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Does Attractiveness Win?

On the Gender-Specific Impact of Attractiveness on Athletic Performance in Tennis

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Abstract

This study examines whether there are gender-specific differences in regard to physical attractiveness of professional tennis players and their performance. For this purpose, the top 100 male and female tennis players of the tennis world ranking in 2014 are examined. Athletic performance is measured by prize money earned for single seasons as well as for the whole career. Different OLS-regressions reveal a significantly positive relationship between physical attractiveness and athletic performance. However, this result holds for female tennis players only. For male tennis players, the impact is insignificant.

JEL-Codes: J24, J31, J49, J71, L83

Gewinnt Attraktivität?

Zum geschlechtsspezifischen Einfluss von Attraktivität auf die sportliche Leistung im Tennis

Zusammenfassung

Diese Studie untersucht, ob ein geschlechtsspezifischer Zusammenhang zwischen der Attraktivität von professionellen Tennisspielern und ihrer sportlichen Leistung besteht. Dazu werden die Top 100 Tennisspielerinnen und -spieler der jeweiligen Weltrangliste im Jahr 2014 untersucht. Die Leistung wird über gewonnene Preisgelder für einzelne Saisons sowie für die gesamte Karriere gemessen. Verschiedene OLS-Regressionen zeigen einen signifikant positiven Zusammenhang zwischen der physischen Attraktivität und der sportlichen Leistung. Dieser Zusammenhang besteht allerdings nur für Frauen. Für männliche Tennisspieler ist der Effekt insignifikant.

Im Internet unter:

http://www.wiwi.uni-muenster.de/io/forschen/downloads/DP-IO_01_2016.pdf

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Does Attractiveness Win?

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1. Introduction

Professional athletes, and those aspiring to become professionals, distinguish themselves through hard work, ambitiousness and, most importantly, raw talent. However, new research points to still another trait of the most accomplished athletes, their attractiveness and particularly attractive faces. Several studies find that more (physically) attractive people have different advantages in comparison to less attractive ones. For example, more attractive people are liked more (Byrne et al. 1968, Kleck and Rubenstein 1975), have better chances to get a date (Brislin and Lewis 1968, Huston 1973), receive more support (Benson et al. 1976), are attributed more socially desirable characteristics (Dion et al. 1972), receive more favourable task performance ratings (Landy and Sigall 1974), and have a higher athletic performance (Postma 2014, Williams et al. 2010). This higher performance results in a higher market value (Rosar et al. 2014). Moreover, physical fitness and health as well as happiness and self-confidence are characteristics of more attractive people (Mathes and Kahn 1975, Shackelford and Larsen 1999, Woodman and Hardy 2003, Hönekopp et al. 2004).

The results of attractiveness studies raise the question whether there is a relationship between physical attractiveness and athletic performance, and if so, in which way. Furthermore, a second question arises, namely whether there are gender-specific differences regarding this relationship.[1] While many studies (for example, Bakkenbüll and Kiefer 2015, Postma 2014, Rosar et al. 2014, Williams et al. 2010) examined the effect of physical attractiveness and athletic performance for each gender separately, no study examined gender-specific differences in this context as yet. Thus, the aim of this paper is to check a hypothetical gender-specific relationship between physical attractiveness and athletic performance by using the top 100 professional male and female tennis players (in the 40th calendar week in 2014) as data sample. To the best of my knowledge, no previous study has investigated this relationship, certainly not for professional tennis players. Thus, this study is the first that analyses the link between physical attractiveness and athletic performance with respect to gender-specific differences.

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[1] In the following the terms "gender" and "sex" are used synonymously.

The paper is organised as follows. Section II gives an overview about existing literature referring to the subject of investigation as well as some theoretical approaches. Section III introduces the data set and presents its descriptive statistics. Section IV presents the empirical results. Section V discusses these results. Section VI concludes the paper.

2. Literature Review and Theoretical Framework

Regarding the relationship between physical attractiveness and (athletic) performance economic studies in general and sport economic studies in particular reveal a huge variety of significantly positive, significantly negative or insignificant results. Moreover, all of the following studies do not analyse possible gender-specific impacts of attractiveness on performance. This section gives a short literature review about the already existing studies dealing with the relationship between physical attractiveness and performance. Furthermore, this section includes a short overview of several different theories that can be used to explain a positive relationship between physical attractiveness and athletic performance.

Postma (2014) examines the direct effect between physical attractiveness and athletic performance by using data from elite professional cyclists that finished the Tour de France in 2012. He depicts a significantly positive relationship between attractiveness of a cyclist and his performance, meaning that riders that performed better at the Tour de France in 2012 have been more attractive. Similar results are gained for National Football League quarterbacks by Williams et al. (2010). Their research shows that more athletic quarterbacks have more attractive faces. Rosar et al. (2014) analyse how facial attractiveness of professional football players in the German Bundesliga influence their market value. Statistical analysis shows that facial attractiveness has a positive effect on a player's market value if his actual performance is controlled for. These three studies investigate the link between physical attractiveness and performance for male athletes. Bakkenbüll and Kiefer (2015) analyse the influence of physical attractiveness on athletic performance for professional female tennis players and find a significantly positive impact. Furthermore, they show that the likelihood to win a match increases with the score of attractiveness. Surprisingly, there is no study that analyse the impact of physical attractiveness on athletic performance depending on gender for the same type of sport. The present study serves to close this research gap.

At first glance, it is not clear how athletic performance can be influenced by physical attractiveness. However, there are some theories that can explain this link. Research projects that deal with questions relating physical attractiveness and its effects start with the assumption

that attractiveness is an objective or at least intersubjective characteristic of the person considered (Köhler 1984). Commonly, there are consistent estimations about a person's attractiveness. Discrepancies in the rating of physical attractiveness are marginal and go back to differences in taste and cultures (Hamermesh and Biddle 1994). This phenomenon is referred to the Attractiveness Consensus (Cunningham 1986, Rosar et al. 2010) and acts as a kind of basis for the following effects of physical attractiveness. First, the Attractiveness Attention Boost (Rosar et al. 2010) indicates that more attractive persons receive higher attention from their social environment. Furthermore, more attractive people benefit from the fact that their actions and statements keep longer in mind than those from less attractive people (Maner et al. 2003). The Attractiveness Stereotype as a second explanatory mechanism focuses on the hypothetical fact that more attractive people would be more high-performing, hard-working, intelligent and creative (Dermer and Thiel 1975, Eagly et al. 1991, Feingold 1992). Third, the Attractiveness Treatment Advantage (Rosar et al. 2010) implies that more attractive people get a higher range of support from their social environment and interaction partners because of higher respect and appreciation (Benson et al. 1976, Dion et al. 1972). The aforementioned mechanisms can be combined to the so-called Attractiveness Competition Advantage (Rosar et al. 2010). This mechanism attests more attractive persons an advantage over less attractive ones.

Concerning the research question, all of these mechanisms predict that more attractive people get higher advancement and support and consequently are fundamentally better in their performance. In the context of professional tennis players, it is imaginable that, particularly at the beginning of a possible professional career, more attractive tennis players receive more support by their families, coaches and managers. This preferential treatment, depending on the level of attractiveness, leads in later years to a higher athletic performance and consequently to greater athletic success.

Besides the Attractiveness Competition Advantage, the so-called Pygmalion Effect (Rejeski et al. 1979) serves as a second theoretical explanatory approach for a positive relationship between physical attractiveness and performance. It is assumed that the performance of people increases with the expectation placed upon people. As a result, higher expectations lead to higher competition levels, better quality coaching and more support from sponsors. With regard to the research subject, the Pygmalion Effect leads to a selection bias in favour of more attractive people because coaches or sponsors may have greater expectations about their ability. This is because of the Attractiveness Stereotype assuming higher skills of more attractive

people that leads to higher support levels by coaches and consequently translates into better performance.

Moreover, several studies find a positive relationship between facial attractiveness and physical health or physical fitness that can serves as a further explanation for a positive relationship between physical attractiveness and performance. For example, Shackelford and Larsen (1999) depict a significantly positive influence of facial attractiveness on physical health for both women and men. Thus, people with more attractive faces are physically healthier than unattractive ones. Hönekopp et al. (2004) also find that the level of physical fitness is positively linked to the attractiveness of faces. However, this relationship was analysed and documented for young women only. Interestingly, Hönekopp et al. (2007) cannot support this link for men. Instead, they find a positive relationship between men's physical fitness and men's body attractiveness if it was rated by female evaluators. Therefore, it can be assumed that men and women with more attractive faces are healthier. Moreover, only women with more attractive faces have better physical fitness and consequently show better athletic performance. For men, it seems that there might be other factors like body attractiveness that influence their physical fitness. Consequently, one can conclude that there are gender-specific differences for the relationship between facial attractiveness and physical fitness. Thus, there might also be gender-specific differences in the relationship between physical attractiveness and athletic performance.

A last explanation for a relation between physical attractiveness and athletic performance might be the relationship between physical attractiveness, happiness and self-esteem or self-confidence. It seems to be understandable that more attractive people have more self-esteem or self-confidence and are happier and consequently have more success or show better performance. For example, Torgler et al. (2008) and Mathes and Kahn (1975) show a gender-independent and positive relationship between physical attractiveness and happiness. In contrast to this, the correlation between physical attractiveness and self-esteem depends on the gender. They find a positive relationship for women, whereas for men it is negative. However, Woodman and Hardy (2003) show a positive relationship between physical attractiveness and self-esteem for both genders. In context of athletic performance, there are many studies that examine the link between self-confidence or alternatively self-esteem and athletic performance. For example, Taylor (1987) shows that self-confidence is a significant predictor of performance in a variety of sports. Mahoney and Avener (1977) reveal a positive relationship for gymnastics, Gould et al. (1981) show that this relationship holds for professional wres-

tlers, Burton (1988) confirms it for swimming, and Nelson and Furst (1972) show it in the context of motor sports. In sum, the positive effect of self-esteem or self-confident on athletic performance might be one possible explanation why more attractive people achieve better performance in sports. Furthermore, the study by Mathes and Kahn (1975) finds a gender-specific impact of physical attractiveness on self-esteem that can possibly explain why there might be gender-specific differences regarding the impact of physical attractiveness on athletic performance.

A lot of research examines the relationships between physical attractiveness, physical fitness or health, self-esteem or self-confidence and athletic performance. However, there are only few studies (see the second paragraph in this Section) that investigate the direct link between physical attractiveness and athletic performance. Up to now and to the best of my knowledge, no study analyses this relationship in consideration of gender for the same type of sport. The literature and theoretical review show that there are some gender differences, particularly regarding the impact of physical fitness and self-esteem on (athletic) performance. Following the research idea by Bakkenbüll and Kiefer (2015) and Postma (2014), the aim of this paper is to test the existence of a gender-specific difference regarding the relationship between physical attractiveness and athletic performance for professional tennis players.

3. Dataset and Descriptive Statistics

The dataset contains the single ranking at the 40th calendar week in 2014 of the top 100 professional male and female tennis players. For men, the Association of Tennis Professionals (ATP) serves as the source for the single ranking, for women it is the Women's Tennis Association (WTA). The needed personal as well as career-related data were collected from the official website of the ATP and WTA.[2] These websites inform about the individual tennis players' profile including information about the biography, results and prize money earned. The data of the tennis players' physical attractiveness were collected from a separate survey. In accordance with the Truth of Consensus Method (Patzer 1985), participants were asked to evaluate standardised pictures with focus on the attractiveness (see below for a precise description of the procedure). Table 1 and Table 2 give an overview about the variables used in this study and their descriptive statistics for male and female tennis players.

[2] These can be found at www.atpworldtour.com and www.wtatennis.com.

Variables	Description	Obs.	Mean	SD	Min	Max
PM_2012	Earned prize money in 2012 (in million $)	100	0.82	1.73	0	12.80
PM_2013	Earned prize money in 2013 (in million $)	100	1.02	2.03	0.03	14.56
PMCa_2012	Earned prize money in the career at the end of 2012 (in million $)	100	4.69	10.33	0.01	75.31
PMCa_2013	Earned prize money in the career at the end of 2013 (in million $)	100	5.71	11.93	0.05	78.50
LN_PM_2012	Log of earned prize money in 2012	100	12.56	1.88	0	16.36
LN_PM_2013	Log of earned prize money in 2013	100	13.09	1.13	10.15	16.49
LN_ PMCa_2012	Log of earned prize money in the career at the end of 2012	100	14.18	1.67	8.53	18.13
LN_ PMCa_2013	Log of earned prize money in the career at the end of 2013	100	14.58	1.39	10.85	18.18
Attractiveness	Physical attractiveness of tennis players	100	3.02	0.73	0.90	4.82
BMI	Body-Mass-Index (BMI) defined by BMI = m/l^2	100	22.85	1.60	19.60	26.88
BMI^2	Body-Mass-Index (BMI) squared	100	524.45	73.44	384.08	722.43
Age_2012	Age at 2012	100	25.88	3.44	17	34
Age^2_2012	Age squared at 2012	100	681.5	179.55	289	1156
Age_2013	Age at 2013	100	26.88	3.45	18	35
Age^2_2013	Age squared at 2013	100	734.26	186.41	324	1125
Pro_Years_2012	Number of years as professional tennis player in 2012	100	7.99	3.45	0	16
Pro_Years_2013	Number of years as professional tennis player in 2013	100	8.99	3.45	0	17
ToursC_2012	Tournaments played in the career at the end of 2012	100	196.94	76.05	8	344
ToursC_2013	Tournaments played in the career at the end of 2013	100	221.63	76.62	20	373
Tours_2012	Tournaments played in 2012	100	23.39	6.04	0	33
Tours_2013	Tournaments played in 2013	100	24.69	5.32	8	35

Table 1: Variable definitions and descriptive statistics for male tennis players

Variables	Description	Obs.	Mean	SD	Min	Max
PM_2012	Earned prize money in 2012 (in million $)	100	0.57	1.24	0.07	7.31
PM_2013	Earned prize money in 2013 (in million $)	100	0.72	1.43	0.01	11.99
PMCa_2012	Earned prize money in the career at the end of 2012 (in million $)	100	2.88	5.65	0.08	38.98
PMCa_2013	Earned prize money in the career at the end of 2013 (in million $)	100	3.60	6.86	0.04	50.97
LN_PM_2012	Log of earned prize money in 2012	100	12.27	1.36	8.89	15.81
LN_PM_2013	Log of earned prize money in 2013	100	12.73	1.19	8.81	16.30
LN_ PMCa_2012	Log of earned prize money in the career at the end of 2012	100	13.58	1.77	9.09	17.48
LN_ PMCa_2013	Log of earned prize money in the career at the end of 2013	100	14.10	1.44	10.51	17.75
Attractiveness	Physical attractiveness of tennis players	100	3.55	1.07	1.05	5.54
BMI	Body-Mass-Index (BMI) defined by BMI = m/l^2	99[3]	21.14	1.31	16.69	24.24
BMI^2	Body-Mass-Index (BMI) squared	99	448.80	54.85	278.66	587.70
Age_2012	Age at 2012	100	23.05	3.81	15	32
Age^2_2012	Age squared at 2012	100	545.69	181.25	225	1024
Age_2013	Age at 2013	100	24.05	3.81	16	33
Age^2_2013	Age squared at 2013	100	592.79	188.84	256	1089
Pro_Years_2012	Number of years as professional tennis player in 2012	100	6.9	4.12	0	18
Pro_Years_2013	Number of years as professional tennis player in 2013	100	7.9	4.12	0	19
ToursC_2012	Tournaments played in the career at the end of 2012	100	148.32	74.96	13	330
ToursC_2013	Tournaments played in the career at the end of 2013	100	169.75	74.81	30	357
Tours_2012	Tournaments played in 2012	100	21.59	5.12	8	30
Tours_2013	Tournaments played in 2013	100	21.43	5.56	7	32

Table 2: Variable definitions and descriptive statistics for female tennis players

In the empirical analysis, different performance-related variables, represented by the prize money earned, serve as dependent variables. To be exact, the earned prize money in the 2012 and 2013 single seasons as well as the earned prize money in the whole career at the end of 2012 and 2013 are used. The prize money earned can be considered as an indicator of the athletic performance and thus of the success of each tennis player. Table 1 shows that on aver-

[3] Due to missing information about the weight of one female tennis player, she was excluded from the analysis.

age, male tennis players earned about 0.82 million US dollars in 2012 and 1.02 million US dollars in 2013. The descriptive statistics of female tennis players in Table 2 show that they earned less prize money than male tennis players. On average, female tennis players earned about 0.57 million US dollars in 2012 and 0.72 million US dollars in 2013. However, both statistics show that the prize money earned rises over time. Regarding the prize money earned in the whole career at the end of 2012 and 2013, the mean values are 4.69 million US dollars and 5.71 million US dollars for male tennis players and 2.88 million US dollars and 3.60 million US dollars for female tennis players. Similar to the prize money earned in single seasons, the prize money earned in the whole career increases over time, too. In a second step, the different prize money variables were logarithmised.

The physical attractiveness of each tennis player was determined using an online-questionnaire in conformity with the Truth of Consensus Method. For this purpose, portraits of the top 100 male and female tennis players based on the ranking of the 40th calendar week in 2014 were selected. The pictures were selected such that face and neck of each tennis player were photographed in a frontal position. The pictures were either taken from the ATP or WTA website or from the German sport magazine Kicker. In a first step, background and clothes were standardised and jewellery or hats were deleted to minimise distortion of the evaluation. In a second step, the sample of the male or female tennis players was divided in four subsamples with 25 photographs in each case. To control for further potential distortion generated by the position of a picture, the questionnaires differed concerning the image position. Each picture was presented at different positions of a questionnaire.

At the beginning of the online-questionnaire, there was a brief introduction and an address of welcome. The participants were informed about the purpose of the questionnaire to evaluate the attractiveness of twenty-five persons. To reduce the influence of recognition and popularity that could distort the pure evaluation of attractiveness, the participants were not informed that the pictures displayed professional tennis players. After the introduction, participants had to answer some demographic questions concerning their age, gender, graduation and whether they participated in sports regularly. The physical attractiveness was measured with an eight point Likert scale, ranging from zero for very unattractive to seven for very attractive. The Likert scale without a midpoint was used to force a choice by the evaluators and to avoid getting a neutral or intermediate evaluation (Garland 1991, Kiefer and Scharfenkamp 2012). After the evaluation of the twenty-five pictures persons were asked whether they could identify any of the persons. This procedure is important to control for further distortive impact on the

evaluation. If the test person clicked the "Yes"-button and wrote down the right name of the female or male tennis player, the evaluation was not used. Each questionnaire ended with an acknowledgement and each evaluator had the possibility to leave his or her email address to get information about the final results.

The online-questionnaires had been active from the 16th of June to the 15th of August 2015. The corresponding link for the survey was propagated using various social media like Facebook or Xing as well as internal platforms for students of the University of Münster and the University of Tübingen. Furthermore, some institutes sent the link to their intern mailing list. In sum, 684 persons participated in the survey. Out of all participants, 32 persons recognised any of the persons shown. Consequently, there were 652 persons whose evaluations have been used. Regarding the descriptive statistics and the demographic details, 57.28 per cent of the participants have been women and 42.72 per cent have been men. Moreover, 79.25 per cent of the attendees stated that they participate in sports regularly. The age structure of the test persons ranged from 15 years to 78 years. On average, the participants were 23.86 years old.

Every picture of the male and female tennis players was evaluated between 31 and 54 times. According to Rosar et al. (2010), 24 evaluations are sufficient to reach a robust attractiveness rating score. To get a value for physical attractiveness all evaluations of each tennis player were summed up and divided by the numbers of evaluators. The highest average score of attractiveness of a single male tennis player is 4.82 whereas the lowest average rating is 0.90. The mean of the physical attractiveness variable is 3.02. The minimum average evaluation of attractiveness of a female tennis player is 1.05 while the highest rating is 5.54. On average, the degree of physical attractiveness is 3.55.

Besides the physical attractiveness score, the number of single tournaments played in 2012 and 2013 as well as single tournaments played in the whole career at the end of 2012 and 2013 were picked up. The athletic performance measured by several prize money variables has to be seen in the context of the number of tournaments played in the year considered. An athlete with a lot of prize money earned may have won it with only a few tournaments whereas another player may have needed more tournaments to achieve the same amount. On average, the female tennis players played 21.59 tournaments in 2012 and 21.43 tournaments in 2013. In 2012, the maximum of tournaments played is 30, in 2013 it is 32 whereas the minimum is eight and seven, respectively. Regarding the male tennis players, the maximum in 2012 is 33 and the minimum is zero. For 2013 the highest value of tournaments played is 35

and the minimum is eight. On average, male tennis players participated in 23.39 tournaments in 2012 and 24.69 tournaments in 2013. Concerning the number of tournaments in the whole career at the end of 2012 and 2013, the mean values for female tennis players are 148.32 and 169.75 and for male tennis players 196.94 and 221.63.

The third explanatory variable is the body mass index (BMI). It is calculated by the formula $BMI = m/l^2$ with "m" representing the body mass in kilogramme and "l" representing the body height in meters. The data needed were collected from the individual players' profiles on the ATP or WTA website. The mean of the BMI for male tennis player is 22.85, for female tennis player it is 21.41. A value between 18.5 and 24.9 implies normal weight for adults (World Health Organization 2015). Descriptive statistics show that the maximum BMI value is 26.88 and the minimum is 19.60 for men and 24.24 respectively 16.69 for women. Moreover, the squared BMI to control for an (inverted) U-shaped relationship was calculated.

Another explanatory variable is the number of years as a professional tennis player in 2012 and 2013. The variables Pro_Year_2012 and Pro_Year_2013 measure the duration of the professional career at the time. Descriptive statistics show that on average the career duration of the analysed tennis players is 7.99 in 2012 and 8.99 in 2013 for male tennis players and 6.9 in 2012 and 7.9 in 2013 for female tennis players. The longest professional career has been lasting for 17 years in 2013 for male tennis players and 19 years for female tennis players. A last explanatory variable similar to the number of years as a professional tennis player is the age of the considered tennis player in 2012 and 2013. On average, male tennis players are 25.88 years old in 2012 and 26.88 years old in 2013. The youngest male tennis player is 17 (18) in 2012 (2013), the oldest is 34 (35). Female tennis players are on average 23.05 years old in 2012 and 24.05 years old in 2013. The youngest one is 15 (16) in 2012 (2013), the oldest one is 32 (33). Similar to the BMI variable, the squared age was calculated to control for an (inverted) U-shaped relationship.

4. Empirical Results

The aim of this paper is to verify whether there is a relationship between physical attractiveness and athletic performance and thus sporting success. Furthermore, it aims to clarify whether there are gender-specific differences between physical attractiveness and its effect on athletic performance. For this purpose, ordinary least square regressions (OLS-regressions) are used for different performance variables. First of all, prize money earned in single seasons for the years 2012 and 2013 are regressed against physical attractiveness, BMI and its square,

age and its square as well as the single tournaments played in 2012 and 2013, separately for women and men. Afterwards, the same, slightly adjusted explanatory variables are regressed on the prize money earned during the whole career at the end of 2012 and 2013. The results of the OLS-regressions for men are presented in Table 3, for women they are presented in Table 4.

	Dependent variables			
Explanatory variables	LN_PM 2012	LN_PM 2013	LN_PMCa 2012	LN_PMCa 2013
Attractiveness	.025	.125	.039	.061
	(.10)	(.83)	(.23)	(.38)
BMI	.820	1.197	.368	.955
	(.30)	(.73)	(.19)	(.54)
BMI^2	-.018	-.026	-.007	-.020
	(-.31)	(-.73)	(-.17)	(-.52)
Age	1.097^{+}	.952*	1.464**	.986*
	(1.80)	(2.49)	(3.08)	(2.13)
Age^2	-.018	-.016*	-.025**	-.016^{+}
	(-1.55)	(-2.30)	(-2.96)	(-1.95)
Tours	.070*	-.042*	.007^{+}	.004
	(2.27)	(-2.01)	(1.92)	(1.17)
Constant	-14.271	-13.591	-12.985	-12.813
	(-.44)	(-.69)	(-.55)	(-.58)
Significance	.005	.022	.000	.000
Obs.	100	100	100	100
Adjusted R2	.121	.089	.473	.330

Note. Variable definitions are provided in Table 1. Dependent variables: LN_PM_2012/2013: logarithmised prize money for the year 2012 and 2013; LN_PMCa_2012/2013: logarithmised prize money for the whole career at the end of 2012 and 2013. $^{+}p<.10$; $*p<.05$; $**p<.01$; $***p<.001$. Displayed are the unstandardised coefficients, *t*-values in parentheses. The variables Age and Tours are accordingly adapted to the investigation period of the dependent variable in each model.

Table 3: Results of OLS regressions for male tennis player

The regression results in Table 3 show an insignificant impact of physical attractiveness on all performance variables for professional male tennis players. These results mean that it cannot be stated that the level of prize money earned and thus the success of each male tennis player depend on his physical attractiveness. The OLS-regressions show other determinants that influence the performance variables in a significantly positive or negative way. First of all, age has a significantly positive impact in all regression models, meaning that prize money earned increases with age. An increase of one year is associated with increases of 109.7 and 95.2 percentage points in prize money for single seasons and increases of 146.4 and 98.6 percentage points in prize money over the whole career. Moreover, age squared for the single

season in 2013 as well as age squared over the whole career at the end of 2012 and 2013 affect the prize money earned in a significantly negative way. This means that age follows an inverted U-shape with maximum at 30.47 and 29.75 years for the 2012 and 2013 single season, respectively. For the whole career at the end of 2012 and 2013 the maximum values are 29.28 and 30.81, respectively. A second explanatory variable that influences the prize money earned is the number of single tournaments played. For the 2012 single season as well as for the whole career at the end of 2012 it affects the performance variables in a significantly positive way. Thus, an increase of one tournament implies a 7.0 percentage point increase in the prize money in 2012 and 0.7 percentage point increase in prize money earned for the whole career at the end of 2012. Interestingly, the 2013 single season influences the prize money earned in a significantly negative way. An increase of one tournament implies a 4.2 percentage point decrease in the prize money. For the whole career at the end of 2013 the effect is insignificant. The last explanatory variables are the BMI and its square. Irrespective of the dependent variable, BMI and BMI^2 have no significant impact on prize money earned and thus on performance and success. In a separate regression, I regressed the number of years as professional tennis player (Pro_Years) on the performance variables instead of age because of a strong correlation between age and the number of years as professional tennis player (r=.887). The regression results are approximately equal. The number of years as professional tennis player (Pro_Years) has a significantly positive impact on all performance variables. This means that an increase of one year as professional male tennis player is connected with increases of 10.9 and 17.7 percentage points in prize money for single seasons in 2012 and 2013 and increases of 25.9 and 27.2 percentage points in prize money over the whole career at the end of 2012 and 2013.[4]

The insights differ for female tennis players. The results of the OLS-regressions for the professional female tennis players are shown in Table 4.

[4] Regression results with the number of years as professional tennis player as one explanatory variable are available upon request.

	Dependent variables			
Explanatory Variables	LN_PM 2012	LN_PM 2013	LN_PMCa 2012	LN_PMCa 2013
Attractiveness	.257*	.188^{+}	.234*	.222*
	(2.53)	(1.78)	(2.28)	(2.34)
BMI	-2.141	-2.585	-2.698^{+}	-2.661^{+}
	(-1.35)	(-1.56)	(-1.66)	(-1.77)
BMI²	.048	.058	.062^{+}	.061^{+}
	(1.27)	(1.47)	(1.67)	(1.68)
Age	1.464***	.431**	1.369 ***	.970**
	(4.56)	(2.96)	(4.01)	(2.96)
Age²	-.027***	-.006*	-.023**	-.014*
	(-3.94)	(-2.29)	(-3.38)	(-2.29)
Tours	-.030	-.009	.004	-.000
	(-1.31)	(-.43)	(1.09)	(-.02)
Constant	16.365	34.008^{+}	22.257	27.356
	(.95)	(1.91)	(1.25)	(1.65)
Significance	.000	.000	.000	.000
Obs.	99	99	99	99
Adjusted R2	.421	.185	.644	.537

Note. Variable definitions are provided in Table 2. Dependent variables: LN_PM_2012/2013: logarithmised prize money for the year 2012 and 2013; LN_PMCa_2012/2013: logarithmised prize money for the whole career at the end of 2012 and 2013. +p<.10; *p<.05; **p<.01; ***p<.001. Displayed are the unstandardised coefficients, t-values in parentheses. The variables Age and Tours are accordingly adapted to the investigation period of the dependent variable in each model.

Table 4: Results of OLS regressions for female tennis player

As opposed to the results of the professional male tennis players, all regression models show a significantly positive impact of physical attractiveness on prize money earned for female tennis players. The positive impact of attractiveness on performance indicates that the higher the physical attractiveness of a female tennis player, the higher is the prize money earned in single seasons in 2012 and 2013 as well as over the whole career at the end of 2012 and 2013. Put differently, female tennis players with a higher attractiveness score show better athletic performance using prize money earned as indicator. In figures, the coefficients of physical attractiveness show that an increase of one point is associated with increases of 25.7 and 18.8 percentage points in prize money earned for single season in 2012 and 2013 and with increases of 23.4 and 22.2 percentage points in prize money earned for the whole career at the end of 2012 and 2013. Age as a second explanatory variable has a significantly positive impact on all performance variables as well. Similar to the result of male tennis player, age follows an inverted U-shape, recognisable by the significantly negative impact of age squared. Thus, for the single seasons in 2012 and 2013, prize money earned increases with age and reaches its maximum at 27.1 and 35.92 years, respectively. Considering prize money earned over the

whole career at the end of 2012 and 2013, the peak is 29.76 years and 34.64 years, respectively. Here again, because of a strong correlation between the number of years as professional tennis player (Pro_Years) and age (r=.937), I run a second OLS-regression with the number of years as professional tennis player instead of age. Regression results are approximately the same. The number of years as professional tennis player has a significantly positive impact on prize money earned in all single seasons as well as over the whole career at the end of 2012 and 2013. Similar to male tennis players, this means that an increase of one year as a professional female tennis player implies an increase of 20.3 and 12.5 percentage points in prize money earned for single seasons in 2012 and 2013 and increases of 23.1 and 21.6 percentage points in prize money earned over the whole career at the end of 2012 and 2013.[5] The BMI has a (weakly) significantly negative impact on prize money earned over the whole career at the end of 2012 and 2013 and follows a U-shape with minimum at 21.7 and 21.8, recognizable by the significantly positive impact of BMI squared. For single seasons, BMI and its square are not statistically significant. Finally, the number of single tournaments played has no insignificant impact in single seasons in 2012 and 2013 as well as over the whole career at the end of 2012 and 2013. Thus, OLS-regressions for female tennis player show that the level of prize money earned and consequently the degree of performance do not only depend on the physical attractiveness score but also on age (or the number of years as professional tennis player) and partly on the BMI.

5. Discussion

The purpose of this paper is to test the hypothetical relationship between physical attractiveness and athletic performance and, in particular, the existence of possible gender-specific differences. The findings confirm an impact of physical attractiveness of female tennis players on prize money earned in single seasons in 2012 and 2013 as well as for the whole career at the end of 2012 and 2013. These results are in accordance with a previous study by Bakkenbüll and Kiefer (2015). Interestingly, the same analyses for professional male tennis players show no statistically significant influence of physical attractiveness on athletic performance. This result is contrary to the results of Postma (2014), Williams et al. (2010), and Rosar et al. (2014). For different sporting disciplines, they show that there is a positive relationship between attractiveness and athletic performance. Concluding, by testing the relationship between facial attractiveness and athletic performance for men and women in one sport-

[5] Regression results with the number of years as professional tennis player as one explanatory variable are available upon request.

ing discipline, namely professional tennis, the findings show that attractiveness has a significantly positive influence on athletic performance for women only.

One possible explanation for the disclosed gender-specific difference can be derived from two studies by Hönekopp et al. (2004) and Hönekopp et al. (2007). In accordance with these studies, facial attractiveness signals physical fitness for women only. For men, such a relation cannot be confirmed. Thus, more facial attractive female athletes signal and have a higher level of physical fitness and consequently perform better. For male tennis player, there are other factors, independent of facial attractiveness that may influence athletic performance. However, the named relationship above between facial attractiveness and physical fitness can be interpreted differently. Athletes with better physical fitness have more attractive faces because they have a healthier lifestyle which results in more attractive and healthier faces. To trace this discussion it would be helpful to test the relationship between facial attractiveness and physical fitness for non-active people.

There is another possible explanation for a positive impact of attractiveness on performance that holds only for women. Physical attractiveness, particularly in the case of female athletes, is positively linked to online popularity (Kiefer and Scharfenkamp 2012), media coverage (Vincent et al. 2007), endorsement (Spencer and McClung 2001) and fit as an endorser (Fink et al. 2004). Accordingly, female athletes with better performance enjoy higher degrees of popularity and thus are more attractive to receive advertising and sponsoring contracts. Furthermore, if these female athletes are more attractive, they have the best chances to get lucrative sponsoring and advertising contracts (Yu 2005)[6]. This, in turn, leads to additional income that provides a further incentive for attractive athletes to perform better than less attractive ones. Additionally, the extra income from sponsoring and advertising contracts can be used to invest in beautification measures and performance enhancing activities. Top ten professional female tennis players like Maria Sharapova, Serena Williams, Caroline Wozniacki and Ana Ivanovic each get one of the highest evaluations on attractiveness and are some of the world's highest-paid female athletes (Forbes 2015). For men, it can be observed that athletic performance is most important to get advertising and sponsoring contracts. Consequently, professional male athletes are more interested in improving performance than in their outer appearance. For example, Roger Federer, one of the most successful professional tennis player, is also one of the world's highest paid male athletes with more than 40 million US-Dollars an-

[6] A good example for a successful tennis player with both characteristics is Maria Sharapova. She is the world's highest paid female athletes for the last 10 years with sponsorship revenues of about 23 million US-Dollars (Forbes 2015).

nually for advertising and sponsoring contracts (Forbes 2015). However, his attractiveness score (2.78 points) is very low. Similar results can be observed for Novak Djokovic and Rafael Nadal, top ten male tennis players with a low attractiveness score but many advertising and sponsoring contracts as well. This suggests, receiving advertising and sponsoring contracts depends rather on athletic performance than on physical attractiveness for professional male athletes.

The correlation between facial attractiveness and self-esteem serves as a third explanation why facial attractiveness influences athletic performance for women only. Mathes and Kahn (1975) show that this correlation is positive for women whereas for men it is negative. Therefore, attractiveness is an important factor for women to feel well which translates into a higher degree of self-esteem and thus leads to better (athletic) performance. This statement does not hold for men. For male athletes, performance is independent or negatively influenced by self-esteem and thus by facial attractiveness.

As demonstrated in Section II, there are also different theories explaining the relationship between attractiveness and performance. The positive effect for women and the insignificant effect for men can be explained by the different impact of the Pygmalion Effect (Rejeski et al. 1979) on gender. In the childhood, the attractiveness of girls can be recognised earlier than in the case of boys because the latter develop the attributes of attractive men over time. In general, older men, meaning between 30 and 40, seem to be more attractive than younger men or boys. Thus, support by the family or coaches and the Pygmalion Effect are stronger for girls than for boys. Consequently, attractiveness has no significant impact on performance in case of men whereas the Pygmalion Effect holds for women.

A further determinant that may have an influence on athletic performance is the Body-Mass-Index (BMI). Regression results show that the BMI has no significant impact on athletic performance for professional male tennis players and a weak significantly negative impact on prize money earned over the whole career at the end of 2012 and 2013 for women. Thus, it can be concluded from the results that the athletic performance of professional tennis players is in some extent independent of the body type. However, this does not mean that physical fitness or constitution have no impact on athletic performance. Rather, this means that the range of differences is at any rate very small for professional athletes, especially for male tennis players, because there is a certain level of fitness needed to achieve good performance and thus to be successful. Because of considering only the best 100 female and male professional

tennis players in 2014 who all have a high fitness level, there are only weak and mainly insignificant differences.

Age or the number of years as a professional athlete have a significantly positive impact on prize money earned during the whole career as well as for single seasons for both sexes. The initial increasing effect is quite intuitive because older age corresponds to longer careers and implies more time for winning prize money. Moreover, tennis players with longer careers have more experience and thus perform better and more proficiently, especially in tight matches (Del Corral 2009), whereas less successful players end their careers earlier. Thus, it is hardly surprising that age or the number of years as a professional tennis player influence athletic performance and thus success.

Finally, the variable number of tournaments played has gender-specific influences on performance. For women, the variable is insignificant for all performance variables. Thus, there are no significant differences regarding the number of tournaments played for female tennis players. For men, there is a significantly positive impact of the number of tournaments played in the 2012 single season as well as over the whole career at the end of 2012. Interestingly, the number of tournaments played in the 2013 single season has a negative impact. This suggests that in 2013 the prevailing strategy is playing fewer tournaments to win more prize money and to achieve better performance and thus to be more successful. One justification for this strategy is that athletes who play a high number of tournaments are exhausted earlier. This results in lower performances in the following matches. The concentration on highly-prized tournaments is more successful and leads to better performance than the concertation on many matches.

6. Conclusion

While there are several studies concerning the relationship between physical attractiveness and physical health, fitness or self-esteem, there are only few comparable investigations on the link between physical attractiveness and athletic performance. Moreover, there is no previous study on the gender-specific impact between physical attractiveness and athletic performance. Therefore, this paper investigates male and female tennis players, which are ranked in the top 100 of the ATP and WTA single ranking in the 40th calendar week in 2014, to estimate whether physical attractiveness of professional tennis players has an impact on athletic performance and whether this impact differs between genders. Regression analyses show that a relationship between physical attractiveness and athletic performance in terms of prize mon-

ey earned exists for female tennis players only. For male tennis players, I could not verify such relationship. Thus, there are gender-specific differences with regard to the impact of physical attractiveness on athletic performance and sporting success in professional tennis.

Nevertheless, this study has some limitations. Hence, further research is needed to confirm the results. The findings cannot clarify the reason for the relationship between physical attractiveness and athletic performance and why this effect is significantly positive for women whereas for men it is insignificant. Therefore, it would be interesting to investigate possible explanations further and to discriminate between different theoretical approaches. Moreover, given that the study is limited to the top 100 and thus to the best male and female professional tennis players worldwide, future research may consider male and female amateur players as well as other kinds of (individual) sports. Furthermore, the relatively small sample size may reduce or distort the results, so that further research could enhance the size of the investigated sample.

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