350,507
Std.Dev.	2,107,301
Variance	4.44e+12
Skewness	1.597043
Kurtosis	5.366672

1 DM = 0.51130 Euros

In 1999 1 DM equalled 0.54543 US Dollars (annual average)

2. Explanatory variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
KEEPER	651	.1059908	.3080625	0	1
DEFENSE	651	.2519201	.4344494	0	1
MIDFIELD	651	.4254992	.4947987	0	1
FORWARD	651	.2165899	.4122375	0	1
GOALS	651	1.416283	2.885024	0	28
FGOAL	651	.6989247	2.63672	0	28
ASSIST	651	1.066052	2.099875	0	12
MASSIST	651	.6390169	1.809449	0	12
TACKLES	651	15.72219	23.97067	0	69.3
DTACKLES	651	5.49616	17.01095	0	69.3
HITS	648	23.35185	31.72442	0	315

Out of 651 players 292 players (or 45 %) did not play at all in the season 1998/99; the median is at 216 minutes out of 3060 possible minutes. The mean is at 894 minutes; standard deviation is 1040 minutes.