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Articles

ATHENS INSTITUTE FOR EDUCATION AND RESEARCH
A World Association of Academics and Researchers
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The current issue is the second of the seventh volume of the *Athens Journal of Sports*, published by the Sport, Exercise, & Kinesiology Unit of the ATINER under the aegis of the Panhellenic Association of Sports Economists and Managers (PASEM).

Gregory T. Papanikos, President, ATINER.

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10-13 May 2021, Athens, Greece

The Sport, Exercise, & Kinesiology Unit of ATINER organizes its **21st Annual International Conference on Sports: Economic, Management, Marketing & Social Aspects, 10-13 May 2021, Athens, Greece** sponsored by the Athens Journal of Sports. The aim of the conference is to bring together academics and researchers of all areas of sports. Please submit a proposal using the form available (https://www.atiner.gr/2021/FORM-SPO.doc).

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Important Dates

- Abstract Submission: **12 October 20019**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **12 April 2021**

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Important Dates

- Abstract Submission: **15 June 2019**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **29 June 2020**

Academic Member Responsible for the Conference

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

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Empirical Mysteries of the 2016-17 NBA Regular Season

By Thomas M. Fullerton, Jr.[*]*, James H. Holcomb*[†]*& Michael L. Jaeger*[‡]

This study examines the on-court performance of the thirty National Basketball Association (NBA) teams during the 2016-17 NBA basketball season. Cross sectional data are employed to analyze wins for the 2016-17 NBA basketball season. Although the results are inconclusive, there is one notable outcome in the form of a negative correlation between team payrolls and victories. Field goal percentage is, similarly, also reliably associated with team wins. In general, the outcomes obtained stand in contrast to those reported in prior analyses conducted for major League Baseball and the National Football League. Replication of this study for the 437 teams in National Collegiate Athletics Association provides an intriguing opportunity for subsequent research.

Keywords: *National basketball association, team performance.*

Introduction

The National Basketball League produces an increasingly popular product in the United States and abroad. Games are watched, or attended, by millions of fans every year, especially as the league continues to invest overseas. Given that, it is natural to examine what influences win-loss records during the regular season. Prior studies have analyzed variables that impact post-season outcomes (Berri and Eschker, 2005; Wallace, Caudill and Mixon, 2013; Zimmer and Kuethe, 2009), but comparatively little attention has been devoted to the regular season.

This effort examines the potential impacts of both on-court performance measures and several management variables on win-loss records during the 2016-17 NBA season. The analysis is similar to what has been used in recent studies of Major League Baseball (MLB) regular season outcomes (Fullerton et al., 2014; Peach et al., 2016; Fullerton and Peach, 2016). There are no guarantees, however, that what works for empirical post-mortems of one spectator sport will be applicable to another segment of the entertainment athletics complex.

The study is structured as follows. Section two provides an overview of related studies; section three describes the data and methodology; section four discusses empirical results. The analysis is summarized in the concluding section. A statistical data appendix is included at the end of the document.

[*]Professor, Department of Economics & Finance, University of Texas at El Paso, USA.
[†]Associate Professor, Department of Economics & Finance, University of Texas at El Paso, USA.
[‡]Dual Credit Economics Instructor, Franklin High School in El Paso, Texas, USA.

Literature Review

Several studies examine the impacts of payroll dispersion on team success. Jewell and Molina (2004) focuses on different aspects of MLB and document an inverse correlation between salary dispersion and victories. More recently, Fullerton et al. (2014) provides evidence that payroll dispersion may not affect team win-loss performances. Increases in player salary ranges are not found to hurt team records. As hypothesized, on-field performances are important to the win-loss column. Peach et al. (2016) reports evidence that each season should be looked at "in isolation from predecessors," due to parameter heterogeneity. That outcome is confirmed by Fullerton and Peach (2016).

Beri (1999) looks at the NBA regular season statistics and team wins, but does not include salaries in the analysis. The empirical results of this study show there is a correlation between player performance and team wins. That study cautions that player performances can be affected by trades, free agent acquisitions, and/or minutes played. Roster changes may require adjustments to new playing styles and reduced playing times. Berri and Eschker (2005) examines NBA post-seasons from 1994-2003. That study finds no evidence of player performances being enhanced during the playoffs. The widespread claim of "Prime-Time Players" found to be fictional.

Katayama and Nuch (2011) analyzes panel data for the NBA regular seasons from 2002 to 2006. Outcomes in that effort indicate that a smaller spread between player salaries positively affects team performance and win-loss records. More specifically, a smaller pay gap is better than paying one-to-three players most of the salary cap and filling the rest of the team with low-paid players. Due to the small number of players on the court compared to the MLB and National Football League (NFL), salary dispersion may not be a factor in causing infighting among NBA teams. In an effort to maximize profits rather than wins, teams may, nonetheless, purchase superstar players to sell more tickets.

Data and Methodology

Data for the 2016-17 NBA season are analyzed in this study. Regular season team wins are the variable of interest. The regular season has eighty-two games for each of the thirty NBA teams. Because not all teams reach the playoffs, post season games are excluded from the analysis.

Variables employed in this study are listed in Table 1.The left-hand dependent variable is WINS17, the number of wins from the eighty-two games played during the regular season. PTS17 is the average points scored per game during the season. FGPCT17 is the successful percentage of baskets made by each team. PT3PCT17 indicates the percentage of 3-point baskets made beyond the 23 foot 9-inch arc. FTPCT17 signifies the percentage of completed shots at the free throw line following fouls. These four variables summarize team offensive output and are expected to be positively correlated with victories.

Table 1. *Variables and Units*

Variable Names	Description	Data Source
GP	Games Played	http://www.espn.com/
WINS17	Games won by the team, a total of 82 games played	http://www.espn.com/
L17	Games lost by the team, a total of 82 games played	http://www.espn.com/
PTS17	Season average of points scored by team per game	http://www.espn.com/
FGPCT17	Season average of successful field goal percentage, any points scored within the 3-point arc, not including free throws	http://www.espn.com/
PT3PCT17	Season average percentage of successful 3-point attempts, any shot beyond the 3-point arch	http://www.espn.com/
FTPCT17	Season average percentage of successful free throws made at the free throw line	http://www.espn.com/
OREB17	Season average of rebounds on offensive side per game	http://www.espn.com/
DREB17	Season average of rebounds on defensive side per game	http://www.espn.com/
REB17	Season average of total rebounds per game	http://www.espn.com/
AST17	Season average of total assist per game	http://www.espn.com/
TOV17	Season average of turnovers per game	http://www.espn.com/
STL17	Season average of steals per game	http://www.espn.com/
BLK17	Season average of blocks per game	http://www.espn.com/
COACH17	The salary for the head coach during the 2016-17 season in dollars	http://www.basketballinsiders.com/
COACHEXP17	The total number of years as a head coach	http:/www.basketball-reference.com/
TOTFINE17	The total of all player fines per team in dollars	http://www.espn.com/
AGE17	The average age of players per team in years	http://www.basketballinsiders.com/
AGE17SQ	The average age of players per team in years squared	Author Calculations
EXP17	The average number of years the players on the team have played in the NBA	http://www.basketballinsiders.com/
PYRL17	Total payroll paid out to all players per team in the 2016-2017 season in dollars	http://www.basketballinsiders.com/
PSD17	The standard deviation of the payroll for each team in dollars	Author Calculations

Many coaches state offense wins games, but defense wins championships. Defensive variables included in the sample are DREB17, STL17, and BLK17, which are also expected to be positively correlated with victories. DREB17 is the average number of times per game a defense successfully gains possession of the ball following an opposing team missed shot. STL17 is the times per game a defense takes the ball away from the opposing team. BLK17 is the average number of times a defense obstructs the ball from going into the hoop. Although, BlK17 does not insure taking possession of the ball, it generally helps reduces scoring by the opposing team.

A statistic many coaches monitor is the assist-to-turnover ratio. In this study, assists and turnovers are both included in the sample. Assists, AST17, is the number of times per game that a pass from one teammate to another results in a basket. Turnovers, TOV17, indicate the number of times per game that the ball is given to the other team via a foul or violation before a shot is taken.

COACH17, the head coach salary, is hypothesized to be positively correlated with WINS17. COACHEXP17, number of years as a head coach, as the related series. T0TFINE17 are total fines is assessed to each team during the season. The highest 2016-17 fine is $3,282,364, assessed against New York Knicks Joakim Noah for violating the league drug policy. TOTFINE17 is expected to be inversely correlated with WINS17 because fines frequently include loss of playing time and likely impair team effectiveness. AGE17 and EXP17 are used to measure team intangibles such as greater insight and maturity that experienced and older players are expected to provide. To allow for negative returns, AGE17SQ is the average age of each team raised to the second power. An inverse correlation between WINS17 and the standard deviation of the team payrolls, PSD17, is hypothesized (Katayama and Nuch, 2011).

Because of the wide variety in rosters across the thirty teams in the NBA, a test for heteroscedasticity is necessary. The White (1980) test is used for this purpose. If the null hypothesis of homoscedasticity is rejected, the standard errors of the parameter estimates have to be re-calculated.

Table 2 reports summary statistics for all of the data included in the sample. There may be more competitive balance in the NBA than is commonly assumed. Coefficients of variation, not shown in Table 2 to avoid redundancy, are calculated as the ratios of the standard deviation to the mean for each of the variables included in the sample. Of the 19 variables listed in Table 2, 11 of them have coefficients of variation that are less than 0.100. That implies that the data are tightly clustered about the respective means for these variables. In turn, that means that there are relatively little comparative differences among the teams for these variables.

The standard deviation for WINS17 is 11.88. The maximum number of wins is 67 by the Golden State Warriors. The smallest number of victories is 20 by the Brooklyn Nets. Skewness for WINS17 is 0.252, which is slightly asymmetric and right-skewed. Kurtosis, or the fourth moment, for WINS17 is 2.58, which indicates the data are somewhat platykurtic relative to a normal distribution, and the coefficient of variation is 0.273.

Table 2. *Summary Statistics*

Variable	Mean	Std. Deviation	Maximum	Minimum	Skewness	Kurtosis
WINS17	41.0	11.2	67	20	0.252	2.580
PTS17	105.6	4.1	115	97.9	0.773	3.462
FGPCT17	45.7	1.4	49.5	43.5	0.610	3.095
PT3PCT17	35.7	1.8	39.1	32.7	-0.015	1.949
FTPCT17	77.2	2.8	81.5	70.6	-0.560	2.552
OREB17	10.1	1.2	12.2	7.9	0.197	1.899
DREB17	33.4	1.2	35.1	30.7	-0.474	2.553
REB17	43.5	1.7	46.6	38.6	-0.572	4.041
ASTAV17	22.6	2.2	30.4	18.5	1.323	6.309
TOV17	14.0	1.3	16.7	12.0	0.252	2.737
STL17	7.7	0.7	9.6	6.6	0.490	3.452
BLK17	4.7	0.7	6.8	3.7	0.776	3.611
COACH17	$4,833,017	$2,486,781	$11,000,000	$2,000,000	0.931	3.219
TOTFINE17	$234,177	$591,875	$3,282,364	$12,000	5.049	25.117
AGE17	26.5	1.3	29.90	24.6	1.128	3.461
AGE17SQ	705.2	73.4	894.0	605.2	1.166	3.652
EXP17	4.7	1.4	8.50	2.1	1.235	4.266
PYRL17	$98,443,474	$11,226,639	$127,254,579	$80,598,193	0.383	2.802
PSD17	$6,017,705	$1,376,395	$8,883,651	$3,385,426	-0.227	2.330

The mean points scored in a game is 105.6. The standard deviation is 4.1. PTS17 ranges from a maximum of 115.9 for the Golden State Warriors to a minimum of 97.9 for the Dallas Mavericks. The distribution of PTS17 is right-tailed with a skewness of 0.773, and slightly leptokurtic with a kurtosis of 3.462. The coefficient of variation for PTS17 is 0.039.

The average field goal percentage is 45.7, with a standard deviation of 1.37, yielding a coefficient of variation is 0.03. The FGPCT17 maximum is 49.5 by the Golden State Warriors, while the minimum is 43.5 by the Memphis Grizzles. FGPT17 has a third moment of 0.610, indicating that this variable is skewed to the right. FGPCT17 is essentially mesokurtic with a fourth moment value of 3.095.

The mean for the percentage of successful three-point shots is 35.7 with a standard deviation of 1.8. Observations for PT3PCT17 range from a maximum of 39.1 by the San Antonio Spurs to a minimum of 32.7 by the Oklahoma Thunder. The skewness is -0.015, reflective of a largely symmetric distribution. The three-point percentage data have thick tails with a kurtosis is 1.95. In spite of that, the coefficient of variation value of 0.050 is not overly large.

The average free throw percentage for the season, FTPCT17, is 77.2 with a standard deviation of 2.8. The most accurate team on the free throw line is the Charlotte Hornets with a maximum of 81.5 percent. The least accurate team on the free throw line is the Miami Heat with a minimum of 70.6 percent. FTPCT17 is left skewed with a skewness of -0.560 and slightly platykurtic with a kurtosis of 2.552. Although the fourth moment is less than 3.0, the coefficient of variation is only 0.036.

The average for offensive rebounds per game is 10.1 in Table 2. The standard deviation for OREB17 is 1.2, with a maximum of 12.2 posted by the Chicago Bulls and minimum of 7.9 recorded by the Dallas Mavericks. The skewness coefficient is 0.197, indicating that OREB17 is somewhat right-tailed. The kurtosis coefficient is 1.899, implying thick tails, and the coefficient of variation is found to be 0.122.

Defensive rebounds, DREB17, has a mean of 33.4 and a standard deviation of 1.2. Two teams, the Brooklyn Nets and the New Orleans Pelicans, charted the maximum season average of 35.1, while Dallas posted the league minimum tally of 30.7. The skewness for DREB17 is -0.474, indicating that it tails off to the left. DREB17 is slightly platykurtic with a fourth moment of 2.553. The coefficient of variation is 0.035.

Total rebounds, REB17, has a mean of 43.5 and a standard deviation 1.7. The maximum season average is 46.6 by the Oklahoma Thunder, and the minimum season average is 38.6 by Dallas. The skewness is -0.572, indicating that REB17 data are asymmetric and skew to the left. With a kurtosis value of 4.041, the data for REB17 are leptokurtic with thin tails relative to the Normal distribution. Given the latter, it is not surprising that the coefficient of variation for REB17 is 0.039.

Teams average 22.6 assists per game with a standard deviation of 2.2 in Table 2. The Golden State Warriors recorded the maximum season average of 30.4. The Toronto Raptors generated the minimum season average at 18.5. AST17 skews to the right and has a third moment of 1.323. These data are

highly leptokurtic with a fourth moment estimate of 6.309. The coefficient of variation for AST17 is 0.098.

The mean for turnovers is 14.0 with a standard deviation of 1.3. The maximum value for TOV17 is 16.7 by the Philadelphia 76ers, while the 2016-17 season minimum is 12.0 by the Charlotte Hornets. The skewness for TOV17 is 0.252. With a kurtosis of 2.737, TOV17 has somewhat thick tails, but the coefficient of variation is still only 0.091.

The mean for steals per game is 7.7 with a standard deviation of 0.7 and a coefficient of variation of 0.085. Golden State achieved the STL17 maximum of 9.6, while the Cleveland Cavaliers ranked at the bottom of the NBA with only 6.6 steals per game. The skewness for STL17is 0.490 and the kurtosis is 3.452.

The season average for blocked shots is 4.7 per game with a standard deviation of 0.7, yielding a coefficient of variation of 0.150. The maximum for BLK17 is 6.8 by Golden State. Dallas trailed the entire league with an average of 3.7 shot blocks per game. The third moment for BLK17 is 0.776 and the fourth moment is 3.611, indicating some asymmetry, but a relatively tight distribution about the mean for this variable.

The average 2016-17 salary for a coach in the NBA is $4,833,017 with a standard deviation of $2,486,781. The maximum salary is $11,000,000, paid to Gregg Popovich of the San Antonio Spurs. The minimum is $2,000,000, paid to Mike Budenhoizer of the Atlanta Hawks, Steve Clifford of the Charlotte Hornets, Michael Malone of the Denver Nuggets, and to Brett Brown of the Philadelphia 76ers. The skewness statistic is 0.931, indicating that these data, slightly, tail to the right. The kurtosis for COACH17 is 3.219, while the coefficient of variation is 0.515.

The 2016-17 average fines per team is $234,177 with a standard deviation of $591,875. Such wide dispersion among these data causes the coefficient of variation to exceed 2.5, easily the largest value for this statistic among any of the variables listed in Table 2. The maximum for TOTFINE17 is the $3,282,364 assessed against the New York Knicks. At the other end of this spectrum is the minimum, and minimal, $12,000 total paid by the apparently well-disciplined San Antonio Spurs. Because these data are strongly right-skewed, the third moment is 5.049. The fourth moment of TOTFINE17 is 25.117, indicating that these data are exceptionally leptokurtic, but with a very high coefficient of variation as already noted.

The mean for AGE17 is 26.5 years with a compact second moment of only 1.3. The Cleveland Cavaliers hold the 2016-17 maximum average age at 29.9. The Portland Trail Blazers have the minimum average age of 24.6 in Table 2. The skewness for AGE17 is 1.128 indicating the distribution is positively skewed, with a fourth moment of 3.461 indicating the data are slightly leptokurtic, and a coefficient of variation of 0.051. To allow for diminishing and, eventually, negative returns to age, AGE17SQ is also included in the sample.

The mean for years spent in the NBA, EXP17, is 4.7 with a standard deviation of 1.4. Given the collective age of the roster for the Cleveland Cavaliers, it is no surprise that maximum value of 8.5 years is associated with that team. Not

surprisingly, the minimum amount of league experience is posted by Portland. The third moment for EXP17 is 1.235, which indicates that the distribution skews to the right. The kurtosis is 4.266, indicating that these data are leptokurtic.

The first moment for PYRL17 is $98,443,474 with a standard deviation of $11,226,639. The team with the highest payroll of $127,254,579 is the Golden State Warriors, the champions of the 2016-2017 season. While Utah has the lowest payroll of $80,598,193 in Table 2, the Jazz did not finish in last place for the season. The skewness coefficient is 0.383, and the kurtosis is 2.802, indicating that the PRYL17 data basically follow a normal distribution.

The mean for team payroll standard deviation in Table 2 is $6,017,705 with a standard deviation of $1,376,395. Cleveland, the 2016-17 home of Lebron James, has the maximum PSD17 at $8,883,652. Philadelphia has the minimum of $3,385,426. The skewness is -0.277, indicating substantial symmetry for PSD17 observations. The fourth moment is 2.330, indicating somewhat platykurtic thick tails. Somewhat reflective of the latter statistic, the coefficient of variation is 0.229.

The specification shown in Equation (1) is used to model wins during the NBA 2016-17 regular season:

$$\begin{aligned} LnWINS17 = {} & \beta_0 + \beta_1 \text{LnPTS17} + \beta_2 \text{LnFGPCT17} + \beta_3 \text{LnPT3PCT17} + \beta_4 \text{LnFTPCT} \\ & + \beta_5 \text{LnOREB17} + \beta_6 \text{LnDREB17} + \beta_7 \text{LnREB17} + \beta_8 \text{LnASTAV17} \\ & + \beta_9 \text{LnTOV17} + \beta_{10} \text{LnSTL17} + \beta_{11} \text{LnBLK17} + \beta_{12} \text{LnCOACH17} \\ & + \beta_{13} \text{LnTOTFINE17} + \beta_{14} \text{LnAGE17} + \beta_{15} \text{LnEXP17} + \beta_{16} \text{LnPYRL17} \\ & + \beta_{17} \text{LnPSD17} + \varepsilon_t \end{aligned} \tag{1}$$

Equation (1) specifies WINS17 as a function of all of the variables from Table 1 and a stochastic error term. The hypothesized parameter signs for most of the parameters are positive. The exceptions are the coefficients for TOV17, TOTFINE17, and PSD17 which are expected to be negative.

Empirical Analysis

The Indiana Pacers do not publish coaching salaries. Regression analysis and in-sample simulation are used to estimate the missing data point for that variable (Friedman, 1962). The number of years of NBA plus college head coaching experience is used as the explanatory variable in Equation (2). Estimation results for Equation (2) are summarized in Table 3. Inputting the head 12 years of coaching experience for Nate McMillan yields $5,426,275 as the 2016-17 salary estimate for the Indiana Pacers.

$$\text{COACH17} = \beta_0 + \beta_1 \text{COACHEXP17} + \varepsilon_t \tag{2}$$

Table 3. *Head Coach Salary Regression Results*

Variable	Coefficient	t-Statistic	Probability
Constant	2,938,879	4.716	0.001
COACHEXP17	207,283	3.827	0.001
R-squared	0.352	**Mean Dep. Var.**	4,833,017
Adjusted R-Sq.	0.328	**S.D. Dep Var.**	2,486,781
Std. Err. Reg.	2,038,988	**Akaike Info Crit.**	31.960
Sum. Sq. Resid	1.12E+14	**Schwart Info Crit.**	32.055
Log-likelihood	-461.424	**Hannan-Quinn Crit.**	31.990
F-statistic	14.649	**Prob(F-statistic)**	0.001

Table 4. *Heteroscedasticity Corrected Regression Results Summary for Regular Season Wins*

Variable	Coefficient	t-Statistic	Probability
C	18.281	0.998	0.338
LNPTS17	-0.658	-0.437	0.670
LNFGPCT17	3.223	1.188	0.258
LNPT3PCT17	2.051	1.475	0.166
LNFTPCT17	-0.096	-0.087	0.932
LNOREB17	11.890	1.659	0.123
LNDREB17	40.956	1.744	0.107
LNASTAV17	0.107	0.218	0.831
LNTOV17	-0.826	-1.368	0.196
LNSTL17	0.777	1.576	0.141
LNBLK17	-0.232	-0.856	0.409
LNCOACH17	-0.022	-0.306	0.765
LNTOTFINE17	-0.019	-0.572	0.578
LNAGE17	0.237	0.152	0.881
LNEXP17	-0.173	-0.578	0.574
LNPYRL17	-1.307	-2.777	0.017
LNPSD17	0.936	2.945	0.012
R-squared	0.891	**Mean Dep. Var.**	3.676
Adjusted R-Sq.	0.736	**S.D. Dep Var.**	0.285
Std. Err. Reg.	0.147	**Sum. Sq. Resid.**	0.258
F-statistic	5.748	**Prob. (F-statistic)**	0.002
Log-likelihood	28.779		

$$LnWINS17 = \beta_0 + \beta_1 Ln\text{FGPCT17} + \beta_2 Ln\text{FTPCT17} + \beta_3 Ln\text{OREB17} + \beta_4 Ln\text{DREB17} + \beta_5 Ln\text{TOV17} + \beta_6 Ln\text{COACH17} + \beta_7 Ln\text{PYRL17} + \beta_8 Ln\text{PSD17} + \varepsilon_t \quad (3)$$

Estimation results for Equation (1) are reported in Table 4. This initial equation includes sixteen explanatory variables. Very few of the computed t-statistics in Table 4 satisfy the 5-percent significance criterion and several coefficients exhibit illogical arithmetic signs. Part of the reason for the parametric insignificance is the small number of sample observations. Multicollinearity may also be present in the sample. The White (1980) test rejects the null hypothesis of homoscedasticity. Some of the parameter signs also run counter to what is hypothesized above.

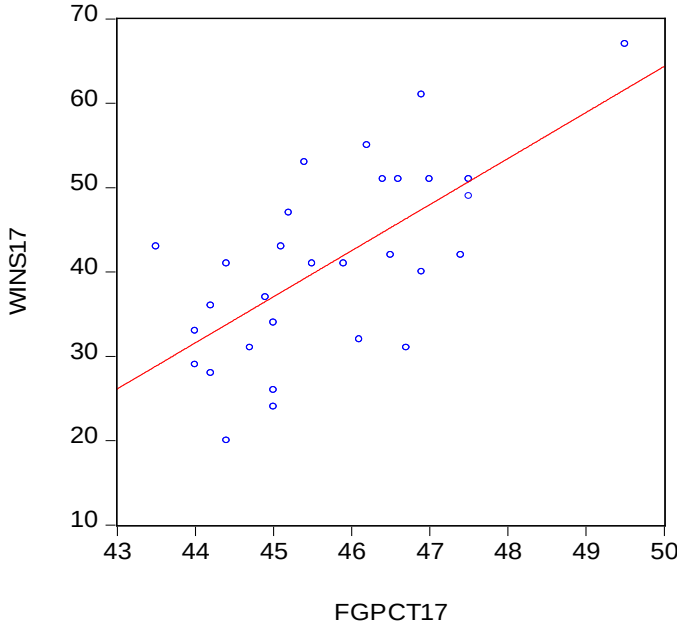
Given the outcomes shown in Table 4, an alternative specification with fewer explanatory variables is employed, next. Estimation results for Equation (3) are summarized in Table 5. Eight regressors are included in this second specification. Three of the eight coefficients have computed t-statistics that satisfy the 5-percent significance criterion. Similar to the results of Peach et. al. (2016) and Fullerton and Peach (2016), the signs for most of the parameter estimates are as hypothesized. To correct for heteroscedasticity, the White (1980) method is employed.

The parameter for field goal percentage is positive with a 5.812 magnitude that satisfies the 5-percent significance criterion. A one-unit increase in FGPCT17 will lead to a 5.8 percent increase in regular season victories. Because wins are determined by scoring the most points, this result is expected. As shown in Figure 1, victories are positively correlated with field goal percentage and that correlation is easily discernible.

Table 5. *Alternative Specification Results Summary for Regular Season Wins*

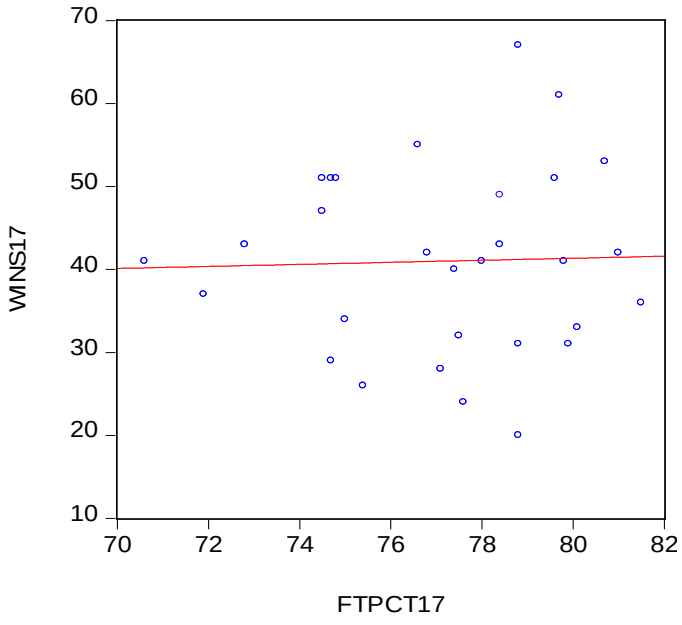
Variable	Coefficient	t-Statistic	Probability
C	-10.817	-1.205	0.242
LNFGPCT17	5.812	5.377	0.000
LNFTPCT17	0.099	0.127	0.900
LNOREB17	-0.191	-0.650	0.523
LNDREB17	0.305	0.296	0.770
LNTOV17	-0.524	-1.106	0.281
LNCOACH17	-0.076	-0.869	0.395
LNPYRL17	-1.197	-2.599	0.016
LNPSD17	1.013	4.612	0.000
R-squared	0.761	**Mean Dep. Var.**	3.676
Adjusted R-Sq.	0.670	**S.D. Dep Var.**	0.285
Std. Err. Reg.	0.164	**Sum. Sq. Resid.**	0.563
F-statistic	8.369	**Prob. (F-statistic)**	0.000
Log-likelihood	17.068		

Figure 1. *2016-17 NBA Regular Season Wins vs. Field Goal Percentage per Game*



The free throw percentage coefficient is positive, but does not satisfy the 5-percent significance criterion. Somewhat surprisingly, the parameter estimate indicates that this variable has a low impact on wins. However, free throws usually account for a small percentage of total points. As shown in Figure 2, wins and FTPCT17 appear weakly correlated at best. Both of the signs for the parameter estimates of natural log of field goal percentage and natural log of free throw percentage align with those of the McGoldrick and Voeks (2005) study.

Figure 2. *2016-17 NBA Regular Season Wins vs. Average Free Throw Percentage per Game*



The coefficient for offensive rebounding does not surpass the 5-percent significance threshold. The negative sign for this coefficient is counterintuitive. This may be because the data for this variable are grouped together very tightly and do not allow any teams to gain very much of an advantage over the others. As shown in Figure 3, regular season wins are negatively correlated with OREB17, but the relationship is not very strong. An alternative possibility is that offensive rebounds result from missed shots. Consequently, greater numbers of offensive rebounds reflect shooting futility and will, logically, be associated with fewer victories. However, that is not the null hypothesis stated above and additional research is required to further examine that possibility.

Figure 3. *2016-17 NBA Wins vs. Average Offensive Rebounds per Game*

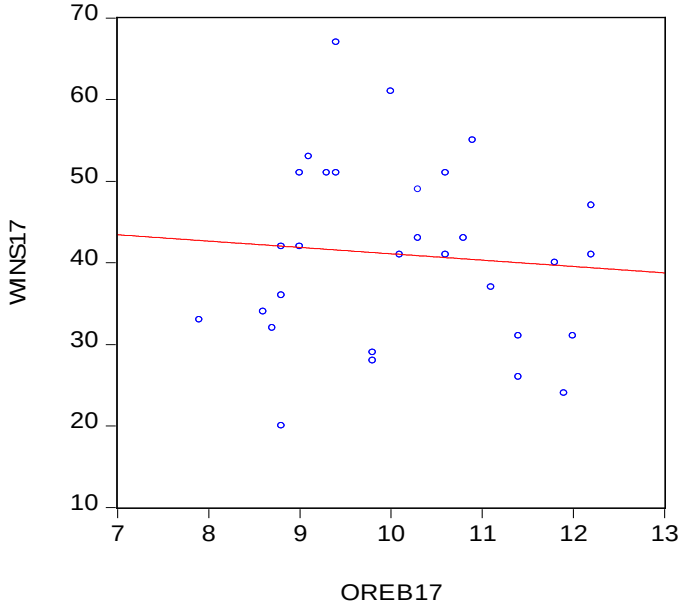
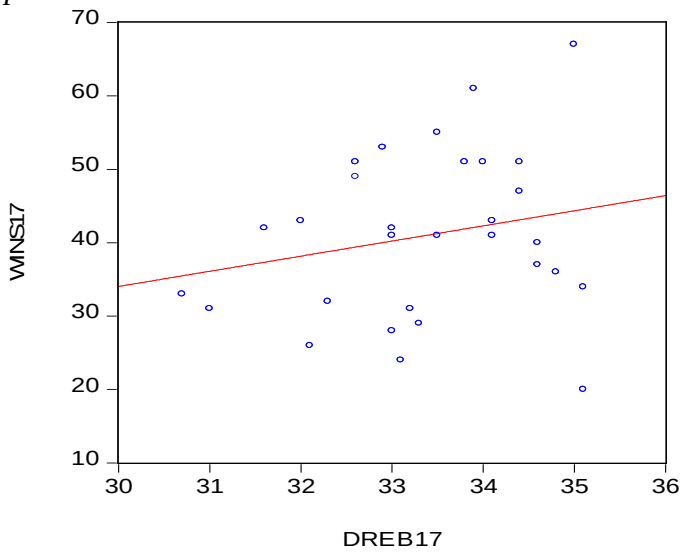


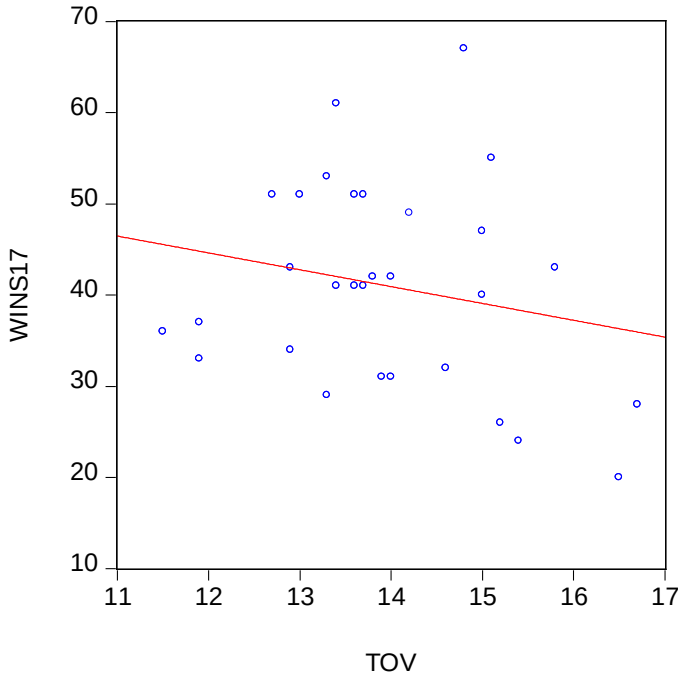
Figure 4. *2016-2017 NBA Regular Season Wins vs. Average Defensive Rebounds per Game*



The defensive rebounding parameter is positive with a magnitude of 0.305, but does not satisfy the standard significance criterion. The insignificance is surprising, as defensive rebounds remove possession from the opposing team and reduce opportunities to attempt shots. As shown in Figure 4, victories are positively correlated with DREB17. Estimates of the marginal effects associated with Equation (3) appear in Table 6. The marginal effect for the variable defensive rebounding is 0.374. Eleven additional defensive rebounds per game increase total wins by four.

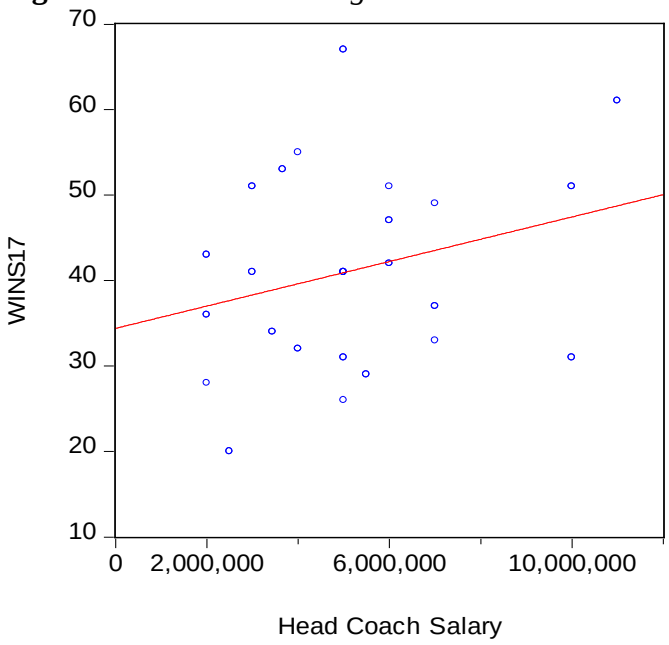
The estimated parameter for turnovers is negative with a magnitude of -0.524. That suggests that a ten percent increase in turnovers will result in a 5.2 percent decrease in wins. Even though it does not meet the 5-percent significance criterion, the TOV17 coefficient is negative as hypothesized. Reducing turnovers allows a team more opportunities to score. It is fairly easy to see in Figure 5 that victories are negatively correlated with turnovers.

Figure 5. *2016-17 NBA Regular Season Wins vs. Average Turnovers per Game*



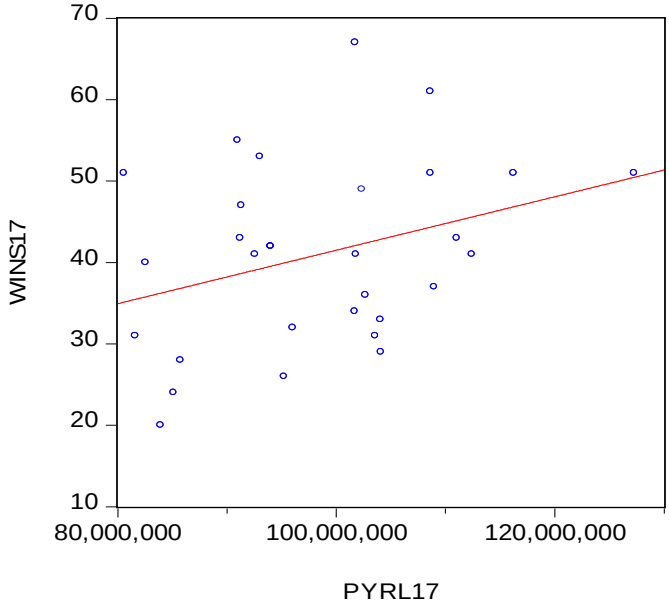
The coefficient for coach salaries does not satisfy the standard significance criterion. The parameter is very close to zero and suggests that victories are not affected by coaching compensation. The implication is that spending more on head coaches will not generate additional wins. As shown in Figure 6, wins do appear to be positively correlated with COACH17, but with a fairly large degree of variability.

Figure 6. *2016-17 NBA Regular Season Wins vs. Coaching Salaries*



The parameter estimate for the natural log of payroll is statistically significant, but is inversely correlated with regular season wins. That runs counter to what is hypothesized. According to the result shown in Table 5, a one percent increase in payroll will reduce wins by 1.1 percent. However, the marginal effect reported in Table 6 is 0.0. Further shrouding this issue in mystery, a casual perusal of Figure 7 suggests that victories are positively correlated with PYRL17. Collectively, the evidence disparities indicate that that human capital analysis in the NBA is less straightforward than what has been reported for other spectator sports such as MLB (Fullerton and Peach, 2017) or the NFL (Fullerton et al., 2017).

Figure 7. *2016-17 NBA Regular Season Wins vs. Team Payrolls*



The natural log of the standard deviation of the payroll for each team is included in the sample to allow for personnel infighting and discord that may result from paying a large portion of the salary cap to a small group of players. The estimated slope coefficient for this regressor in Table 5 is statistically significant and positive. That is opposite of what Katayama and Nuch (2011) suggest. The result for 2016-17 suggests that it is better to pay a small number of highly effective players most of the team salary cap. As can be discerned in Figure 8, victories seem to be positively correlated with PSD17.

Figure 8. *2016-17 NBA Regular Season Wins vs. Team Payroll Standard Deviations*

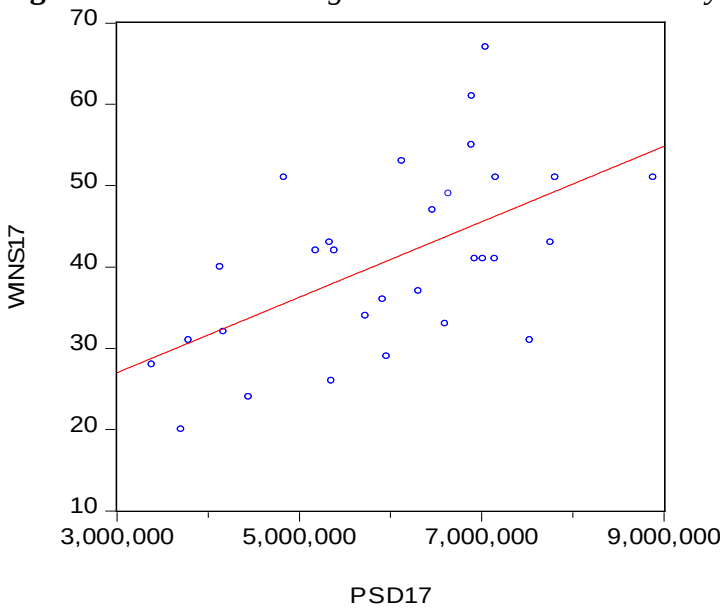


Table 6. *Independent Variable Marginal Effects Table*

Independent Variable Marginal Effects			
Variable	**Coefficient**	**Mean**	**Marginal Effect**
WINS17	N/A	41.0	N/A
FGPCT17	5.812	45.7	5.214
FTPCT17	0.099	77.2	0.053
OREB17	-0.191	10.1	-0.775
DREB17	0.305	33.4	0.374
TOV17	-0.524	14.0	-1.535
COACH17	-0.076	$4,833,017	0.000
PYRL17	-1.197	$98,443,474	0.000
PSD17	1.013	$6,017,705	0.000

Note: Marginal effects are calculated as $\frac{dWINS17}{dx} = \hat{\beta}_x * \frac{\overline{WINS17}}{\bar{x}}$ for each explanatory variable included in Table 5.

The vast majority of the parameter estimate signs for Equation (3) do not match what is hypothesized above. These outcomes are distinct from the patterns found for MLB (Fullerton and Peach, 2017) or the NFL (Fullerton et al., 2017). One factor behind this departure from the other major professional spectator sports

in the United States may be over-valued contracts. During the 2016 off-season teams spent record amounts on post players. The following player salaries total more than $365 million, which is approximately 4 times the $94 million salary cap allotted to each team: Los Angeles Laker, Timofey Mozgov; New York Knicks, Joakim Noah; Washington Wizards, Ian Mahimi; Portland Trailblazers, Meyers Leonard; Orlando Magic, Bismack Biyomobo and Charlotte Hornets, Miles Plumlee. These players are all post players whose primary job is to rebound. Those players tend to have low field goal shooting percentages.

It may not be feasible to successfully model NBA regular seasons in a manner similar to MLB or the NFL. The numbers of players on the field in those sports mandates more teamwork among players. (Katayama and Nuch, 2011). In the NBA, one player can change the outcome of the game. For example, the Reggie Miller eight points in nine seconds closed out a game for a playoff victory. During the nine second stretch, Miller, with little help from his teammates, was responsible for a steal, defensive rebound, two successful three-point shots, and two successful free throws (Callahan, 1995). Actions of this magnitude would be difficult to duplicate in either the MLB or the NFL.

Conclusion

This study examines the on-court performance of the thirty NBA teams during the 2016-17 NBA basketball season. To date, there have been relatively few studies that use regular season cross sectional data to examine team performances. In contrast to recent studies for the NFL and MLB, the empirical results for this effort are largely inconclusive. One key departure is the parameter sign for the human capital payroll variable, which is both negative and statistically significant

The results suggest that players with high field goal percentages will, as hypothesized, help teams win. Other on court performance variables are not found to be reliably linked to team successes. While contrary to what is hypothesized for it, the outcome for payroll dispersion suggests that NBA teams should consider larger salary gaps and allow for one-to-three players to command the better parts of team payrolls.

Because of the small number of observations, there is an obvious pathway for further inquiry. Although coaching salaries for the NBA are not all published, coaching salaries for the NCAA are public record. Inclusion of all coaches on staff across all teams may generate additional insights. Replication of this study employing all 437 NCAA teams may also combat against multicollinearity. There is likely a positive correlation between coaching salaries and wins in the NCAA. Support for the other hypotheses discussed above may also prove less elusive in a study of the NCAA regular season wins.

Acknowledgements

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Data Appendix

Table 1.

Team	GP	WINS17	PTS17	FGPCT17	PT3PCT17	FTPCT17
Atlanta Hawks	82	43	103.2	45.1	34.1	72.8
Boston Celtics	82	53	108	45.4	35.9	80.7
Brooklyn Nets	82	20	105.8	44.4	33.8	78.8
Charlotte Hornets	82	36	104.9	44.2	35.1	81.5
Chicago Bulls	82	41	102.9	44.4	34	79.8
Cleveland Cavaliers	82	51	110.3	47	38.4	74.8
Dallas Mavericks	82	33	97.9	44	35.5	80.1
Denver Nuggets	82	40	111.7	46.9	36.8	77.4
Detroit Pistons	82	37	101.3	44.9	33	71.9
Golden State Warriors	82	67	115.9	49.5	38.3	78.8
Houston Rockets	82	55	115.3	46.2	35.7	76.6
Indiana Pacers	82	42	105.1	46.5	37.6	81
LA Clippers	82	51	108.7	47.5	37.5	74.5
Los Angeles Lakers	82	26	104.6	45	34.6	75.4
Memphis Grizzlies	82	43	100.5	43.5	35.4	78.4
Miami Heat	82	41	103.2	45.5	36.5	70.6
Milwaukee Bucks	82	42	103.6	47.4	37	76.8
Minnesota Timberwolves	82	31	105.6	46.7	34.9	79.9
New Orleans Pelicans	82	34	104.3	45	35	75
New York Knicks	82	31	104.3	44.7	34.8	78.8
Oklahoma City Thunder	82	47	106.6	45.2	32.7	74.5
Orlando Magic	82	29	101.1	44	32.8	74.7
Philadelphia 76ers	82	28	102.4	44.2	34	77.1
Phoenix Suns	82	24	107.7	45	33.2	77.6
Portland Trail Blazers	82	41	107.9	45.9	37.5	78
Sacramento Kings	82	32	102.8	46.1	37.6	77.5
San Antonio Spurs	82	61	105.3	46.9	39.1	79.7
Toronto Raptors	82	51	106.9	46.4	36.3	79.6
Utah Jazz	82	51	100.7	46.6	37.2	74.7
Washington Wizards	82	49	109.2	47.5	37.2	78.4

Notes:
Only variables with the 17 suffix are used in the empirical analysis.
GP stands for regular season games played.
WINS17 is the number of 2016-17 regular season games won by each team.
PTS17 is the 2016-17 regular season points per game average for each team.
FGPCT17 is the 2016-17 regular season shooting percentage within the 3-point arc by each team, not including free throws.
PT3PCT17 is the 2016-17 regular season shooting percentage from beyond the 3-point arc for each team.
FTPCT17 is the 2016-17 regular season free throw percentage for each team.

Table 2.

Team	OREB17	DREB17	ASTAV17	TOV17	STL17	BLK17
Atlanta Hawks	10.3	34.1	23.6	15.8	8.2	4.8
Boston Celtics	9.1	32.9	25.2	13.3	7.5	4.1
Brooklyn Nets	8.8	35.1	21.4	16.5	7.2	4.7
Charlotte Hornets	8.8	34.8	23.1	11.5	7	4.8
Chicago Bulls	12.2	34.1	22.6	13.6	7.8	4.8
Cleveland Cavaliers	9.3	34.4	22.7	13.7	6.6	4
Dallas Mavericks	7.9	30.7	20.8	11.9	7.5	3.7
Denver Nuggets	11.8	34.6	25.3	15	6.9	3.9
Detroit Pistons	11.1	34.6	21.1	11.9	7	3.8
Golden State Warriors	9.4	35	30.4	14.8	9.6	6.8
Houston Rockets	10.9	33.5	25.2	15.1	8.2	4.3
Indiana Pacers	9	33	22.5	13.8	8.2	5
LA Clippers	9.0	34.0	22.5	13	7.5	4.2
Los Angeles Lakers	11.4	32.1	20.9	15.2	8.2	3.9
Memphis Grizzlies	10.8	32.0	21.3	12.9	8	4.2
Miami Heat	10.6	33.0	21.2	13.4	7.2	5.7
Milwaukee Bucks	8.8	31.6	24.2	14	8.1	5.3
Minnesota Timberwolves	11.4	31.0	23.7	14	8	4.5
New Orleans Pelicans	8.6	35.1	22.8	12.9	7.8	5.5
New York Knicks	12.0	33.2	21.8	13.9	7.1	5.5
Oklahoma City Thunder	12.2	34.4	21.0	15	7.9	5
Orlando Magic	9.8	33.3	22.2	13.3	7.1	4.8
Philadelphia 76ers	9.8	33.0	23.8	16.7	8.4	5.1
Phoenix Suns	11.9	33.1	19.6	15.4	8.2	4.9
Portland Trail Blazers	10.1	33.5	21.1	13.7	7	5
Sacramento Kings	8.7	32.3	22.5	14.6	7.6	4
San Antonio Spurs	10.0	33.9	23.8	13.4	8	5.9
Toronto Raptors	10.6	32.6	18.5	12.7	8.3	4.9
Utah Jazz	9.4	33.8	20.1	13.6	6.7	5
Washington Wizards	10.3	32.6	23.9	14.2	8.5	4.1

Notes:
OREB17 is the 2016-17 regular season offensive rebounds per game average for each team.
DREB17 is the 2016-17 regular season defensive rebounds per game average for each team.
ASTAV17 is the 2016-17 regular season total assists per game average for each team.
TOV17 is the 2016-17 regular season turnovers per game average for each team.
STL17 is the 2016-17 regular season steals per game average for each team.
BLK17 is the 2016-17 regular season blocked shots per game average for each team.

Table 3.

Team	COACH17	TOTFINE17	AGE17	EXP17	PYRL17
Atlanta Hawks	$2,000,000	$186,849	28.4	6.2	$91,216,857
Boston Celtics	$3,670,000	$124,000	25.5	4.2	$93,035,160
Brooklyn Nets	$2,500,000	$27,000	25.8	3.5	$83,943,358
Charlotte Hornets	$2,000,000	$31,000	26.1	4.4	$102,675,926
Chicago Bulls	$5,000,000	$217,175	26.1	3.9	$92,571,387
Cleveland Cavaliers	$3,000,000	$50,000	29.9	8.5	$127,254,579
Dallas Mavericks	$7,000,000	$79,000	27.2	4.1	$104,042,028
Denver Nuggets	$2,000,000	$36,000	26.3	4.9	$82,573,997
Detroit Pistons	$7,000,000	$89,899	25.6	3.7	$108,967,919
Golden State Warriors	$5,000,000	$114,000	28.2	6.7	$101,725,589
Houston Rockets	$4,000,000	$76,000	26.2	4.7	$90,996,769
Indiana Pacers	$5,426,275	$88,000	26.9	5.7	$94,008,504
LA Clippers	$10,000,000	$109,000	29.7	8.3	$116,237,542
Los Angeles Lakers	$5,000,000	$120,000	25.8	4.4	$95,226,183
Memphis Grizzlies	$2,550,000	$45,000	27.5	5.5	$111,045,893
Miami Heat	$3,000,000	$101,000	27.3	5.1	$101,818,405
Milwaukee Bucks	$6,000,000	$81,000	25.7	4.3	$94,012,121
Minnesota Timberwolves	$10,000,000	$22,000	25.7	3.6	$81,621,379
New Orleans Pelicans	$3,437,500	$214,238	26.3	4	$101,707,386
New York Knicks	$5,000,000	$3,282,364	27	3.9	$103,595,894
Oklahoma City Thunder	$6,000,000	$289,095	25.8	3.7	$91,339,949
Orlando Magic	$5,500,000	$46,000	25.5	3.8	$104,110,336
Philadelphia 76ers	$2,000,000	$47,000	24.6	2.1	$85,763,788
Phoenix Suns	$2,500,000	$238,851	25.5	4.5	$85,115,778
Portland Trail Blazers	$5,000,000	$44,000	24.6	3.1	$112,416,239
Sacramento Kings	$4,000,000	$730,487	26.1	4.5	$96,043,092
San Antonio Spurs	$11,000,000	$12,000	28.9	6.6	$108,640,621
Toronto Raptors	$6,000,000	$201,364	25.5	3.8	$108,664,969
Utah Jazz	$3,000,000	$57,000	26.3	4.7	$80,598,193
Washington Wizards	$7,000,000	$266,000	25.7	3.8	$102,334,382

Notes:
COACH17 is the 2016-17 regular season head coach salary for each team with an authors estimate provided for the head coach salary of the Indiana Pacers.
TOTFINE17 is the 2016-17 regular season total of all player fines for each team.
AGE17 is the 2016-17 regular season average age of players for each team.
EXP17 is the 2016-17 average number of years the players on each team have in the NBA.
PYRL17 is the 2016-17 total players payroll for each team.

Table 4.

Team	**PSD17**
Atlanta Hawks	$5,334,572
Boston Celtics	$6,129,341
Brooklyn Nets	$3,704,970
Charlotte Hornets	$5,914,903
Chicago Bulls	$7,017,125
Cleveland Cavaliers	$8,883,652
Dallas Mavericks	$6,601,351
Denver Nuggets	$4,131,973
Detroit Pistons	$6,309,190
Golden State Warriors	$7,047,165
Houston Rockets	$6,891,170
Indiana Pacers	$5,181,032
LA Clippers	$7,810,465
Los Angeles Lakers	$5,355,228
Memphis Grizzlies	$7,758,962
Miami Heat	$6,925,492
Milwaukee Bucks	$5,386,981
Minnesota Timberwolves	$3,788,828
New Orleans Pelicans	$5,729,209
New York Knicks	$7,529,957
Oklahoma City Thunder	$6,464,880
Orlando Magic	$5,959,714
Philadelphia 76ers	$3,385,426
Phoenix Suns	$4,445,831
Portland Trail Blazers	$7,144,805
Sacramento Kings	$4,170,870
San Antonio Spurs	$6,893,417
Toronto Raptors	$7,158,464
Utah Jazz	$4,835,127
Washington Wizards	$6,641,051

Notes:
PSD17 is the 2016-17 standard deviation of the player payroll for each team.

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Careers in Participant Sport and Other Free Time Activities during Youth and Young Adulthood in South and East Mediterranean Countries

By Ken Roberts[*]*, Siyka Kovacheva*[±] *& Stanimir Kabaivanov*[‡]

This paper presents evidence from surveys in 2015-16 of nationally representative samples of approximately 2000 15-29 year olds in each of five South and East Mediterranean countries (Algeria, Egypt, Lebanon, Morocco and Tunisia). The analysis examines the interactive effects of age, gender, family class origins (indicated by fathers' education), and whether respondents progressed through higher education and their current labour market positions, on participation rates in sport plus two social and three cultural free time activities. We find that each free time activity had its own profile in terms of the relationships between participation and the predictor variables, and that sport differed from all the other activities in the width of gender differences, the relatively steep decline in participation from age 15-19 to 20-24 then 25-29, and the strong and enduring influence of family class origins. A conclusion is that in South and East Mediterranean countries (and probably elsewhere), although sport participation may be boosted among adolescents by initiatives in school education and community associations, participation rates will then begin to sink back except when individuals have been reared in households with supportive family free time cultures.

Keywords: *Arab, free time, North Africa, South and East Mediterranean, sport, young adults, youth.*

Introduction

Background

There have been campaigns to involve more young people throughout the history of modern sports. Only the rationales have changed: to form noble characters, to teach teamwork and leadership, to foster group identity, to train young men for military service, to nurture internationally competitive athletes, and most recently to address an 'obesity crisis' as part of a shift towards healthier modern lifestyles. Only the latter rationale requires young people to be not only recruited but to be retained in sport, not just throughout youth but for their entire subsequent adult lives.

This recent source of interest in young people's sport careers has coincided with a worldwide lengthening of the youth life stage with upward movements in typical ages of completing full-time education, commencing adult employment,

[*]Emeritus Professor of Sociology, University of Liverpool, UK.
[±]Associate Professor, University of Plovdiv, Bulgaria.
[‡]Associate Professor, University of Plovdiv, Bulgaria.

and parenthood. During this extended life stage, young people experience short careers though upper secondary and subsequent education and training, in youth jobs, in peer group and romantic relationships, sometimes in housing, always in their leisure lives. Nowadays eleven and 12 year olds in most countries must learn how it is appropriate for teenagers to use social media, and when aged 19 and 20 they must learn to replace 'childish' with new age appropriate uses (Waechter and Hollauf, 2018). In Britain youth careers have been identified in time spent 'hanging about' on neighbourhood streets (MacDonald and Shildrick, 2007), and how as they grow older young people must seek out new appropriate places to go and things to do in their free time (Hendry, 1983; Hendry et al, 1993, 2002).

A series of studies have found that uses of free time in adulthood, even in late-adulthood, often feature skills and tastes that were learnt when young (Bennett, 2006, 2013; Bennett and Hodkinson, 2012; Hodkinson, 2002, 2011; Maguire et al, 1987; Scott and Willitts, 1989). However, discovering that those involved when adults and in later life first became involved when much younger is not the same as showing that most young enthusiasts remain loyal to their tastes and activities. Throughout recent decades UK sport participation rates among children and young people have been high and rising (see, for example, Department for Culture, Media and Sport, 2008; Mason, 1995; Sport England, 2003), but this has not fed through into higher rates of adult participation. Nor have occupational upgrading (more non-manual and fewer manual jobs), or increased participation in higher education, both cross-sectionally related positively to sport participation, boosted overall adult participation rates. Nor has the 2012 London Olympics left a mass sport participation legacy.

There is UK evidence that individuals who remain active in several sports throughout their late-teens and into their mid-20s are most likely to remain sport participants throughout young adulthood (Roberts et al, 1991). However, there is also UK evidence that the chances of youth sport careers being extended into later life stages are fixed much earlier, in childhood, in sports-active families (Haycock and Smith, 2016; Parry, 2015; Quarmby and Dagkas, 2010; Smith et al, 2015).The most plausible explanation of the relatively high rates of sport participation at all life stages in Nordic countries lies in the norm of childhood socialisation in sports-active households (Green et al, 2015a; 2015b). There is evidence from the South Caucasus that differences in sport participation rates between socio-demographic groups are fixed by, then remain stable after, age 16 (Birchwood et al, 2008).

The following passages present evidence on how much of this applies in South and East Mediterranean countries which are culturally different, and where modern sports have shallower and briefer historical roots, than in the European and North American societies where most existing evidence has been sourced. Also, we are able to assess whether profiles and predictors of youth careers in sport are also found in other uses of free time in the South and East Mediterranean. In Euro-America we know that certain cultural tastes, specifically in high culture, are unlikely to be acquired after childhood (Hantrais and Kamphorst, 1987; Nagel, 2010). We have evidence from the South and East Mediterranean on youth and young adulthood careers in a much wider range of free time activities than in any previous studies in any part of the world. As well as showing whether the South

and East Mediterranean countries are similar or different to Western societies in their social demographies of sport participation, we can also see whether local social profiles and trends with age in sport participation are found in a wider range of free time activities in the predominantly Arab and Islamic South and East Mediterranean.

The significance for sports policy concerns whether boosting enduring participation needs sports-specific measures, or whether it may be necessary to change more widely rooted features of the age group's lives. We will then better understand why boosting young people's levels of participation in sports, or widening the range of their sporting repertoires alone, may fail to feed through into higher rates of sport participation in young and later adulthood, and why it may be necessary to try something different, and what kind of difference may prove most efficacious.

Evidence

This is from interview surveys in 2015-16 among nationally representative samples of around 2000 15-29 year olds in each of five South and East Mediterranean countries (Algeria, Egypt, Lebanon, Morocco and Tunisia). The fieldwork was supervised by local academic partners and conducted by survey organisations with experience of identifying nationally representative samples in their respective countries. The initial samples were always households, in which all residents aged 15-29 were interviewed. Fieldworkers went out in pairs and the interviews were always conducted by a same-sex interviewer. There was complementary qualitative fieldwork in three contrasting locations in each of the five countries (see Roberts et al, 2018c), but the following analysis uses data solely from the quantitative surveys.

The research was planned in the immediate aftermath of the 'Arab Spring' of 2011 when there was international interest in the conditions, grievances and aspirations of the region's youth, and the interviews covered all aspects of respondents' lives – their childhood families, education, employment and unemployment, profiles of religious and political orientations and activities, plus uses of free time for which respondents were asked about their frequency of participation in 16 different activities. Answers were recorded on a six-point scale with a range from never to every day. Throughout the following analysis we use 'at least once a week' as the cut-off for distinguishing regular participants from others. Respondents were also asked to estimate the time that they spent each day watching television and online. We restrict our analysis to single respondents having shown elsewhere that marriage was associated with a general reduction in out-of-home free time activities by men and women (Roberts et al, 2018a). Thus our comparisons between participation rates in different age groups (15-19, 20-24 and 25-29) are assumed to be age effects, features of normal (in the countries) age-related changes in uses of free time among unmarried youth and young adults, rather than consequences of changes in family circumstances.

Throughout our analysis we divide respondents into age groups and by gender, and also by 'social class' origins, indicated most appropriately for our

purposes by fathers' education. Occupation proves a less precise indicator in countries where around a third of all male employment is self-employment which can mean anything from subsistence farming to a substantial enterprise. Father's education was a good predictor of whether the fathers held (or had held if subsequently retired) 'salariat' (non-manual) positions. It is also likely to be the better indicator of a household's cultural character. Fathers' and mothers' education were positively inter-related, but fathers were the better educated: 10 percent of fathers against six percent of respondents' mothers had been to university. Most mothers had 'housewife' as their sole occupation. As we had expected, fathers' education predicted their children's educational attainments and thereby indirectly, but also directly, their subsequent employment (Kovacheva et al, 2018; Roberts et al, 2018b).

We are not seeking to explain gender, age or social class differences in uses of free time, but to test whether differences between socio-demographic groups formed by age 15-19 remained unchanged throughout the 20-29 age range, and whether by 15-19 participation rates had peaked and rose no higher. We also test whether respondents' post-16 experiences had independent effects on free time uses. For this purpose we group just the 25-29 age group into those with and without higher education qualifications, and also by their labour force positions. Here we treat males and females differently. Fifty-five percent of all the young adult women in the surveys had never entered the labour market and this 'inactive group' are separated from those who were at least seeking jobs. Males are grouped according to the quality of their employment. Those with 'salariat' jobs (with written contracts of indefinite duration), or who were in informal jobs or self-employed with incomes above the lowest quartiles in their countries, are separated from the more numerous respondents who were part of a precariat of lower-paid employees, or were currently unemployed, and others who had become long-term inactive in the labour market (see Roberts et al, 2018b).

In addition to sport participation, we present evidence on five additional uses of free time. Two are social uses. One is going out with friends which, especially for males, was the most common free time activity, where we know that the most revealing differences were in where the friends met and exactly what they did (see Roberts et al, 2018c), but there were also differences in whether the various socio-demographic groups went out with friends to do anything at all in a typical week. The second social use of free time is visiting tea rooms and cafes. Then we present evidence on three cultural activities; attending music concerts and/or festivals, visiting the theatre, and visiting libraries. Here our interest lies in whether participation profiles and trends with age are similar or different from those in sport.

Our evidence is cross-sectional. We are not presenting prospective or retrospective longitudinal data. We cannot say how the uses of free time of the individuals in our surveys changed as they grew older. Our measurements are of the propensity to participate within different socio-demographic groups. These may remain stable while many individuals alter their behaviour in ways that cancel out each other's changes.

Findings

Sport

Table 1a presents the findings from the entire sample of single respondents. The declining Ns in successive age groups, and the lower Ns among females, are due to variations in the proportions of all respondents who were single. In all the directly comparable cells in Table 1a, males have higher sport participation rates than females, and the difference at age 15-19 (21 percent) is very similar to the difference at age 25-29 (18 percent). In all age groups respondents with better-educated fathers had the higher sport participation rates. Among females the social class gap remained stable across the age groups, whereas among males it widened with age from 14 percent to 19 percent. This was due to highly educated fathers tending to have sons whose sport participation proved enduring from late-teens to late-20s. The sport careers of sons with less educated fathers proved more vulnerable as they progressed through youth and into young adulthood. Daughters of highly educated fathers were also different from other females in that 30 percent were participating in sport at age 15-19 and almost as many, 29 percent, at age 25-29. In all the other fathers' education groups, the clear trend with age in sport participation was downward. Males and females with highly educated fathers not only had the highest sport participation rates in all age groups, but were also different in their greater tendency to stick in sport through youth and into young adulthood.

Table 1b shows that 25-29 year olds who were higher education graduates had higher sport participation rates than other members of their age group. This applied among males and females. However, this positive cross-sectional relationship between higher education and sport participation was entirely due to the children of highly educated fathers being over-represented among the young adults who themselves had become higher education graduates. Our evidence does not suggest that higher education was having any independent and consistent effect on levels of sport participation.

The numbers of cases in all the tables that deal only with the 25-29 age group are much smaller than, for example, in Table 1a. This is because the 25-29 year olds were the more likely to be married (not single), then when divided by whether they were higher education graduates (Table 1b) and by their labour market experience or inexperience (Table 1c) as well as by gender and fathers' education, the numbers shrink still further.

Table 1a. *All Respondents: Percentages playing Sport at least once a week*

	Males				**Females**		
	15-19 %	**20-24 %**	**25-29 %**		**15-19 %**	**20-24 %**	**25-29 %**
Father's education: primary or less	32	27	25		11	10	8
Middle or upper secondary	45	46	31		21	21	10
Higher	46	40	44		30	19	29
All	39	35	29		18	15	11
N =	1518	1450	1043		1208	926	628

Table 1b. *25-29 year olds only*

	Males			Females	
	Higher education %	**Other %**		**Higher education %**	**Other %**
Father's education: primary or less	19	24		11	7
Middle or upper secondary	34	26		11	8
Higher	42	45		21	35
All	31	25		13	9
N =	196	642		163	342

Table 1c. *25-29 year olds only Respondent's Occupational Class*

	Males			Females	
	Business or sub-business, salariat or sub-salariat, informals %	**Other (precariat, inactive, detached) %**		**Any class in labour force %**	**Inactive %**
Father's education: primary or less	30	21		26	23
Middle or upper secondary	26	34		26	43
Higher	43	36		42	35
All	29	26		27	29
N =	173	369		287	255

This is of greatest concern with the participation rates of respondents with highly educated fathers (just 10 percent of all respondents in the age group). The participation rates in this sub-population (in Tables 1b and 1c) are calculated from less than 20 cases. Our response is to attach significance only to trends common in all three fathers' education groups, and when one such group is different, to attach significance to this only if the same difference appears in other free time activities, not to any solitary statistic.

Applying this 'rule', we can see in Table 1c that workforce experience did not have any independent and consistent effects on sport participation rates. Neither higher education nor labour force experiences were altering or even modifying the main variations and stabilities in participation rates by age, gender and class origins. The broad social demography of sport participation appeared to have been set enduringly earlier in the samples' lives.

Social uses of Free Time

Going out

There were similarities, but also major differences, between the social demography and trends with age in sport participation and social uses of free time. Spending free time with friends was by far the respondents' most common out-of-

home free time activity. As with sport, in all the directly comparable cells in Table 2a, males were more likely than females to go out with friends at least once a week. Among males, participation fluctuated across the age groups only between 73 percent and 77 percent, whereas the female range was from 36 percent to 48 percent, and the trend with age was downward. Fathers' education (our indicator of social class origins) made no difference to males' participation rates, whereas there was a strong positive association among the young women: those with highly educated fathers were by far the most likely to go out with friends at least once a week.

Table 2a. *All Respondents: Percentages going out with Friends at least once a week*

	Males				**Females**		
	15-19 %	**20-24 %**	**25-29 %**		**15-19 %**	**20-24 %**	**25-29 %**
Father's education: primary or less	67	70	76		38	32	31
Middle or upper secondary	77	78	76		54	53	43
Higher	78	76	86		57	62	43
All	73	74	77		48	43	36
N =	1518	1450	1043		1208	926	628

Table 2b. *25-29 year olds only*

	Males			**Females**	
	Higher education %	**Other %**		**Higher education %**	**Other %**
Father's education: primary or less	77	73		36	33
Middle or upper secondary	76	72		50	40
Higher	87	83		50	35
All	79	73		44	36
N =	196	642		163	342

Table 2c. *25-29 year olds only Respondent's Occupational Class*

	Males			**Females**	
	Business or sub-business, salariat or sub-salariat, informals %	**Other (precariat, inactive, detached) %**		**Any class in labour force %**	**Inactive %**
Father's education: primary or less	72	80		76	79
Middle or upper secondary	72	85		75	85
Higher	87	79		89	70
All	73	81		76	80
N =	173	369		287	255

Higher education was making only a slight difference to males' involvement in this use of free time, but it boosted participation among young women, especially those with the most highly educated fathers (Table 2b). Positions inside and outside the workforce were making no consistent differences across fathers' education groups among either the males or females (Table 2c).

Cafes and tearooms

Visiting cafes and tearooms, our second social use of free time, was also second only to going out with friends in the overall participation rates in the various free time activities.

Once again, males out-performed females in all the directly comparable cells in Table 3a. Males' likelihood of visiting a café or tearoom at least once a week rose steadily with age among those whose fathers had ended their education at all levels, but among females this was the case only among those with the most highly educated fathers. A highly educated father was boosting participation rates most strongly among both males and females in our oldest, 25-29 age group (Table 3a).

Male and female respondents aged 25-29 who had graduated from higher education had higher participation rates in visiting cafes and tearooms than others in their age group, and this education effect was strongest among the females, especially among the females with the better–educated fathers (Table 3b). In contrast, the 25-29 year olds' positions inside or outside the workforce were making no consistent differences across the gender and fathers' education groups to respondents' likelihood of visiting cafes or tearooms at least weekly (see Table 3c).

Table 3a. *All Respondents: Percentages visiting Cafes or Tearooms at least once a Week*

	Males				**Females**		
	15-19 %	**20-24 %**	**25-29 %**		**15-19 %**	**20-24 %**	**25-29 %**
Father's education: primary or less	41	51	58		12	11	15
Middle or upper secondary	49	57	62		22	26	24
Higher	47	53	73		24	28	33
All	45	54	61		18	18	20
N =	1518	1450	1043		1208	926	628

Table 3b. *25-29 year olds only*

	Males			**Females**	
	Higher education %	**Other %**		**Higher education %**	**Other %**
Father's education: primary or less	61	56		16	16
Middle or upper secondary	61	57		34	21
Higher	76	66		46	26
All	67	57		28	18
N =	196	642		163	342

Table 3c. *25-29 year olds only Respondent's Occupational Class*

	Males			Females	
	Business or sub-business, salariat or sub-salariat, informals %	**Other (precariat, inactive, detached) %**		**Any class in labour force %**	**Inactive %**
Father's education: primary or less	56	64		16	13
Middle or upper secondary	55	73		28	17
Higher	76	71		25	38
All	58	67		22	16
N =	173	369		287	255

Cultural Activities

Musical events

Attendance at these events declined with age, but among males this was only in our oldest, 25-29 years old age group (Table 4a). Males were more likely than females to attend these events, but only marginally so. Participation was related to family class origins, but there were no clear associations with progressing through higher education or respondents' own experiences in the labour market (Tables 4b and 4c).

Table 4a. *All Respondents: Percentages attending Music Concerts or Festivals at least once a week*

	Males				Females		
	15-19 %	**20-24 %**	**25-29 %**		**15-19 %**	**20-24 %**	**25-29 %**
Father's education: primary or less	7	9	6		7	5	3
Middle or upper secondary	13	10	6		9	8	5
Higher	12	12	13		12	4	8
All	10	10	7		9	6	4
N =	1518	1450	1043		1208	926	628

Table 4b. *25-29 year olds only*

	Males			Females	
	Higher education %	**Other %**		**Higher education %**	**Other %**
Father's education: primary or less	5	7		4	2
Middle or upper secondary	8	6		5	5
Higher	7	17		0	22
All	7	7		4	4
N =	196	642		163	342

Table 4c. *25-29 year olds only Respondent's Occupational Class*

	Males			Females	
	Business or sub-business, salariat or sub-salariat, informals %	**Other (precariat, inactive, detached) %**		**Any class in labour force %**	**Inactive %**
Father's education: primary or less	7	5		6	5
Middle or upper secondary	5	5		4	9
Higher	11	7		9	10
All	6	5		3	6
N =	173	369		287	255

Theatre

Here, unlike any other free time activity that we feature, attendances peaked in the 20-24 age group then dropped to their lowest level among the 25-29 year olds. Family class origins were making a difference, but their association with participation rates began only after age 20. Once again, males were more involved than females (Table 5a). Also once again, there were no clear associations with whether respondents had progressed through higher education or their positions in the workforce (Tables 5b and 5c).

Table 5a. *All Respondents: Percentages visiting a Theatre at least once a week*

	Males				Females		
	15-19 %	**20-24 %**	**25-29 %**		**15-19 %**	**20-24 %**	**25-29 %**
Father's education: primary or less	5	7	3		3	3	1
Middle or upper secondary	5	7	3		3	4	1
Higher	3	11	6		2	9	3
All	5	7	3		3	4	1
N =	1518	1450	1043		1208	926	628

Table 5b. *25-29 year olds only*

	Males			Females	
	Higher education %	**Other %**		**Higher education %**	**Other %**
Father's education: primary or less	2	4		1	2
Middle or upper secondary	1	3		3	0
Higher	7	17		2	10
All	2	4		2	2
N =	196	642		163	342

Table 5c. *25-29 year olds only Respondent's Occupational Class*

	Males			**Females**	
	Business or sub-business, salariat or sub-salariat, informals %	**Other (precariat, inactive, detached) %**		**Any class in labour force %**	**Inactive %**
Father's education: primary or less	3	2		3	1
Middle or upper secondary	2	2		2	3
Higher	11	7		2	4
All	2	2		2	2
N =	173	369		287	255

Libraries

This is the sole free time activity among those featured here where there was no sign of a gender effect. Otherwise, as with sport, participation declined with age, and family class origins were making a difference in all gender/age groups (Table 6a). Respondents' own labour market experiences were making no difference to their likelihood of visiting libraries (Table 6c). Nor was higher education among the females, except that when males and females with highly educated fathers had not themselves progressed through higher education, this appeared to have boosted their propensity to visit (Table 6b).

Table 6a. *All Respondents: Percentages visiting a Library at least once a week*

	Males				**Females**		
	15-19 %	**20-24 %**	**25-29 %**		**15-19 %**	**20-24 %**	**25-29 %**
Father's education: primary or less	13	13	7		18	15	7
Middle or upper secondary	19	16	8		23	19	8
Higher	27	26	19		28	22	14
All	17	15	8		22	17	8
N =	1518	1450	1043		1208	926	628

Table 6b. *25-29 year olds only*

	Males			**Females**	
	Higher education %	**Other %**		**Higher education %**	**Other %**
Father's education: primary or less	6	8		7	7
Middle or upper secondary	6	10		13	6
Higher	11	31		0	35
All	7	10		8	9
N =	196	642		163	342

Table 6c. *25-29 year olds only Respondent's Occupational Class*

	Males			**Females**	
	Business or sub-business, salariat or sub-salariat, informals %	**Other (precariat, inactive, detached) %**		**Any class in labour force %**	**Inactive %**
Father's education: primary or less	6	3		5	2
Middle or upper secondary	3	9		5	10
Higher	14	7		11	10
All	6	5		6	6
N =	173	369		287	255

Discussion and Conclusions

Discussion

The cultural free time activities that we have examined did not exhibit similar socio-demographic participation profiles or trends with age during youth and young adulthood. Library visiting was different from all the other activities (sports, social and cultural) in the complete absence of any gender effect. Theatre visits were also unique among the activities being considered here in that 20-24 was the age when attendances peaked. However, a very distinctive feature of the entire cultural sector is that gender differences, if present at all, were far narrower than in sport or social uses of free time. In contrast, all three cultural activities were similar to sport in the clear and consistent relationships across age and gender groups with family class origins, indicated by fathers' education. With family class origins controlled, there was never a clear relationship between participation in sport or any of the cultural activities on the one side, then on the other, whether respondents had progressed through higher education or their current positions inside or outside the labour market. An important exception was that in the cultural activities, respondents with highly educated fathers who had not themselves progressed through higher education appeared to be compensating with exceptionally high rates of participation in all three cultural activities. The obverse may also have applied: university graduates whose fathers were equally educated may have felt no need to add further cultural distinction to their social identities (Bourdieu, 1984). It was not just the cultural, but rather every single free time activity that we have examined that displayed distinctive socio-demographic features. Social uses of free time differed from one another as well as displaying overall differences from cultural and sports activities. There were neither differences by age nor fathers' education in 'going out' rates among the males.

Visits to cafes and tearooms rose with age among the males. These findings were not replicated in any other free time activity.

That said, other socio-demographic features recurred in most free time activities. Males were usually more involved than females. Peak activity was usually at age 15-19 then at best was maintained but more often declined. Respondents with highly educated fathers usually had the highest participation rates, and these relatively high rates were likely to endure throughout their 20s. The combination of a highly educated father and highly educated son or daughter had distinctive consequences. It boosted female rates of 'going out' and 'visits to cafes and tearooms'. Counter-intuitively, as noted above, sons and daughters of highly educated fathers who themselves had not progressed through higher education were more likely to be involved in all three cultural activities than when both generations were graduates.

Sport proved similar to cultural activities in the strong effects of fathers' education, suggesting that childhood socialisation was making a lasting impression on these uses of free time, and this applied equally to sons and daughters. Family origins appeared to set limits to sport and cultural participation rates which could be exceeded during early youth only to drop back when young adults entered their 20s. However, sport differed from cultural activities in the wider gender differences in the former, and the relatively step downward trend with age except among males with highly educated fathers.

Conclusions

We now have persuasive evidence from the UK, the South Caucasus, and the South and East Mediterranean, that the foundations for enduring careers in participant sport are usually laid in childhood and early adolescence in specific family contexts. Parents and siblings may be sports-active, or the families may simply encourage their children to play. We can add that in the South and East Mediterranean, and possibly elsewhere, the same families also foster participation in cultural free time activities. This encouragement appears to be part of family cultures in which progression through higher education is treated as just normal. In Europe further progression into salariat careers is also treated as normal, but currently this cannot be so in the South and East Mediterranean because the supply of suitably qualified young people vastly exceeds the number of salariat jobs. Sport participation by older children and young people can probably be boosted in school and community facilities and projects, but all the evidence now available suggests that participation is unlikely to endure into later life stages unless supportive foundations have been laid in childhood family cultures.

Extending the family cultures upon which long term careers in participant sport are built will be difficult given that modern sports were originally designed to be played by boys and young men, and more specifically by those in elite secondary schools and universities. Modern sports were then easily spread into other classes, and all over the world, as forms of exciting entertainment and uses of free time, but it now appears that participation, rather than just entertainment,

has endured into adulthood only amid supportive family and sport club-based cultures. In the West these supportive families and sport club cultures now embrace girls and women, but up to now any such trend has been far weaker in the South and East Mediterranean.

There is no mechanism whereby family experiences in childhood can mechanistically cause persons aged 20-something to play sport. Causation must be via a propensity to play which is a property of a sub-population. The propensity can keep a participation rate stable while whether any individual plays will depend on a host of other circumstances. The underlying propensity to play can change. It did so when and where modern sports were originally invented, which was at a time when people were moving from rural into urban areas and industrial employment. The main change in Western family free time cultures in the 20th century followed the advent of mass media, especially television. For a few decades television drew families together in front of 'the box in the living room' before bedroom sets, then laptops, tablets and smartphones dispersed viewing into private and other public spaces.

Elite sport (the top events and players in the most popular sports) has developed into a global entertainment business which enriches its star players, promoters and media companies. Much participant sport has moved from playing fields to indoor spaces, and large team sports have been partly replaced by small group games and individual exercise in gyms, parks and along roads. None of these changes have expanded the family cultures in which childhood socialisation makes physically active recreation a normal part of everyday life, for life. The addition of various kinds of theme parks to amusement parks and heritage sites has extended the possibilities for family days-out. Participant sport needs an equivalent wave of entrepreneurialism, probably promoting new forms of sport as family recreation, if it is to contribute to alleviating an obesity crisis. This should become part of the sports research agenda. We now know from experience that simply promoting existing sports among young people more vigorously and extensively through schools and community associations will not yield lifelong changes. It is now time to discover whether new sports can be pioneered and promoted, and make a lifelong enduring difference to participation rates.

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Technology Enhanced Sports Spectators Customer Experiences: Measuring and Identifying Impact of Mobile Applications on Sports Spectators Customer Experiences

By Ekaterina Glebova[*] & Michel Desbordes[±]

The present study aims to investigate the effect of mobile applications (apps) implementation and employment on spectators customer experiences (SSCX). This research provides a conceptual framework for studying the effects of technologies (smartphones, apps, etc.) on sports spectator experiences, with the intention of future research at the intersection of these two topics. It delineates usage of technologies as a multidimensional construct and proposes that technologies affect consumer psychology and experience through different dimensions— cognitive, emotional, behavioural, sensorial, and social responses (Lemon and Verhoef 2016). With this conceptual framework and research agenda, it challenges us to ask deeper questions about why technological affiliation and level of technology using involvement may be driving previously established differences in consumer experiences, and to uncover the psychological mechanisms underlying the effects. This framework complements and extends previous literature and provides a new delineated framework for considering research on the effects of technologies on CX. We have confirmed that usage of mobile apps may impact on SSCX trough social, cognitive and behavioural responses.

Keywords: *sports spectacle, mobile application, customer experience, smartphone, technology, fan experience*

Introduction

Mobile applications became an essential part of sports spectating culture, enhancing and making more comfortable fan experiences, functioning for all the stakeholders (Glebova et al. 2020a, Glebova and Desfontaine 2020).

The present study aims to investigate the effect of mobile applications (apps) implementation and employment on sports spectators customer experiences (SSCX). This research provides a conceptual framework for studying the effects of new technologies on sports spectator experiences (Desbordes et al. 2019), with the intention of future research at the intersection of these two topics. It delineates usage of technologies as a multidimensional construct and proposes that new technologies affect consumer psychology (King and Dong 2017) and experience

[*]Researcher, 1 - Université Paris-Saclay CIAMS, 91405, Orsay, France and 2 - Université d'Orléans, CIAMS, 45067, Orléans, France.
[±]Professor, 1 - Université Paris-Saclay CIAMS, 91405, Orsay, France and 2 - Université d'Orléans, CIAMS, 45067, Orléans, France.

(Klaus and Maklan 2012) through different dimensions— cognitive, emotional, behavioral, sensorial, and social responses (Lemon and Verhoef 2016).

With this conceptual framework and research agenda, it challenges us to ask deeper questions about why technological affiliation and level of technology using involvement may be driving previously established differences in consumer experiences, and to uncover the psychological mechanisms underlying the effects. This framework complements and extends previous literature and provides a new delineated framework for considering research on the effects of technologies on CX.

Theoretical Background

Despite technological development and sports digitalization trends, research on sports digitalization in the International Sports discipline is surprisingly still nascent. Mobile apps are especially interesting nowadays (Kojo et al. 2014), because they embrace and consolidate in a single interface many opportunities of emerging technologies, such as Internet of things (IoT) (Marek and Wozniczka 2017), Social Media, Immersive technologies (XR) and many more (Vikström and Zheng 2013, Giblin and Parrington 2016, Ritchy 2017, Glebova and Desfontaine 2020).

Wang et al. (2012, 2016) study results show that the different uses of smartphones in everyday living are associated with different perceptions toward the capability of smartphones and, in turn, how travelers communicate, consume information consumption, and use their time.

Because of the large array of technological innovations and tools available to fans, brands, coaches and sports performers, this choice, paired with the increased desire to collect and process information rapidly and at minimum cost to the user, may increase the chances of selecting the fad option, rather than an appropriate tool. A number of technologies in sport reviews have previously been published (e.g., Uematsu and Saito 2008, Cummins et al. 2013, McCarthy 2013, Wilson 2013, Morosan and DeFranco 2016, Mejova and Kalimeri 2019).

There is a tendency towards growth of technologically highly sophisticated products (Glebova and Brasier 2020), resulting in fundamental transformations in the interaction of the company with the customer (Table 1). This indicates the need for a broad study since academic research into the readiness of people to use such systems is still considered to be at early stage (Parasuraman 2000).

Accordingly, technological changes can significantly alter consumers' way of life (Pires et al. 2011, Chang et al. 2016). Mick and Fournier (1998) tested and noticed that technology instead of always being positive is often paradoxical. At the same time as it generates positive feelings of control, freedom, novelty, competence, efficiency, satisfaction, association and engagement, it may also provoke feelings of chaos, enslavement, obsolescence, incompetence, inefficiency, dissatisfaction, isolation and disengagement.

Recent academic researchers are focused mostly on intersection of technologies and sports performance and exercising (Ratten 2018), but the understanding of

impact of technologies (and technological use as a complex factor) on the CX of sports fans and spectators remains unclear.

However, there are a large number of academic works regarding CX and Spectators experiences, which are the strong theoretical foundation for the current research (Gentile et al. 2007, Gilmore and Pine 2002, Buccini and Padovani 2007, Bodet, 2008, Verhoef et al. 2009, Bouchet 2011, Chavanat and Bodet 2014, Theodorakis 2014, Biscaia 2018, Lemon and Verhoef 2016, Kemppainen 2018, Zaki and Neely 2018, Glebova and Desfontaine 2020).

Table 1. *Technology Usage (TU) Positive and Negative Sides of Impact and Proposed Dimensions*

Dimension	TU Positive Impact	TU Negative Impact
TAM (Davis 1989, Parasuraman and Colby 2001)	Optimism innovativeness	Discomfort insecurity
Emotional (Lemon and Verhoef 2016)	Joy and fulfillment	Emotional instability (Roberts et al. 2015) Depression, anxiety, low self-esteem and stress (SIS)
Social (Lemon and Verhoef, 2016, Roberts and David 2016)	Social support (Wann and Melnick 2001)	Loneliness, social escape, social anxiety
Perceived usefulness, sensorial	Information support, basic needs satisfaction	Distraction, aggravating the memory, vision, headaches
Satisfaction (Roberts et al. 2015, Roberts and David, 2016)	Satisfaction (Morgan and Rego 2006)	Dissatisfaction (Kim et al. 2019)
Cognitive (Lemon and Verhoef 2016)	Usefullness in terms of information access and analisys	Aggravation of concentration of attention
Psychological (Lemon and Verhoef 2016), addiction-orientated (Pancani et al. 2019, Riva 2016)	Optimization of resources	Anthropomorphism, physical inactivity, lack of physical activity, behavioral (technological) addiction (adopted from SIS, Kim et al. 2014)

Although positive perceptions toward technology use leads to positive behavioral outcomes (Morosan and DeFranco 2016), research has determined cases when use of technology may increase technology anxiety, in turn leading to customer dissatisfaction (Liu 2012, Lee and Baker 2017).

Technologies are so attractive for positive, societal change, but also generate an environment for potential concern (Nichols 2017). While such technologies have been widely adopted in training scenarios, understanding the limitations regarding their effective use is paramount (Chandy and Tellis 1998).

Inversini and Schegg (2016) proposes five activity categories relevant for mapping the consumption journey of a sport event, namely, "sensing", "linking", "performing", "organizing", and "navigating". These five activity categories extend the work of Korn and Pine (2011) and Gretzel and Fesenmaier (2003). In their typology of human capability, Korn and Pine (2011) theorize present-day consumers, as individuals and in groups, employ mobile technology to fulfil two primary purposes: connecting; and doing. Individuals and groups connect by sensing and linking respectively; they manipulate their surrounding environments by performing and organizing (Inversini and Schegg 2016).

Important to note, that in current study we use terms "smartphone", "mobile phone", "technology" interchangeably as synonyms, adding to this list "mobile apps", because mobile apps cannot be used separately from screen device such as smartphone, laptop, tablet, etc. Furthermore, mobile apps may include additional accessors, such as wearable technologies.

Design/Methodology/Approach

This study draws on literatures spanning from technology, CX, Sports Spectacle, Technologies Innovations, Psychology and combine them with data collection and analysis in the spirit of grounded theory. The outcome is a new conceptual framework on impact of mobile apps and related technologies on sports spectacle and their influences on emotional and other reactions. It discusses the findings in terms of implications for theories of Spectator experiences and journey, technology, an expanded role for the mobile apps construct in consumer research, specializing in sports spectacle.

The data gathering tools are interviews (N=20) and questionnaires (N=100) including key items measuring general factors of SSCX and mobile applications.

Expected Implications

The research results provide benefits for all organizations in the sports industry, sports-related brands, event organizations, researchers and customers as well.

Spectator ways to experience are heterogeneous, moreover with the today technological advancements opportunities. Therefore, club managers need to know and understand their spectators to better adjust deployment and implementation of mobile apps (Davenport et al. 2019).

Furthermore, possessing of knowledge enables managers to keep a track of various types of technologies they have planned, introduced and implemented, make better decisions in the area of resource allocation and enhance SSCX and Customer Journey (Glebova et al. 2020b).

Research Design

Case studies are used to test hypotheses. The purpose is to understand how or why using technologies impact on SSCX. It let us to assess the conditions surrounding a phenomenon to build a plausible explanation or to discover a causal relationship that links the antecedents to the results. The synthesis of literature has led us to formulate following hypotheses.

The main Hypothesis: Usage of emerging technologies affects SSCX through different dimensions— cognitive, emotional, behavioral, sensorial, and social responses (Lemon and Verhoef 2016).

Pittman (2017) in his study attempted to answer a simple question: in terms of emotional well-being, are social media (and other apps) good? The overall findings of this research offer a simple answer: "yes". Considering the fact, that emotional aspect is essential in sports fandom, we formulate hypothesizes regarding anxiety (Liu 2012, Lee and Baker 2017) and feeling nervous, emotionally instable (Roberts et al. 2015) using smartphones in SSCX.

H.1. Emotional
H1.1. Usage of apps in SSCX increases anxiety
H1.2. Active apps users in SSCX feel nervous
H2. Social

From a social perspective, recent studies have shown that loneliness and social anxiety are positively related to smartphone addiction (Bian and Leung 2015, Darcin et al. 2016). This phenomenon aligns with the study by Kim (2017), who found that lonely individuals tend to rely more on apps-mediated communication than face-to-face real interactions to alleviate their loneliness (Pancani et al. 2019).

Definitely, nowadays technology let people stay connected, including fans. Mobile apps, functioning for all the stakeholders, are a powerful fan engagement tool as well (Wagner and Dixon 2016). Users usually appreciate this fact (Wang et al. 2016), but do fans think they are better socially engaged and socially supported in grace of technology?

H2.1. Sports spectators feel socially engaged and supported in grace of technologies

However, a few studies indicate that using smartphone and apps often leads users to feeling of loneliness (Gezgin et al. 2018), even naming this phenomenon "Phoneliness" (Pittman 2017).

H2.2. Active users of apps in SSCX feel loneliness
H3. Sensorial

Extending SIS model suggestions (Pancani et al. 2019) and noted physiological impact on technologies users (Bian et al. 2016), we test hypothesizes that using of smartphone and apps may cause problems with vision or headaches.

H3.1. Active users of apps in SSCX notice problems with vision abilities

Prolonged smartphone sessions can provoke musculoskeletal damage, including back and neck pain (Kim and Kim 2015, Kim et al. 2013, Pancani et al. 2019).

H3.2. Active users of apps in SSCX notice problems with headaches

H4. Cognitive

Campos et al. (2016) have simply explained the relationship between attention and memory, and it was widely discussed in cognitive psychology and neuroscience. Attention influences memory, and memory, in turn, influences attention (Chun and Turk-Browne 2007, Kuhl and Chun 2014). Indeed, researchers consider that attention and memory are interdependent systems since recollection is itself a form of attention, in as much as memory involves internally oriented attention. Moreover, active mental engagement incorporates strategic distribution of attention and, consequently, greater probability of successful recollection (Kuhl and Chun 2014).

Memory is limited in capacity (Kuhl and Chun 2014), imposing constraints on attentional processes (Robinson 2001). Memory depends on externally oriented attention even if attentive behavior is not related to explicit motivation to form long term memories (Kuhl and Chun 2014). Simplifying, attention is a step towards memory (Mancas and Le Meur 2013, Chun and Turk-Browne 2007, Pancani et al. 2019); from a cognitive perspective, highlighting the positive and negative consequences of para-social relationships that might arise from such a phenomenon (Pancani et al. 2019).

H4.1. Active users of apps in SSCX notice memories aggravation about the match/game details

Pancani et al. (2019) notices that smartphones are a primary driving distraction, and the most recent estimates indicate that these devices cause at least 1 of every 4 accidents on US streets. Furthermore, smartphone addiction was found to negatively affect academic performance (Hawi and Samaha 2017).

H4.2. Active users of apps in SSCX are less concentrated (concentration of attention) on the game/match

The use of smartphone to overcome negative inner states can be interpreted as a distraction strategy that can have the positive effect to free the mind from the source of negative feelings, preventing the use of more dysfunctional strategies, such as rumination (Riva 2016). Thus, the construct underlying Emotion regulation through technologies usage might represent a good coping strategy to improve current mood, though future studies are needed to assess its effectiveness (Pancani et al. 2019).

H4.3. Active apps users lose focus on game/match sports content (distraction)
H5. Behavioral

The literature has well documented how people are prone to anthropomorphize, i.e., ascribe humanlike characteristics, nonhuman agents (Epley et al. 2008, Pancani et al. 2019)

H5.1. Active users of technologies in SSCX are addicted to anthropomorphize technological devices

Functioning for all the stakeholders, and being the marketing tool (Glebova et al. 2020a) apps may "push" in different manner fans to consume additional service, and encourage to change consumption habits (Wang et al. 2016, Schut and Glebova 2020).

H5.2. Active users of apps in SSCX consume more "sports fans additional services"

Methodology

The data gathering tools are interviews and questionnaires including key items measuring general factors of CX and technologies advances. Data collection embraces 3 main studies: (1) survey for sports fans, using Survey Monkey software (N=100), quantitate and qualitative measuring of impact on SSCX of using and implementing emerging technologies (2) Qualitative interviews (N=10) with sport fans deeper investigating the impact of technologies on SSCX (3) Interviews (N=10) with professional managers in sports industry.

Results, contributions, case studies will be synthesized in order to conceptualize the framework.

We are investigating issues in global context, without any attachment to a particular place, organization or event. SSCX become more complex and inclusive, that's why we understand technologies and CX as entire and undividable concepts. Samples for studies 1 and 2 are chosen broadly from sports fan groups in social media. A sample for study 3 is defined by an expertise, knowledge and experience in the field of implementation emerging technologies if SSCX (especially positions in sports clubs relating to technological transformation, digital transformation and innovations). For testing hypothesizes, we consolidate, analyses and rate collected data from interviews against each hypothesis, evaluating it from 0 (disagree) to 5 (absolutely agree), results can be found in Table 2 in discussion section.

Current study focuses on sport spectators in terms of using and implementation different types of mobile apps in their customer experiences.

Results and Discussion

Taking into account the global context, where absolute majority of people use smartphones and apps, including SSCX, we can consider them as active apps users. However, according to the questionnaire answers, about 2% do not use apps in their SSCX, but this fact does not change landscape of this study in general.

We have collected questionnaire answers from volunteers around the world, 61.22% men, 35.71% women and 3.06% not specified gender (Q1) , following age groups (Table 2):

Table 2. *Age of Participants*

(1) below 18	4.00%
(2) 19-25	18.00%
(3) 26-34	30.00%
(4) 35-46	21.00%
(5) 47-55	18.00%
(6) 56-65	8.00%
(7) 65 and elder	1.00%

Source: Questionnaire, Q2 Answers.

There are three main purposes for using smartphone in SSCX (Table 3): doing/playing sports or measure performance (73%), make payments or buy things (51%), and the highest percent of mobile apps users watch sports (88%).

Table 3. *Do you Use your Smartphone for Sports Experiences?*

(1) No, never	2.00%
(2) Yes, I use it for doing/playing sports or measure sports performance	73.00%
(3) Yes, I use it for watching sports	88.00%
(4) I make payments or buy things	51.00%
(5) Other	6.00%
(6) I don ‘t know	2.00%

Source: Questionnaire, Q3 Answers.

The Q4 is mainly focused on identifying of using the second and multiple screens in SSCX. We can see that definitely spectators use smartphone during SSCX, especially for getting information concerning sports (76%) or buy tickets, order food, book hotel (50%). 37% use social media during SSCX, 29% make payments and 25 % do shopping (Table 4).

Table 4. *Do you Use Smartphone of Tablet during Sport Spectating?*

I don't use it (1)	2.00%
I use it to get information about sports (2)	76.00%
I buy tickets/ order food/ book hotel (3)	50.00%
I make payments (4)	29.00%
I do shopping (5)	25.00%
I communicate about sports (6)	28.00%
I communicate on various topics (7)	27.00%
I use social media (8)	37.00%
I make pictures (9)	43.00%
I post in social media (10)	34.00%
I don't know (11)	2.00%
Other (12)	1.00%

Source: Questionnaire, Q4 Answers.

Table 5 demonstrates key mobiles apps employed by fans in SSCX. The Facebook is leading (74.75%) but it could be explained by the fact that we searched volunteers for questionnaire in Facebook sports fan communities.

70.71% of spectators use official applications of clubs and events they are interested in. The number of apps has been increased last years and almost any event and organization today have an own app, enhancing SSCX and functioning for all the stakeholders.

Instagram (59.60%) is popular in many terms, including SSCX, we suggest, in many cases for the second screen role.

MCN Sports (56.57%) and ESPN (53.54%) seem to have a strong recognition rate among sports spectators.

Table 5. *What Mobile Apps are you Using in your SSCX?*

ESPN (1)	53.54%
Facebook (2)	74.75%
Instagram (3)	59.60%
Official applications of clubs or events you are interested in (4)	70.71%
CBS Sports (5)	13.13%
CBScore (6)	8.08%
Yahoo Sports (7)	49.49%
Bleacher report (8)	20.20%
theScore (9)	9.09%
365Reports (10)	22.22%
MCN Sports (11)	56.57%
I don't know (12)	15.15%
Other (please precise) (13)	9.09%

Source: Questionnaire, Q5 Answers.

The most of all fans appreciate opportunity to access information quick and easy (82%), use photo and video camera (80%) and use easy ticketing/reservations/

booking (66%). 48% enjoy game performance and analytics, 46% of fans marked opportunity "to easy buy and order thing" (Table 6).

Table 6. *How Mobile Apps Improve SSCX?*

It doesn't improve my sports experience (1)	8.00%
Access to information is quick and easy (2)	82.00%
I can easy buy and order things I need (3)	46.00%
Easy ticketing/reservations/ bookings (4)	66.00%
Easy and cashless payments (5)	25.00%
Game/performance analytics (6)	48.00%
Easy shopping (7)	38.00%
Memory/Reminders/Calendars (8)	33.00%
Tools such as timer, calculator, clock (9)	43.00%
Photo and video camera (10)	80.00%
Access to communications (11)	24.00%
Other (please precise) (12)	1.00%

Source: Questionnaire, Q6 Answers.

It is important to note, that in the framework of current study, we consider the social media as just a kind of mobile app. The empirical evidence shows that the main role of social media is informational resource, often in terms of second screen. 84 % "surf online during watching game", 82% use social media to follow favorite athletes and clubs, 66% treat mobile device as a friend in terms of social media, probably satisfying communication and social needs, and then 35% communicate with friends via social media, and 49% use social media to read news and other posts. Some of them make payments (18%) and do shopping on social media (28%).

Important to note, that 2% do not use social media at all and 13% do not use it in sports context, so there are 15% spectators who do not use social media in their SSCX (Table 7).

Table 7. *Social Media in SSCX*

I don't use social media at all (1)	2.00%
I do not use social media in sports context (2)	13.00%
I follow my favorite athletes and clubs (3)	82.00%
I communicate with friends (4)	35.00%
My phone\tablet is a kind of my friend, I communicate with it (5)	66.00%
I make payments (6)	18.00%
I watch spots broadcast (7)	77.00%
I do shopping (8)	28.00%
I read news and others posts (9)	49.00%
I share my posts and media (10)	29.00%
I "surf" online during watching a game (11)	84.00%

Source: Questionnaire, Q7 Answers.

Table 8 demonstrates the negative side. Initially we can assume that apps usage has a negative impact on ability to stay concentrated (68%, 74%) as an

intensity of attention in general (78%). It aggravates memory (79%). 53% notice a link between apps and feeling lonely.

Table 8. *Negative Side Effects or Results of Using Smartphone and Apps in SSCX*

No, never (1)	2.00%
Yes, it makes me distracted (2)	68.00%
Yes, it makes me anxious (3)	49.00%
Yes, it makes me nervous (4)	37.00%
Yes, it makes me feel lonely (5)	53.00%
Yes, it makes me tired (6)	20.00%
Yes, it slows my concentration ability (7)	74.00%
Yes, it aggravates my memory (8)	79.00%
Yes, it causes a headache (9)	44.00%
Yes, it reduces my vision abilities (10)	13.00%
Yes, it slows my attention (11)	78.00%
Yes, but I don't know exactly how to describe this effect (12)	37.00%
I buy too much things by my mobile shopping (13)	25.00%
I don't know at all (14)	2.00%
Other (please precise) (15)	0.00%

Source: Questionnaire, Q8 Answers,

Surprisingly, we find that 65.66% identify mobile device as a friend, joining other 21.21% who confirm that does not feel comfortable without mobile devices (86.87% in total who does not feel comfortable in SSCX without a mobile). Furthermore, 38.38% take a neutral position, choosing answer "sometimes, it depends". 15.15% show no attachment or addiction to mobile device in SSCX (Table 9).

Table 9. *Do you Feel Comfortable Having SSCX without Mobile Device?*

No, I do not feel comfortable without my devices (1)	21.21%
My mobile is like a friend, I do not feel fine without it (2)	65.66%
Yes, it does not matter for me (3)	15.15%
Sometimes, it depends (4)	38.38%
I don't know (5)	4.04%

Source: Questionnaire, Q9 Answers.

The equally leading and contrary responds are "it's handy and useful in many issues" and "it's a negative effect", and moreover in more than 50% cases these two options have been chosen in the same times as a multiple choice.

38% find the positive effect, 34% claim mobile devices enhance their experiences, 31% confirms an effect, but can't describe it. 24 % thanks mobiles for making their payments and shopping easier, joining other 21% for opportunity of buying more and enjoy shopping (Table 10).

Table 10. *Smartphone effect on SSCX*

No, why should it effect somehow? (1)	4.00%
No, there's no link between my device and sports-related experiences (2)	12.00%
Yes, it is very handy and useful in many issues (3)	53.00%
Yes, it enhances my experiences (4)	34.00%
Yes, payments and shopping are easier (5)	24.00%
Yes, I can buy more and enjoy my shopping (6)	21.00%
Yes, it's a positive effect (please precise below) (7)	38.00%
Yes, it's a negative effect (please precise below) (8)	53.00%
Yes, but I cannot identify and describe it (9)	31.00%
I don't know (10)	1.00%

Source: Questionnaire, Q10 Answers.

Testing Hypotheses

H.1. Emotional

Obviously, emotional aspect of fandom is essential. And we have found that mobile apps usage may affect emotional aspect of SSCX positively and negatively. Moreover, we have found many in expected and interesting insights in exploratory spirit from interviewees. For example, Juan Areola, notices a link between emotional and social aspects of SSCX.

Questionnaire Q8.3 and Q8.4 quantitatively indicate the negative side of emotions in SSCX concerning mobile apps in terms of feeling anxious and nervous, disproving H1.1. and H1.2.

H1.1. Usage of apps in SSCX increases anxiety

49% of mobile apps users feel anxiety in terms of SSCX.

H1.2. Active apps users feel nervous in SSCX

68% feel distracted and 37% of mobile apps users feel nervous, demonstrating a level of stress.

Interesting to note, that more than a half of fans indicated anxious and feeling nervous are active users of mobile app, and we found a relation between the level of technology affiliation and negative responses (Q8). It let us conclude that active mobile apps users in SSCX are less stable emotionally.

H2. Social

H2.1. Sports spectators feel socially engaged and supported in grace of technologies

Q4.6-7 show us that 28% use smartphones to communicate about sports and other 27% communicate on various topics. Q6.11 demonstrates 24% who claim their experiences are enhanced by access to communications. From Q10.4 we know, that 34% think, that mobile devices and apps enhance their SSCX in general.

However, all the interviewees confirmed that spectators feel socially engaged and supported by their personal devices and apps (Table 11).

H2.2. Active users of apps in SSCX feel loneliness

Q8.5 answers show that 53% feel lonely during SSCX.

H3. Sensorial

H3.1. Active users of apps in SSCX notice problems with vision

H3.2. Active users of apps in SSCX notice problems with headaches

Finally, both hypothesizes from "Sensorial" part are disproved with minor Q8.10 (13%) and Q8.9 (44%). Likewise, the majority of interviewees disproved these statements.

H4. Cognitive

H4.1. Active users of apps in SSCX notice memory aggravation about the match/ game details

79% have notices memory aggravation in SSCX (Q8.8).

H4.2. Active users of apps in SSCX are less concentrated (concentration of attention) on the game/match

74% (Q8.7) confirms smartphone and apps usage slows their concentration abilities in SSCX.

H4.3. Active apps users lose focus on game/match sports content

68% (Q8.2) reported they feel distracted because of technologies and apps usage during SSCX (Table 11).

H5. Behavioral

H5.1. Active users of apps in SSCX are addicted to anthropomorphize technologies

Q7.5 (66%) and Q9.2 (65.66%) firmly demonstrate that fans identify devices as friends and have a kind of addiction to technology. It let us confirm this hypothesis.

H5.2. Active users of apps in SSCX consume more "sports fans additional services"

The results of multiple tests Q6.3 (46%), Q6.4 (66%), Q6.7 (38%), Q7.8 (28%), Q10.5-6 (45%) of this hypothesis let us confirm, that mobile apps users consume more additional services, or, in other words, mobile apps may encourage (if it is a purpose, but usually it is) to consume more (Table 11).

Table 11. *Summarizing Results of Hypotheses' Testing*

Hypothesis	Questionnaire	Interviews	Conclusion
H.1. Emotional			
H1.1. Usage of apps in SSCX increases anxiety	Q8.3 (49%)	1	Disproved
H1.2. Active apps users in SSCX feel nervous	Q8.4 (37%)	2	Disproved
H2. Social			
H2.1. Sports spectators feel socially engaged and supported in grace of technologies	Q6.11 (24%) Q4.6-7 (55%) Q10.4 (34%)	5	Confirmed
H2.2. Active users of apps in SSCX feel loneliness	Q8.5 (53%)	3	Confirmed
H3. Sensorial			
H3.1. Active users of apps in SSCX notice problems with vision	Q8.10 (13%)	2	Disproved
H3.2. Active users of apps in SSCX notice problems with headaches	Q8.9 (44%)	1	Disproved
H4. Cognitive			
H4.1. Active users of apps in SSCX notice aggravations in memories about the match/game details	Q8.8 (79%)	3	Confirmed
H4.2. Active users of apps in SSCX are less concentrated (concentration of attention) on the game/match	Q8.7 (74%)	4	Confirmed
H4.3. Active apps users lose focus on game/match sports content	Q8.2 (68%)	4	Confirmed
H5. Behavioral			
H5.1. Active users of apps in SSCX are addicted to anthropomorphize technological devices	Q7.5 (66%) Q9.2 (65.66%)	N/A	Confirmed
H5.2. Active users of apps in SSCX consume more "sports fans additional services"	Q6.3 (46%) Q6.4 (66%) Q6.7 (38%) Q7.8 (28%) Q10.5-6 (45%)	4	Confirmed

Source: Collected Data.

Conclusions

In this study we attempted to investigate a role and impact of mobile apps and related technologies on SSCX through different dimensions: emotional, social, sensorial, cognitive and behavioral.

We have confirmed that usage of mobile apps may have an impact on SSCX trough social, cognitive and behavioral responses. Otherwise, collected data doesn't prove the impact through emotional and sensorial dimensions. Finally, the main hypothesis is confirmed and we proved that mobile apps and related

technologies affect SSCX, however, further investigations and details must be conducted, and we are planning similar studies in the larger scale.

Nowadays, the absolute majority of fans might be considered as active users of mobile apps and related technologies, and just about 2% of fans don't belong to this category. As for an emotional aspect of SSCX, we cannot affirm the link between the fact that fans feel anxious or nervous and using technologies in SSCX.

Employing social media and other time of social types of app (e.g., messengers) in SSCX, users are looking for first of all the information to stay updated, majority of them think apps as a factor enhancing their SSCX in social aspect. However, we have reconfirmed (Pittman 2017, Gezgin et al. 2018, Pancani et al. 2019) that link between using smartphone and feeling of loneliness exists, but should be further explored in terms of SSCX.

Despite recent scholars' finding (Kim and Kim 2015, Park et al. 2015, Pancani et al. 2019) concerning negative impact of technologies on user's sensorial responses, we have not confirmed any clear link between using apps in SSCX and headaches or vision reduction.

From a cognitive perspective, we suggested and confirmed that active users of technologies in SSCX notice memories aggravation about the match/game details and furthermore, active users of technologies in SSCX are less concentrated (concentration of attention) on the game/match.

Empirical evidence demonstrates that fans identify devices as friends and have a kind of addiction to technology. It confirms that active users of technologies in SSCX are addicted to anthropomorphize technologies, including smartphones and apps. Moreover, mobile apps users consume more additional services (Schut and Glebova 2020), or, in other words, mobile apps may encourage (if it's a purpose, but usually it is) to consume more.

Awareness about how mobile apps and related technologies helps to better understand nature, courses and impact of technological devices on SSCX in order to continuously improve the quality of SSCX and sports culture for spectators.

Future Research Directions

We intend to build a technologies usage and deployment optimization model in SSCX, based on empirically measured and identified impact of technologies (focus on mobile apps and XR). This study is a little but solid step to our final purpose.

Acknowledgments

Our thanks to Paris Saclay (Paris Sud) University and IDEX-2018 program. We are grateful for all international experts who have shared their precious opinions in order to improve our studies: Juan Iraola, Khaled Saleh, Stijn Jacobs, Sikaar Keita, Oscar Pérez-Córdoba Dávila, Andrei Angelescu, Ryan McCumber,

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Annex
Questionnaire Text

Mobile apps

Smartphones and Sports Experiences

By this short survey we would like to ask you about using smartphones and tablets in sports-related activities. It's about doing and playing sports, watching any kinds and forms of sports and any other activities related to sports. Thanks in advance for sharing your experience!

Question Title

1. Your gender

- ○ M
- ○ F
- ○ Not specified

Question Title

2. How old are you?

- ○ below 18
- ○ 19-25
- ○ 26-34
- ○ 35-46
- ○ 47 -55
- ○ 56 - 65
- ○ 65 and older

Question Title

3. Do you use your smartphone for sports experiences?

- ☐ No, never
- ☐ Yes, I use it for doing/playing sports or measure sports performance
- ☐ Yes, I use it for watching sports
- ☐ I make payments or buy things
- ☐ Other
- ☐ I don't know

Question Title

4. Do you use smartphone of tablet during sport spectating?

- ☐ I don't use it
- ☐ I use it to get information about sports
- ☐ I buy tickets/ order food/ book hotel
- ☐ I make payments
- ☐ I do shopping
- ☐ I communicate about sports
- ☐ I communicate on various topics
- ☐ I use social media
- ☐ I make pictures
- ☐ I post in social media

- [ ] I don't know
- [ ] Other
- [ ] Other (please precise)

Question Title

5. What mobile apps are you using in sports?

- [ ] ESPN
- [ ] Facebook
- [ ] Instagram
- [ ] Official applications of clubs or events you are interested in
- [ ] CBS Spors
- [ ] CBScore
- [ ] Yahoo Sports
- [ ] Bleacher report
- [ ] theScore
- [ ] 365Reports
- [ ] MCN Sports
- [ ] I don't know
- [ ] Other (please precise)

Question Title

6. How mobile apps improve your sport experience?

- [ ] It doesn’t improve my sports experience
- [ ] Access to information is quick and easy
- [ ] I can easy buy and order things I need
- [ ] Easy ticketing/ reservations/ bookings
- [ ] Easy and cashless payments
- [ ] Game / performance analytics
- [ ] Easy shopping
- [ ] Memory/Reminders/Calendars
- [ ] Tools such as timer, calculator, clock
- [ ] Photo and video camera
- [ ] Access to communications
- [ ] Other (please precise)

Question Title

7. How do you use Social media in sports experiences?

- [ ] I don't use social media at all

- ☐ I do not use social media in sports context
- ☐ I follow my favorite athletes and clubs
- ☐ I communicate with friends
- ☐ My phone\tablet is a kind of my friend, I communicate with it
- ☐ I make payments
- ☐ I watch spots broadcast
- ☐ I do shopping
- ☐ I read news and others posts
- ☐ I share my posts and media
- ☐ I "surf" online during watching a game
- ☐ Other (please precise)

Question Title

8. Have you ever notices any negative side effects or results from using a smartphone/tablet in sports context?

- ☐ No, never
- ☐ Yes, it makes me distracted
- ☐ Yes, it makes me anxious
- ☐ Yes, it makes me nervous
- ☐ Yes, it makes me feel lonely
- ☐ Yes, it makes me tired
- ☐ Yes, it slows my concentration ability
- ☐ Yes, it aggravates my memory
- ☐ Yes, it causes a headache
- ☐ Yes, it reduces my vision abilities
- ☐ Yes, it slows my attention
- ☐ Yes, but I don't know exactly how to describe this effect
- ☐ I buy too much things by my mobile shopping
- ☐ I don't know at all
- ☐ Other (please precise)

Question Title

9. Do you feel comfortable about having your sports-related experiences without using your smartphone/tablet?

- ☐ No, I do not feel comfortable without my devices.
- ☐ My mobile is like a friend, I do not feel fine without it

- [ ] Yes, It does not matter for me.
- [ ] Sometimes, it depends.
- [ ] I don't know
- [ ] Any comments? Please let us know.

Question Title

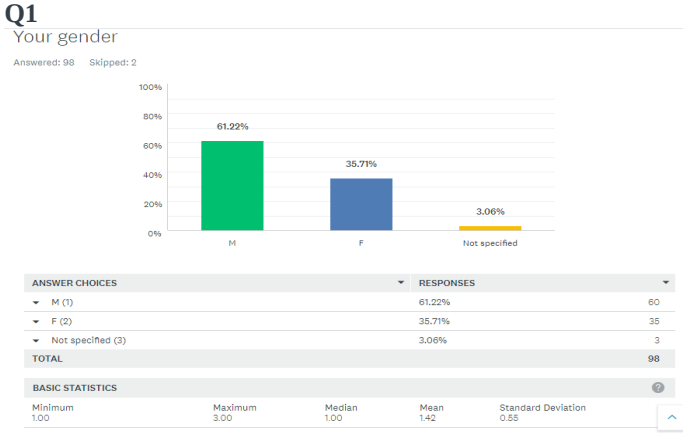
10. Does you smartphone/tablet significantly affect your sports-related experiences?

- [ ] No, why should it effect somehow?
- [ ] No, there's no link between my device and sports-related experiences.
- [ ] Yes, it's very handy and useful in many issues.
- [ ] Yes, it enhances my experiences
- [ ] Yes, payments and shopping are easier
- [ ] Yes, I can buy more and enjoy my shopping
- [ ] Yes, it's a positive effect (please precise below)
- [ ] Yes, it's a negative effect (please precise below)
- [ ] Yes, but I cannot identify and describe it
- [ ] I don't know

Any comments? Please be precise.

Questionnaire Results

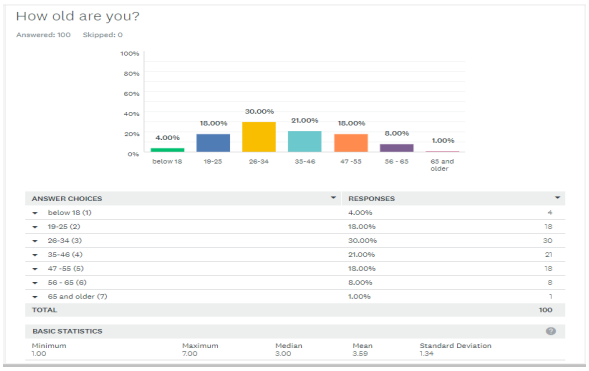
Q1



ANSWER CHOICES	RESPONSES	
M (1)	61.22%	60
F (2)	35.71%	35
Not specified (3)	3.06%	3
TOTAL		98

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	3.00	1.00	1.42	0.55

Q2

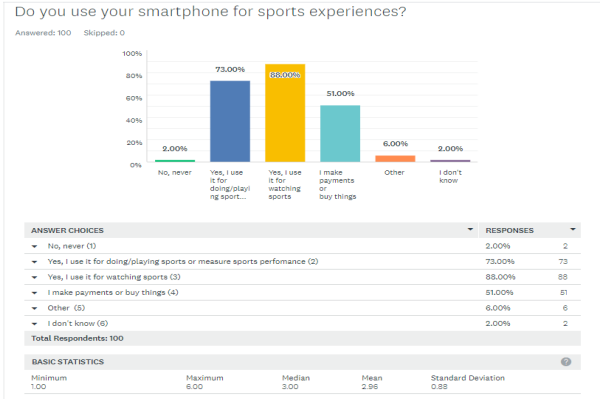


ANSWER CHOICES	RESPONSES	
below 18 (1)	4.00%	4
19-25 (2)	18.00%	18
26-34 (3)	30.00%	30
35-46 (4)	21.00%	21
47 -55 (5)	18.00%	18
56 - 65 (6)	8.00%	8
65 and older (7)	1.00%	1
TOTAL		100

BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
1.00	7.00	3.00	3.59	1.34

Q3

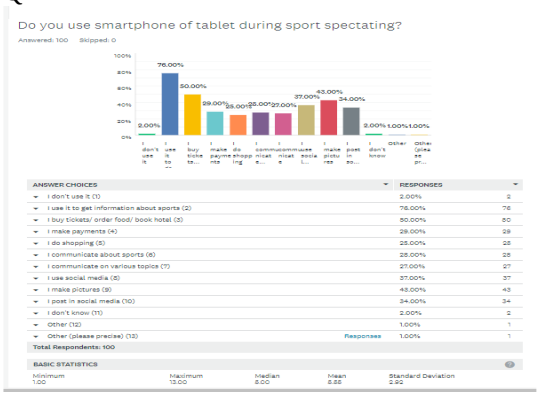


ANSWER CHOICES	RESPONSES	
No, never (1)	2.00%	2
Yes, I use it for doing/playing sports or measure sports perfomance (2)	73.00%	73
Yes, I use it for watching sports (3)	88.00%	88
I make payments or buy things (4)	51.00%	51
Other (5)	6.00%	6
I don't know (6)	2.00%	2
Total Respondents: 100		

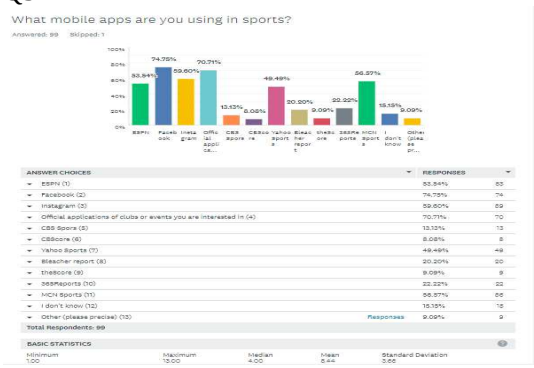
BASIC STATISTICS

Minimum	Maximum	Median	Mean	Standard Deviation
1.00	6.00	3.00	2.96	0.88

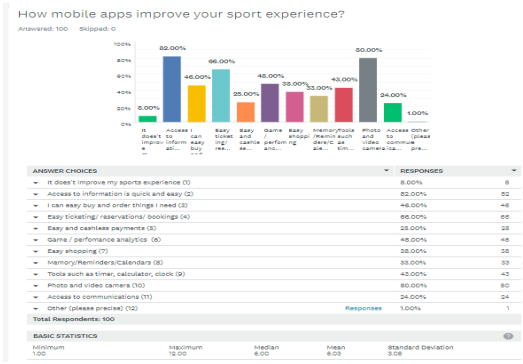
Q4


Do you use smartphone of tablet during sport spectating?
Answered: 100 Skipped: 0
ANSWER CHOICES
RESPONSES
I don't use it (1) 2.00% 2
I use it to get information about sports (2) 76.00% 76
I buy tickets/ order food/ book hotel (3) 50.00% 50
I make payments (4) 29.00% 29
I do shopping (5) 25.00% 25
I communicate about sports (6) 25.00% 25
I communicate on various topics (7) 27.00% 27
I use social media (8) 37.00% 37
I make pictures (9) 43.00% 43
I post in social media (10) 34.00% 34
I don't know (11) 2.00% 2
Other (12) 1.00% 1
Other (please precise) (13) Responses 1.00% 1
Total Respondents: 100
BASIC STATISTICS
Minimum 1.00
Maximum 13.00
Median 6.00
Mean 5.88
Standard Deviation 2.99

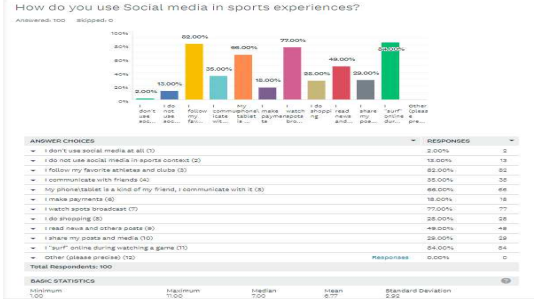
Q5


What mobile apps are you using in sports?
Answered: 99 Skipped: 1
ANSWER CHOICES
RESPONSES
ESPN (1) 83.84% 83
Facebook (2) 74.75% 74
Instagram (3) 59.60% 59
Official applications of clubs or events you are interested in (4) 70.71% 70
CBS Sports (5) 13.13% 13
CBSsports (6) 8.08% 8
Yahoo Sports (7) 49.49% 49
Bleacher report (8) 20.20% 20
theScore (9) 9.09% 9
365Reports (10) 22.22% 22
MCN Sports (11) 56.57% 56
I don't know (12) 15.15% 15
Other (please precise) (13) Responses 9.09% 9
Total Respondents: 99
BASIC STATISTICS
Minimum 1.00
Maximum 13.00
Median 4.00
Mean 5.44
Standard Deviation 3.66

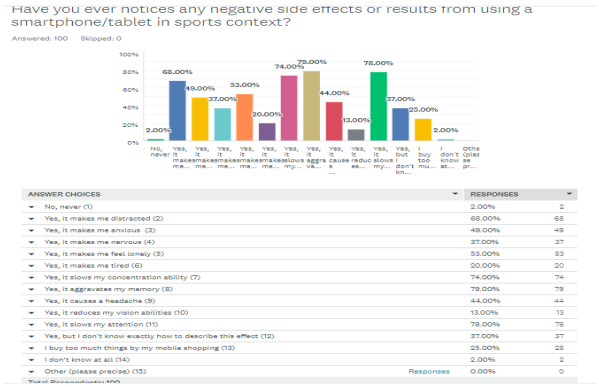
Q6


How mobile apps improve your sport experience?
Answered: 100 Skipped: 0
ANSWER CHOICES
RESPONSES
It doesn't improve my sports experience (1) 8.00% 8
Access to information is quick and easy (2) 82.00% 82
I can easy buy and order things I need (3) 46.00% 46
Easy ticketing/ reservations/ bookings (4) 66.00% 66
Easy and cashless payments (5) 25.00% 25
Game / performance analytics (6) 45.00% 45
Easy shopping (7) 38.00% 38
Memory/Reminders/Calendars (8) 33.00% 33
Tools such as timer, calculator, clock (9) 43.00% 43
Photo and video camera (10) 80.00% 80
Access to communications (11) 24.00% 24
Other (please precise) (12) Responses 1.00% 1
Total Respondents: 100
BASIC STATISTICS
Minimum 1.00
Maximum 12.00
Median 6.00
Mean 6.03
Standard Deviation 3.08

Q7

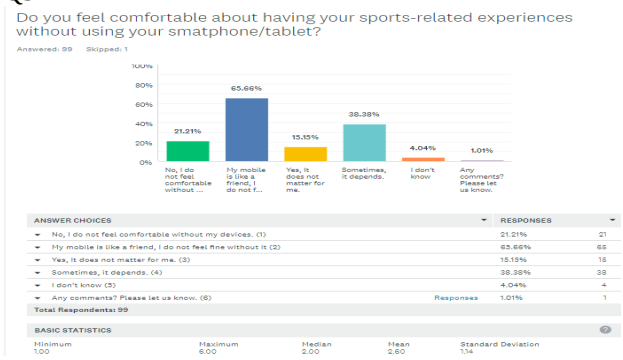

How do you use Social media in sports experiences?
Answered: 100 Skipped: 0
ANSWER CHOICES
RESPONSES
I don't use social media at all (1) 2.00% 2
I do not use social media in sports context (2) 13.00% 13
I follow my favorite athletes and clubs (3) 82.00% 82
I communicate with friends (4) 35.00% 35
My phone/tablet is a kind of my friend, I communicate with it (5) 66.00% 66
I make payments (6) 18.00% 18
I watch sports broadcast (7) 77.00% 77
I do shopping (8) 38.00% 38
I read news and others posts (9) 49.00% 49
I share my posts and media (10) 29.00% 29
I "surf" online during watching a game (11) 84.00% 84
Other (please precise) (12) Responses 0.00% 0
Total Respondents: 100
BASIC STATISTICS
Minimum 1.00
Maximum 11.00
Median 7.00
Mean 6.77
Standard Deviation 2.92

Q8



ANSWER CHOICES	RESPONSES	
No, never (1)	2.00%	2
Yes, it makes me distracted (2)	68.00%	68
Yes, it makes me anxious (3)	49.00%	49
Yes, it makes me nervous (4)	37.00%	37
Yes, it makes me feel lonely (5)	53.00%	53
Yes, it makes me tired (6)	20.00%	20
Yes, it slows my concentration ability (7)	74.00%	74
Yes, it aggravates my memory (8)	79.00%	79
Yes, it causes a headache (9)	44.00%	44
Yes, it reduces my vision abilities (10)	13.00%	13
Yes, it slows my attention (11)	78.00%	78
Yes, but I don't know exactly how to describe this effect (12)	27.00%	27
I buy too much things by my mobile shopping (13)	25.00%	25
I don't know at all (14)	2.00%	2
Other (please precise) (15)	Responses 0.00%	0

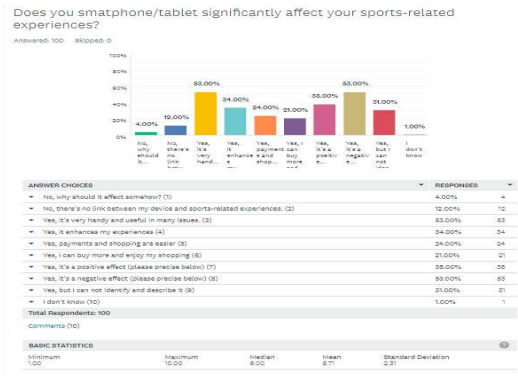
Q9



ANSWER CHOICES	RESPONSES	
No, I do not feel comfortable without my devices. (1)	21.21%	21
My mobile is like a friend, I do not feel fine without it (2)	65.66%	65
Yes, it does not matter for me. (3)	15.15%	15
Sometimes, it depends. (4)	38.38%	38
I don't know (5)	4.04%	4
Any comments? Please let us know. (6)	Responses 1.01%	1
Total Respondents: 99		

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	6.00	2.00	2.60	1.14

Q10



ANSWER CHOICES	RESPONSES	
No, why should it effect somehow? (1)	4.00%	4
No, there's no link between my device and sports-related experiences. (2)	12.00%	12
Yes, it's very handy and useful in many issues. (3)	53.00%	53
Yes, it enhances my experiences (4)	34.00%	34
Yes, payments and shopping are easier (5)	24.00%	24
Yes, I can buy more and enjoy my shopping (6)	21.00%	21
Yes, it's a positive effect (please precise below) (7)	38.00%	38
Yes, it's a negative effect (please precise below) (8)	53.00%	53
Yes, but I can not identify and describe it (9)	31.00%	31
I don't know (10)	1.00%	1
Total Respondents: 100		
Comments (10)		

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	10.00	6.00	6.71	2.31

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Free Time Activities of High School Students: Sports or Video Games?

By Ildikó Balatoni[*]*, Henrietta Szépné Varga*[±] *& László Csernoch*[‡]

Data from various national and international surveys show that people in developed countries do not perform enough physical activity, even though it is an essential part of a healthy lifestyle. Young people spend most of their free time watching TV, using IT-tools, including computer games. In recent years, video-game (i.e., e-sports) team competitions have become more and more popular in Hungary, with countless spectators and mass events that further promote this new sport. We were interested in knowing the proportion of free time high school students spend participating in sports and video games, and if the time spent on them is gender specific. The survey was conducted in the Spring of 2018 in Hungary, among high school students. Questions concerned the respective individual's sporting habits and their computer games-related behaviour. While analysing the data, the proportion of time spent on physical activity and video games was also examined and the scope extended to explore the differences between age groups, place of residence, type of school, and genders as well. The questionnaire was filled in by 882 students. Respondents reported to have approximately 3.6 hours of free time on weekdays and 6.6 hours on weekends. Boys reported having half an hour freer time. 86.8% of the students do sports regularly, with no difference ($p>0.2$) between the genders. In Hungary, the compulsory system of daily physical education in primary and secondary schools contributes greatly to this purpose, but the passion for and the enjoyment of physical activity is also important. At the same time, we need to be aware of the needs and interests of our children in order to influence their way of life in a positive way.

Keywords: *free time, physical activity, students, sports, video games*

Introduction

The concept of free time has changed recently (Furlong et al. 2000), and in fact it is not related to time itself anymore, but rather to its use. In the past decade, free time at home has also become a proper form of recreation, which has been made especially attractive by television and computer games (Nagy and Fazekas 2016). Researchers consider it justified that in the case of the present-day youth the forms of free time are no longer determined by the diverse, intelligent ways of experiencing recreation, but by the peculiarity of the modern age, the rushing

[*]Executive Director, Clinical Center, University of Debrecen, Hungary.
[±]Quality Management Assistant, Clinical Center, University of Debrecen, Hungary.
[‡]Professor and Head, Department of Physiology, Faculty of Medicine, University of Debrecen, Hungary.

(often virtual) world of information society that triggers quick reactions (Nagy and Fazekas 2016).

In parallel, the lack of physical activity in the Western societies has reached a point that it can be considered an epidemic and can be the basis of a number of non-communicable chronic diseases. Unfortunately, Hungary is one of the countries where adolescent obesity and associated metabolic disorders are the highest in the European Union (Eurostat 2018).

In the course of our research, we conducted a survey on a sample of 882 people in the North Great Plain region of Hungary, among high school students. We studied the matter of how often respondents are doing sports in their free time and how much time they spend on computer games. We were interested in seeing whether or not there are any differences in this respect between students attending different types of high schools, grammar *vs*. vocational, and between their places of residence, cities *vs*. villages and farms.

Literature Review

Numerous studies have found that today television and computer use dominate the ways of spending free time in all European countries (Kenyeres and Juhász 2017). According to Eurostat (2018), the proportion of daily internet users in the EU is 95%, while in Hungary is 92%.

Based on the 2016 results of the representative Hungarian Youth Research conducted every four years on a large sample of 12,000 young people (15-29 years old), the role of IT-technology played in the lives of young Hungarians has further increased; while between 2004-2008 home internet access has become common. In 2016 this was also the case with smartphone usage (Székely and Szabó 2017). Now this phenomenon also affects everyday activities from communication to learning and work to free time. The most important tool is the smartphone, which only 31% of young people in 2012 had use of, whereas by 2016 this ratio reached 85%, and 70% of the devices were connected to the World Wide Web. In parallel with the wide-spreading of digital devices and the internet, the role of the media in everyday life has also changed, with digital media already present in two-thirds of free time activities.

According to the Eurobarometer data for 2017, almost half (46%) of the population of the European Union does not conduct any physical activity at all, and only 40% do sports on a regular basis. Looking at the 15-24-year-old age group, the proportion of non-athletes is 24%, while the proportion of those who conduct physical activity at regular intervals (1-5 times per week) is 62%. On the other hand, the ratio of those practicing physical activity decreases with age (Eurobarometer 2018).

A study concerning 34 different countries, involving more than seventy thousand schoolchildren (Guthold et al. 2010) shows that young people spend more than 3 hours a day with sedentary activities, which are not related to school or to homework. At the same time, 23.8% of boys and 15.4% of girls conduct physical activities 5 times a week that last at least sixty minutes. All this is not

only reflected in a decrease in physical endurance, but also in a more frequent appearance of psychological problems (Vancampfort et al. 2018). Other researchers (Feldman et al. 2003) have found that time spent on physical activity and electronic media usage is not interlinked, however time spent on home work and part-time work reduce the amount of free time that can be spent on sports. Boraccino et al. (2009), as a result of their 32-nation study, have suggested that moderate or more intense physical activity among adolescents is correlated with age, gender and social status, and gender differences move in line with age. At the same time, on-screen activities and regular sports are not competitive factors of each other.

Researchers have pointed out that the risk of depression and anxiety disorders increases in the case of young people who spend more than 2 hours/day of their free time looking at screens (Vandendriessche et al. 2019, Zink et al. 2019), which can be offset by regular physical activity. The use of electronic media in the pre-school age could predict a perception of lower self-esteem in later stages (during adulthood) and increase the incidence of emotional problems and inadequate family involvement (Hinkley et al. 2014). Parents having a child under 2 years of age and allowing watching TV, DVD or video for more than 1 hour a day for entertainment or "babysitting" purposes, should at least be conscious about what and how long their children are watching (Zimmerman et al. 2007).

Over the past decade, children's screen time has increased dramatically. Research has shown that screen time (TV, video games, computers, smartphones, etc.) is linked to the consumption of foods containing large amounts of fat and salt, as well as to the consumption of sugary foods and beverages, which coupled with physical inactivity, lead straight to childhood obesity (Mack et al. 2017, Delfino et al. 2018, Hicks et al. 2019, Miguel-Berges et al. 2019, Olds et al. 2019, Zhu et al. 2019).

Insufficient physical activity, too much screen time, inadequate meals and short sleep duration increase the risk of cardiovascular diseases, obesity, and may result in additional health problems (Pereira et al. 2015). In many cases screen activities of many young people also take away from sleep time and looking at screens before going to bed may impair the quality of sleep as well. Insufficient sleep and poor sleep quality sooner or later result in the emotional instability of young people, leading to chronic emotional dysregulation and impaired school performance (Hysing et al. 2015, Xu et al. 2019).

Other researchers investigated the relationship between school performance and physical fitness, with the emphasis on the impacts of screen time (Aguilar et al. 2015). It was found that both parents and teachers should try to influence young people to minimize the negative effects of electronic media.

The role of parents is extremely important in developing a healthy lifestyle concerning their children. Both the behavioral pattern shown in the field of sports and physical activity conducted together, along with family programs are decisive with respect to the development of habits in a later age (Dong et al. 2016, Langoy et al. 2019). Parental effects are also important in developing healthy eating habits and limiting screen time (Frate et al. 2019, Goncalves et al. 2019). In addition, the built environment (i.e., the environment in which people live and work, including

but not restricted to man-made structures and facilities) also influences the free time spending habits of young people (Kosztin et al. 2017, Balatoni et al. 2018, Bejarano et al. 2019).

Based on this, the question arises whether besides the daily school load how the environmental enrichment of cyberspace will take away time from physical activity and how the increased media consumption created by the information society will shape the free time of school age children.

We were curious as to what kind of sporting habits do young people in our region have and how much time they spend in front of the screen.

Methodology

The survey was carried out in Hungary, with the contribution of the students of a six-grade grammar school in Debrecen, as well as a four-grade grammar school and a vocational secondary school in Hajdúnánás, respectively, in the spring of 2018.

Hajdúnánás is a town in the North Great Plain region of Hungary, in Hajdú-Bihar county, with a population of 17,059 people, which is 0.17% of the country's population. It is 40 km from Debrecen. Its agriculture system is advanced, with the country's largest grain processing plant situated here. The active population is steadily declining, the proportion of people over 65 is increasing, and the under-14 age group is decreasing (aging index – the number of people over 65 compared to the number of 0-14-year-olds, in % – 129.35%). The health status of the population, similarly to the respective data from this part of the country, shows disadvantageous statistical results, especially regarding cardiovascular, cancer and alcohol related illnesses and completed suicides (Hajdúnánás Városi Önkormányzat 2018).

Debrecen is Hungary's second largest city and the economic, educational, scientific and cultural center of Hajdú-Bihar County and the North Great Plain region. Its population is 202,402, that is 2.05% of the country's population and 38.16% of the population of Hajdú-Bihar County. The aging index is 130.05% (Debrecen Megyei Jogú Város 2018). Labor market opportunities are better than in smaller settlements of the region or the county.

First the participating schools were approached then the school officially notified the parents of the students to get their consent. The questionnaires were consequently filled in voluntarily and anonymously, and interviewers were also contributing to the process. Besides our questions concerning socio-demographic data we were also interested in the sporting habits of the individuals. The rest of the questionnaire covered computer game-related behavior, including the time spent on computer games, the gaming platform, and any competition-related goals in this respect. We were also curious as to how much free time young people have on weekdays and weekends, and how their time spent on video games (screen time) and physical activity are divided in their free time, furthermore the difference between the genders. We also analyzed the differences between the age

groups and whether these parameters are influenced by the place of residence and the type of school.

The completed questionnaires were processed with the EvaSys software (http://www.vsl.hu). When presenting any data, the mean ± SD is shown in all cases. Differences with $p < 0.05$ were considered significant.

Results

The questionnaire was completed by 882 respondents, with an average age of 15.9 ± 1.3 years (mean ± SD). 55.4% of the respondents were girls, 42.6% were boys; their average age was 16.0 ± 1.3 and 15.7 ± 1.3 years, respectively.

54.8% of the respondents live in Debrecen, in the county seat, 37.3% live in the neighboring towns, the others live in smaller settlements, villages and farms.

Respondents, based on their own judgment, have an average of 3.6 ± 1.7 hours of free time on weekdays and 6.6 ± 1.7 hours on weekends (Figure 1).

50.3% of the respondents said they used to play computer games, on average 1.9 ± 1.4 hours on weekdays, and 3.3 ± 2.0 hours on weekends.

34.1% of young people play on their mobile phones, 29.0% on a computer, 19.1% use video game consoles.

The most popular games are FIFA (15.7%), PUBG and League of Legends (13.2% and 13.0%), and CS: GO (12.6%). 7.9% of the participants play in a competitive way and 2.95% are members of an e-sports association.

86.6% of the respondents said they were doing sports regularly (the term "sports" was defined as continuous physical activity of at least 30 minutes beyond school physical education); concerning frequency 24.1% of the respondents answered they did sports on a daily basis, 47.1% marked the answer "2-3 times a week".

When analyzing the aggregate data in terms of the selected sports the most popular ones are running (22.1%), cycling (21.8%) and conditioning workouts at gyms (21.2%).

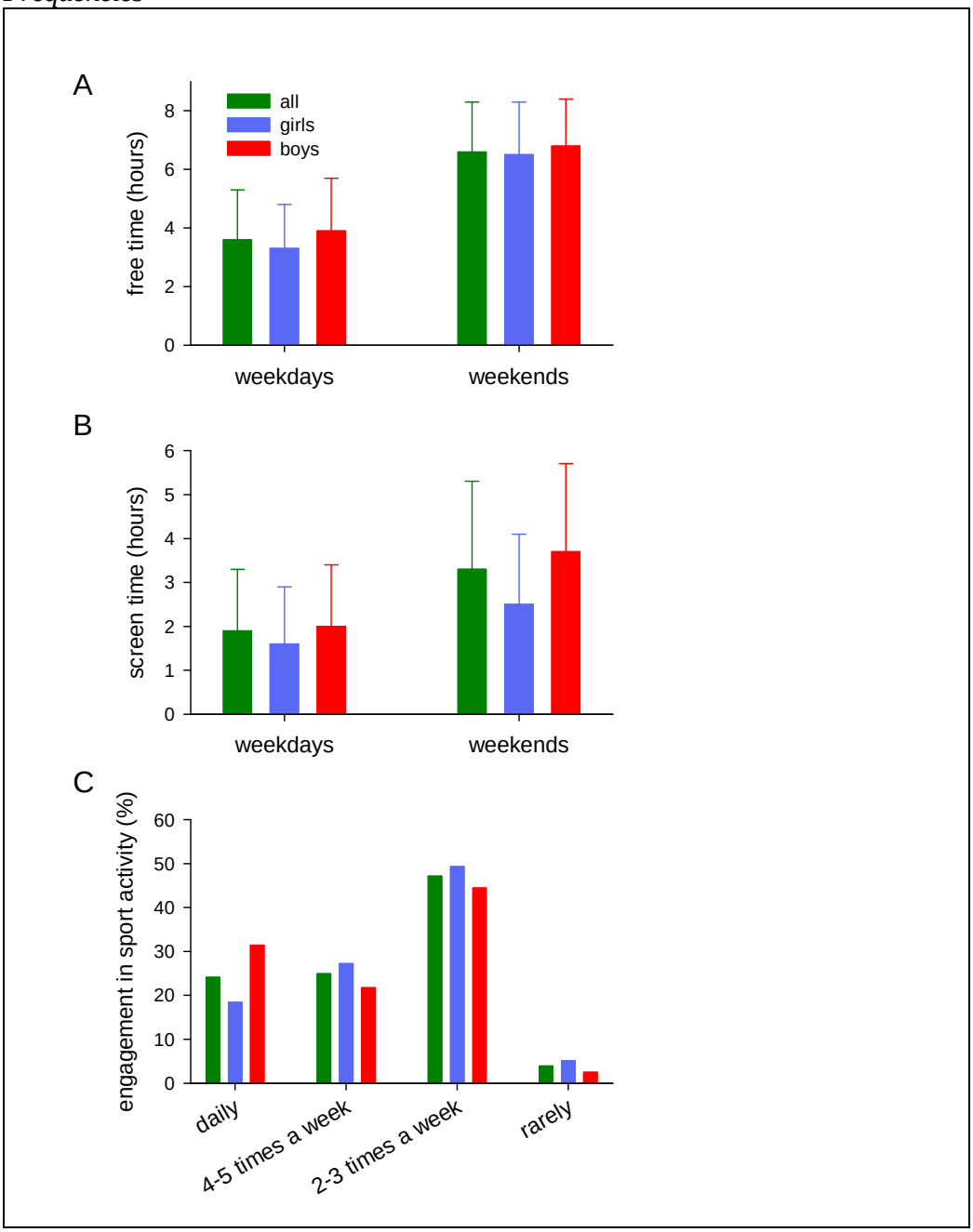
In the case of non-athletes, the most common causes of inactivity were fatigue and lack of time.

Non-athletes mentioned walking (20%), cycling (15.5%) and working around the house (13.8%) as other forms of physical activity.

Gender Differences

When analyzing the gender differences, it can be observed that girls reported significantly less free time both on weekdays (3.3 ± 1.5 hours) and weekends (6.5 ± 1.8 hours) than boys (3.9 ± 1.8 hours; 6.8 ± 1.6 hours) (weekdays: $p < 0.001$, weekend: $p < 0.01$; Figure 1A).

Figure 1. *Self-Estimate of Free (A) and Screen Times (B) during Weekdays and Weekends (C) Percentage of those Engaging in Sport Activity at Different Frequencies*



Source: Authors' Compilations.

When asked if they were playing computer games, only 25.6% of the girls answered yes, compared to boys, 83.8% of whom answered yes. The difference is clearly ($p < 0.0001$) significant.

The time spent on computer games is also significantly different (weekdays: $p < 0.01$; weekend: $p < 0.001$) between the two genders (Figure 1B). While boys spend 2.0 ± 1.4 hours on weekdays and 3.7 ± 2 hours on weekends exposed to

electronic screens, girls spend much less, that is 1.6 ± 1.3 hours on weekdays and 2.5 ± 1.6 hours on weekends.

As far as the platform is concerned, while the most commonly used device is the smartphone in the case of both genders, boys use the computer in the same proportion as the phone. In contrast, the ratio of the second most commonly used device by girls (i.e., the laptop) is just over the half of the ratio of that of the phone.

There was no difference between the genders in terms of the most popular games.

Since the proportion of computer players among girls is much lower than that of boys, the proportion of female members of e-sports associations is also lower than that observed in the case boys. Of the girls participating in competitions only one is a member of an e-sport association, while for boys this value is 25.

Looking at the matter of sports habits, it can be stated that 85.4% of girls and 89.5% of boys do sports on a regular basis. In this respect, there was no detectable difference ($p > 0.2$) between the genders, but at the same time concerning the frequency sporting activities, the ratio of girls doing sports daily was significantly lower ($p < 0.001$).

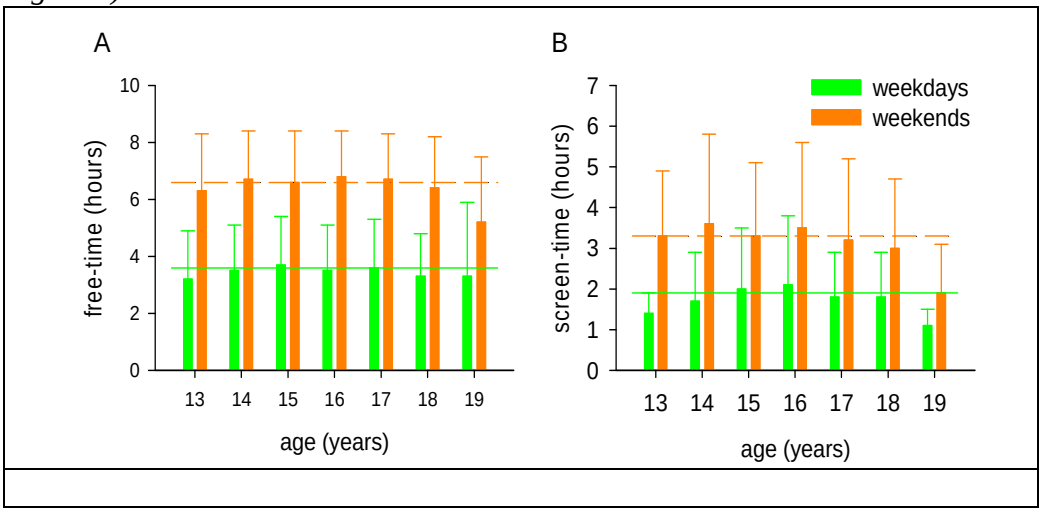
Among boys, football, conditioning workouts at gyms and cycling, among girls, running, cycling and dancing are the most preferred sports.

There are no differences between girls and boys in the most common causes for not doing sports.

Differences between Age Groups

There is no significant difference between the age groups in terms of free time (Figure 2). On the other hand, the time spent on playing decreases over the age of 16, while the proportion of players participating in competitions and members of associations increases with age.

Figure 2. *Self-Estimate of Free (A) and Screen Times (B) during Weekdays and Weekends at Different Ages. Horizontal Lines Represent the Average (taken from Figure 1) over the Entire Cohort*

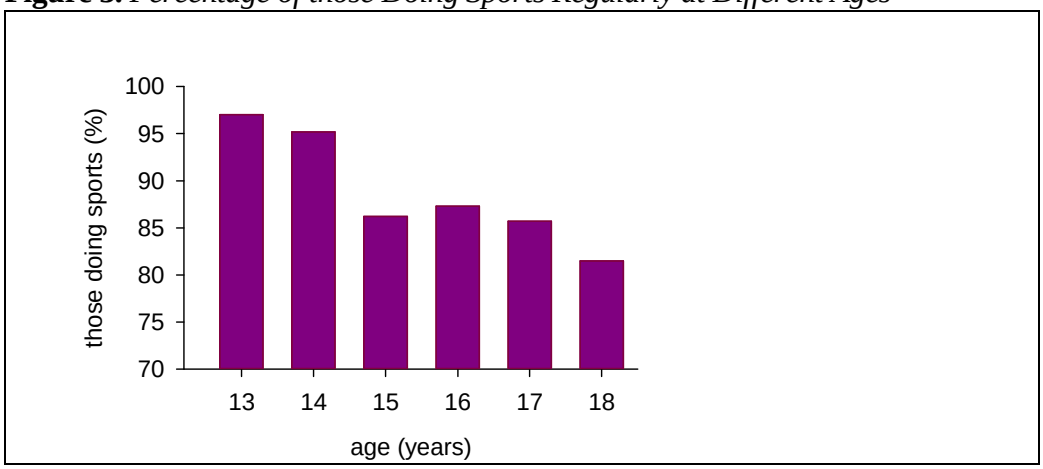


Source: Authors' Compilations.

The proportion of those doing sports regularly decreases with age (Figure 3), with the response rate of lack of motivation as the reason for not doing sports is increasing.

There is a significant difference between 14- and 18-year-olds concerning regular physical activity (95.2% *vs*. 81.5%; p <0.001). The most frequently chosen sports do not change depending on age, but it is noticeable that until the age of 14, the 4th most common sport is swimming, however by the age of 18, hardly any people remain who do this sport.

Figure 3. *Percentage of those Doing Sports Regularly at Different Ages*



Source: Authors' Compilations.

Differences between School Types

We also compared the answers of students of grammar schools and vocational secondary schools. According to the data, the proportion of girls among grammar school students is higher than in vocational secondary schools (61.2% *vs*. 44.6%; p <0.001). The values clearly show that vocational secondary school students have more free time both on weekdays and on weekends (grammar school: weekdays 3.3 ± 1.6 hours, weekend: 6.5 ± 1.7 hours; vocational secondary school: weekdays 4.7 ± 1.6 hours, weekend 7.1 ± 1.7 hours; p <0.001; p <0.001). The proportion of those playing computer games is significantly higher. In spite of this, the time spent in front of the screen is lower than that of their peers (grammar school: weekdays 1.6 ± 1.1 hours, weekend: 3.2 ± 1.9 hours; vocational secondary school: weekdays 2.6 ± 1.9 hours, weekend 3.8 ± 2.2 hours; p <0.001 and p <0.01, respectively).

The proportion of those regularly doing sports is significantly lower among vocational secondary school students (89.5% *vs.* 75.3%; p <0.001). In the case of the selected sports, the most popular one concerning vocational secondary school students is football versus cycling which is in first place in the case of grammar school students.

Residential Differences

Among those who have filled in the questionnaire, we can find people living in county seats (Debrecen), small towns, villages and farms as well. Analyzing the data obtained, it can be concluded that people living in Debrecen reported less free time both on weekdays and on weekends (weekdays: Debrecen 3.6 ± 1.7 hours *vs.* other 4.0 ± 1.7 hours; $p < 0.01$; weekend: Debrecen 6.5 ± 1.7 hours *vs.* other 6.8 ± 1.7 hours, $p < 0.05$). It is assumed that this is due to the higher number of private lessons of Debrecen-based students and the wider range of study groups offered by the respective school.

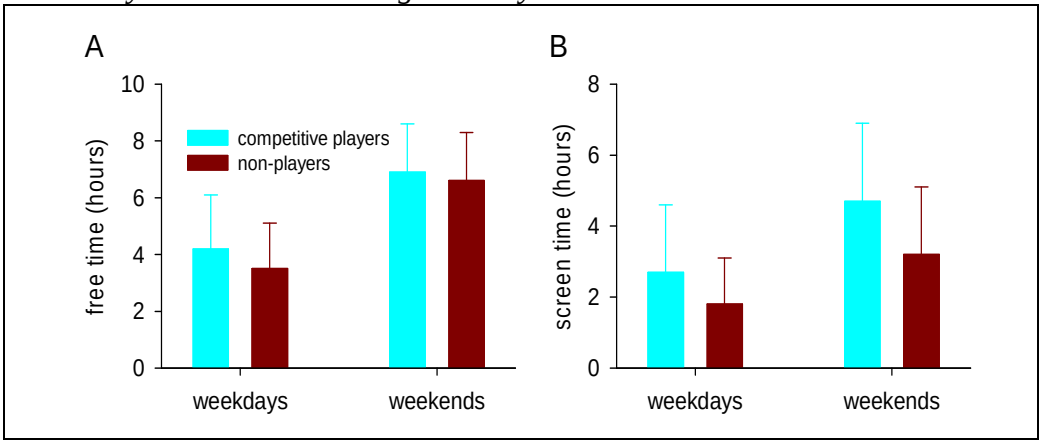
Among the respondents there were 6 people who live on a farm. Although it is not possible to draw statistical conclusions due to the low number of respondents, we would like to note that their answers differed considerably from the others on several issues. Of the people living on a farm, 5 people said they were playing computer games on a regular basis, but in their case only one person had a smartphone, the others played on the computer. They do not have laptops, video game consoles, or tablets. In contrast to the others' 87.3% ratio, only two-thirds of those living on a farm are doing sports. In addition to the lack of time and fatigue, lack of money and health are also among the reasons for not doing sports. In the case of other activities, working around the house and physical work dominate in the answers in contrast to the answers of the others' walking and cycling.

Characteristics of Competitive Players

Of the respondents 70 people said they were playing computer games on a competitive level. If comparing their answers with others' (Figure 4), it is noticeable that they have more free time on weekdays (competitors: weekdays 4.2 ± 1.9 hours, others: weekdays 3.5 ± 1.6 hours; $p < 0.001$). Their time spent in front of the screen also shows a much higher value (competitors: weekday 2.7 ± 1.9 hours, others: weekdays 1.8 ± 1.3 hours; $p < 0.001$).

If looking at weekends – although the competitors report a bit freer time in this case also – the difference is not significant (competitors: weekend 6.9 ± 1.7 hours, others: 6.6 ± 1.7; $p > 0.2$). At the same time, their time spent in front of the screen is significantly higher than that of the others during this period (competitors: weekend 4.7 ± 2.2 hours; others: 3.2 ± 1.9; $p < 0.001$). In the light of this it is surprising that 89.6% of them do sports regularly, 50% of them do so on a daily basis.

Figure 4. *Self-Estimate of Free (A) and Screen Times (B) of Competitive Video-Game Players and Others during Weekdays and Weekends*



Source: Own Compilation.

Discussion

During our research, we interviewed 882 high school students in North-East Hungary about their computer gaming and sporting habits. 50.3% of the respondents spend several hours in front of the screen every day, and –based on their own judgment– spend half of their daily free time playing computer games, however 86.6% of them also do sports on a regular basis. There are significant gender differences among computer gamers: compared to 83.6% of boys, only 25.6% of girls said they used to play such games. In the case of answers concerning sports-related questions, we found a significant difference between the genders regarding the chosen sport and the frequency of doing sports.

Among younger people (13-16 years old) the percentage of gamers is higher, but the time spent playing games does not show age-dependence. Similar to other international studies (e.g., Eurobarometer 2018), the proportion of those doing sports regularly decreases with age, while the lack of motivation increases.

Vocational secondary school students typically reported more free time than their grammar school counterparts, and the percentage of gamers among them was also higher.

E-sports competitors have more free time and of course spend much more time in front of the screen than others. At the same time, the proportion among them doing sports regularly is the same.

As stated in the WHO strategy (Waxman 2004), unhealthy nutrition and physical inactivity have reached a magnitude today that is responsible for 60% of global deaths. These two factors affect health both together and on individual level. The most common element of a sedentary lifestyle is the time spent on mobile phones and computers.

Adult habits are established at a young age, which is why adolescent participation in regular sports activities reduces the likelihood of developing unhealthy lifestyle habits in adulthood (Torsveit et al. 2018). For this reason, it is

very important for young people to experience healthy lifestyle habits in their surroundings and thus form these for themselves (González-Valero 2019).

Adolescence is the period when a young child becomes an adult, and due to hormonal changes, he/she is prone to great emotional fluctuations and changes in the nervous system in addition to physical transformation. This period is characterized by frequent stressful situations and feelings, as a result of which young people are emotionally vulnerable (Költő and Zsiros 2013).

If the risks at this stage of life are further increased by habits harmful to health, the likelihood of developing diseases will continue to grow also. Unhealthy lifestyle, such as physical inactivity, inadequate nutrition, long time spent in front of the screen, lack of sleep all emerge as a global trend in the world, and unfortunately there is an increase in the likelihood of cardiometabolic diseases, obesity and further psychological illnesses among children as well (Pereira et al. 2015, Mack et al. 2017).

Research related to this matter unequivocally emphasizes the importance of regular sports at an early age (Dumith et al. 2011, Guthold et al. 2010), highlighting the significance of sports in the case of genetic factors that make one disposed to obesity (Celis-Morales et al. 2019).

Conclusions

Our results clearly show, in line with previous observations, that high school students, especially boys, spend a significant amount of their free time in front of a television or computer screen. An import component of this is either participating in or playing video games or watching e-sports events. This raises several concerns. First and foremost, the time for other free time activities, including physical exercise, is reduced with all the health-related consequences. Second, when sitting in front of the screen people usually pick up unhealthy eating habits as well, namely, drinking sugary beverages and consuming large amounts of food with fat and salt again contributing as risk factors for the non-communicable chronic diseases. Finally, as evidenced from our data, some of the most popular computer games are those which include combat and fighting the extensive use of which might result in behavioral disorders.

One of the most important platforms for solving the problem analyzed above could by the family. Although not assessed here, parental responsibility in shaping a child's lifestyle is indisputable. Other important factors are physical education in schools, everyday physical activity organized within the school, and the passion for exercise transmitted from educators and PE teachers to children. The built environment also has a significant impact on shaping the free time habits of young people. For this reason, it can be concluded that it is us, the adults of today who are shaping the adult habits of future generations. It is the responsibility of all of us to let children grow up to healthy adults. However, cross-border cooperation all over the EU is needed to achieve comprehensive results.

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