

QUALITY OF LIFE: THE CONTRIBUTION OF A FOOTBALL VIEWING CENTER TO NOISE POLLUTION IN AN URBAN CITY

Francis Olawale Abulude^{1,2*}, Samuel Dare Fagbayide³, and Akinyinka Akinnusotu⁴

¹Department of Chemistry, Federal University of Technology, Minna, Niger State, Nigeria

²Science and Educational Development Institute, Akure, Ondo State, Nigeria
Akure, Ondo State, Nigeria

³Department of Agricultural and Bio-Environmental Engineering, The Federal Polytechnic, Ilaro, Ogun State, Nigeria

⁴Central Analytical Laboratory, Science Laboratory Technology Department, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria

^Corresponding author: walefut@gmail.com

Abstract

Noise pollution is an environmental problem due to its effect on hearing and other related health issues. The elevated noise levels above standard limits cause hearing loss and other attendant problems. In Nigeria, viewing centers where football matches are watched via satellite are known as ‘Mini Stadium’. In this study, the noise pollution of a viewing center was assessed. To do this, five top teams each from the English Premier League (EPL), La Liga, Bundesliga, League 1, and Serie A were selected for the assessment. A sound level meter (GB: 2266204, made in China) was used for the monitoring. The range of noise levels in dBA showed as follow: EPL (56-108); La Liga (46-106); Bundesliga (54-102); Serie A (49-101); and Ligue 1 (54-101). The results when compared with the standard limits, it was observed that part of the results exceeded the limits, this means that the viewers and others within the viewing center may be prone to the hearing problem. It is recommended that acoustic insulators and hearing aids should be used to reduce the attendant problems associated with noise.

Keywords: Noise, hearing aid, viewing center, mini stadium, sound level meter, Bundesliga

Introduction

Noise is generally unfiltered sound, irregular frequency, and unwanted sound. Studies have shown the correlations between noise and health this means noise have side effects (damage to physiological health) on human health (Firdaus and Ahmad, 2010; Savale, 2014; Jariwala et al., 2017; Rink, 2018; Brandon, 2018; Panhwar et al., 2018).

Goal 1, one of the Sustainable Development Goals set by the United Nations General Assembly in 2015 is ‘No Poverty’ (UN, 2018). Nigeria is making headway in this regard. The federal and state governments and microfinance banks are making funds available for the establishments of small scale businesses. Part of the use of the funds is the establishments of football viewing centers (Fig 1) popularly called ‘mini stadium’ Yes, mini stadia are providing sources of income to the owners, but in terms of environmental hazards – ‘Noise Pollution’ are they culprits? Generally, people visit the viewing centers to watch sports, especially football live matches (foreign leagues) interest were developed in certain club sides thereby leading to the establishments of fan clubs. According to Adetiloye (2018), many Nigerians love football, but

the majority cannot watch it at their homes due to the high cost of cable subscription, hence they prefer the option of watching at the viewing centers.



Fig 1. A typical viewing center in Nigeria. Source: Complete Sports (accessed 21st May 2018)

Sport no doubt is essential for physical fitness and entertainment of individuals. One of the interesting sporting activities and popular game is football, which is watched in the stadium throughout the world. Due to one reason or the other, not all football spectators or lover would be in the stadia, one of the alternatives is football viewing centers located at convenient locations. During the course of watching the game, there were actions and reactions which produce sound. The question now is what is the level of sound produced? Is it within the recommended limits for sound? What effect can it have on human and animals within and outside the vicinities?

This study was aimed at assessing the levels and the impact of noise on hearing thresholds at a viewing center in Akure, Ondo State, Nigeria to do this, twenty-five foreign team matches were used as case studies using a sound level meter.

Materials and Methods

Akure (Lat: 7°15'0.00"N; Long: 5° 11' 42.00'E) with a population of 421,100, the largest city and capital of Ondo State is located in the Southwest of Nigeria (Latitude.to (v1.33 beta), 2018). It is a fast-growing urban area with increases in vehicular movements, hotels and recreation centers, population, estates, business centers, and other developments.

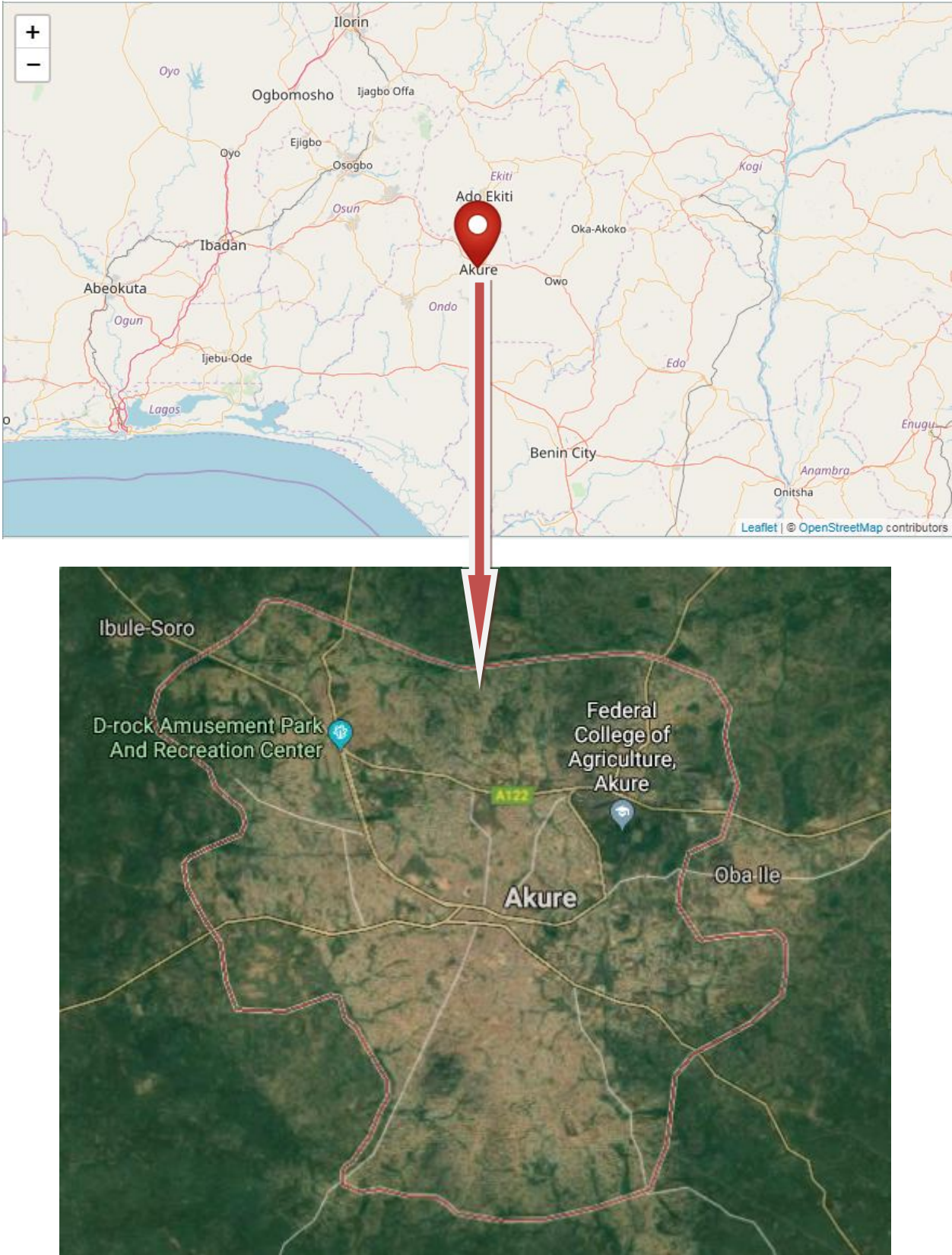


Fig 2: The location of the noise assessment

This research work was carried out on live matches played in EPL, La Liga, Bundesliga, Serie A, and Ligue 1 which were viewed at a viewing center. In each of the leagues, five top teams were chosen. Twenty-five matches played by each team were watched and each of the matches was monitored with a sound level meter (GB: 2266204, made in China): Measurement range 30dBA - 130dBA, accuracy (± 1.5 dB), frequency range (31.5Hz - 8KHz) and power supply (3*1.5V AAA battery). The meter was switched on, after 1sec the screen LCD panel displayed the sound level of the current environmental noise, then **MIN**imum button was pressed, a value appeared, replacing the current environmental noise when this value was stabilized, it was read as the **MIN** sound level of the noise source. The same procedure was applied to the **MAX**imum reading. Noise level readings (dBA) were taken directly from the noise sources (Abulude et al., 2018). The generated values (triplicates) were statistically analyzed using Minitab 16 and Microsoft Excel Statistical Softwares.

Results and Discussion

Table 1 showed the sound levels recorded at the viewing center. The highest noise levels (56 and 108 dBA) produced by the viewers were recorded during the matches that involved Manchester City, Arsenal, and Chelsea (Fig 3). Likewise, in the La Liga, the highest sound produced by the viewers was 106 dBA (Fig 4). Barcelona, Real Madrid, and Atletico Madrid viewers produced averages of 83.92, 81.60, and 76.76 respectively. Also, in Bundesliga league, Bayern Munich and Borussia Dortmund matches, noise levels were above 100 dBA (Fig 5). The viewer's noise obtained during Italia Serie A was below 100 dBA (Fig 6), and lastly, the French Ligue 1 only match that was above 100 dBA was recorded from the viewers during the matches that involved Paris Saint Germain (PSG) with a mean value of 76.96 (Fig 7). In comparison with the standard limits set by NESREA (1991), NIOSH (2001), and OSHA (2014) for 8 h/day, it was observed that the noise levels produced by the viewers during the live matches were well above considering the fact that each match did not exceed 2 h/day. From the results of each league, it could be deduced that the matches involving teams from the EPL, La Liga, and Bundesliga which produced high noise could cause more problems for the viewers and other within the environment of the viewing centers. In line with NIDCD, (2014) noise with decibel level from 100-115 dB can cause damage to the ear, the use of earplugs is recommended for the prevention of the ear problem. It is paramount too to make use of this plug whenever one is visiting a viewing center to watch football matches especially the ones involving the top teams in each of the league games. Fig 8 is the presentation of radar charts (polygonal shapes) showing the multivariate data on the noise levels in the results. From the origin to the points on the axis, the radii depicted the matches watched that gave the highest noise levels. These were the matches that involved Chelsea (EPL), Barcelona (La Liga), Bayern Munich (Bundesliga), PSG (Ligue 1), and Inter Milan (Serie). This could be as a result of high numbers of fans present at the viewing centers during the match days. However, the noise levels obtained in the study were above the standard limits.

During the study, it was observed that the following reasons accounted for the elevated noise levels: (i) jubilation after goals were scored, (ii) when a losing team equalized or goals were tallied, (iii) when a match was won, (iv) goalmouth scramble, (v) missed scoring chances, (vi) the use of vuvuzelas, (vii) whistles, (viii) screaming fans, just to mention a few.

In comparing the results obtained in this study with others, it was observed that the results were not comparable with 140 dBA obtained for live matches at the 2010 FIFA world cup (Morris et al., 2013), 123-140 dBA noise obtained at a football game (Barnard et al., 2011); 105 and 124 dBA reported at a hockey match (Cranston et al., 2013), and lastly, 121-141 dBA obtained in a six-day badminton tournament held in Sweden (Sjödén, 2018). In a study carried out on the effects of noise on sports officials by Flamme and Williams (2013), it was observed that at 104 dBA an unprotected official is at risk of hearing loss. According to Ammon et al., 2015, there are various ways of spending leisure times.

Fig 9 showed the matrix plots which are the graphical representation of the correlation of variables. Not all the rows and columns showed linear correlations, but there were correlations which showed generally elevated noise levels at the viewing centers. Figure 10 depicted the boxplot of noise levels obtained for all the top clubs. It showed the minimum, maximum, median, first quartile and the third quartile of data obtained. The box (interquartile range) and the whiskers (the two lines outside the box) were used for comparing the distributions. The boxplot that had a large interquartile range showed that there was a high level of noise. In this end, all the matches viewed that involved Chelsea, Manchester City, Tottenham United, and Arsenal (EPL), PSG, Olympique Marseille, and AS Monaco (Ligue 1), Barcelona, Sevilla, and Atletico Madrid (La Liga), Bayern Munich, Borussia Dortmund, and RB Leipzig produced high volume of noise.

Conclusion

The study was undertaken to assess the noise levels in a viewing center in Akure, Nigeria. Five top teams from different continents were selected for the study. The results obtained were compared with WHO, NESREA, OSHA, and NIOSH. Based on this, it was observed that the levels of noise due to the viewers were higher and above the standard limits. The implication of this is revelation of a potential danger to the hearing problem of the viewers and people around the centers. The causes of high noise levels were identified as a high number of fans, goalmouth scrambles, misses, goals, the award of penalties just to mention a few. To reduce the hearing problems of the individual viewers, hearing aids should be used, and if the management of the center is financially buoyant good acoustic insulators should be used as sound proofs.

Acknowledgment

The authors are grateful to Abulude Ifeoluwa for his assistance in the sampling.

Conflict of interest

The authors have declared no conflict of interest.

Funding

There were no funds for the study.

Table 1: Summary of the sound level recorded during each club's matches

Clubs	Range (dBA)	Mean	Std Dev	CoefVar	Skewness	Kurtosis
Premier League						
Liverpool	64-90	72.32	6.90	9.54	1.00	0.27
Manchester City	65-106	78.92	12.99	16.46	0.44	-0.86
Arsenal	56-108	79.12	12.64	15.98	0.47	-0.30
Tottenham	56-99	82.64	12.13	14.68	-0.28	-0.79
Chelsea	64-108	80.16	13.65	17.03	1.17	1.57
Spanish (La Liga)						
Barcelona	63-106	83.92	13.47	16.05	-0.02	-1.30
Sevilla	54-98	68.76	12.31	17.91	0.96	0.23
Atletico Madrid	65-98	76.76	10.75	14.00	0.73	-0.78
Real Madrid	65-105	81.60	11.13	13.64	0.37	-0.67
Alaves	46-89	69.96	9.76	13.95	0.09	0.88
Germany (Bundesliga)						
FC Schalke 04	54-97	69.12	10.09	14.60	0.82	1.31
FC Bayern Munich	66-102	81.24	11.04	13.58	0.30	-0.94
Borussia Dortmund	61-102	77.76	12.89	16.57	0.50	-1.06
SV Werder Bremen	54-98	70.20	10.70	15.24	0.68	0.48
RB Leipzig	56-98	75.88	10.63	14.01	0.44	-0.26
Italy (Series A)						
Juventus F.C	56-99	76.44	10.94	14.31	0.32	-0.34
Inter Milan	54-98	72.00	12.33	17.13	0.58	-0.31
AS Roma	56-88	70.92	10.34	14.58	0.21	-0.96
AC Milan	55-99	70.12	11.41	16.27	0.90	0.37
SSC Napoli	49-88	69.44	11.32	16.30	-0.08	-0.89
French (Ligue 1)						
Paris Saint-Germain F.C	60-101	76.96	12.48	16.22	0.45	-1.06
Olympique Lyonnais	56-87	66.76	7.57	11.34	0.82	0.82
Olympique de Marseille	54-89	68.88	9.67	14.03	0.35	-0.43
FC Nantes	54-77	66.20	6.08	9.19	-0.17	0.05
AS Monaco	56-96	71.68	11.07	15.44	0.69	-0.49
Standard Limits						
Concha-Barrientos <i>et al.</i> (2004)	85dBA					
NESREA (1991)	90dBA (8 h/day)					
OSHA (2014)	90dBA (8 h/day)					
NIOSH (2001)	85dBA (8 h/day)					

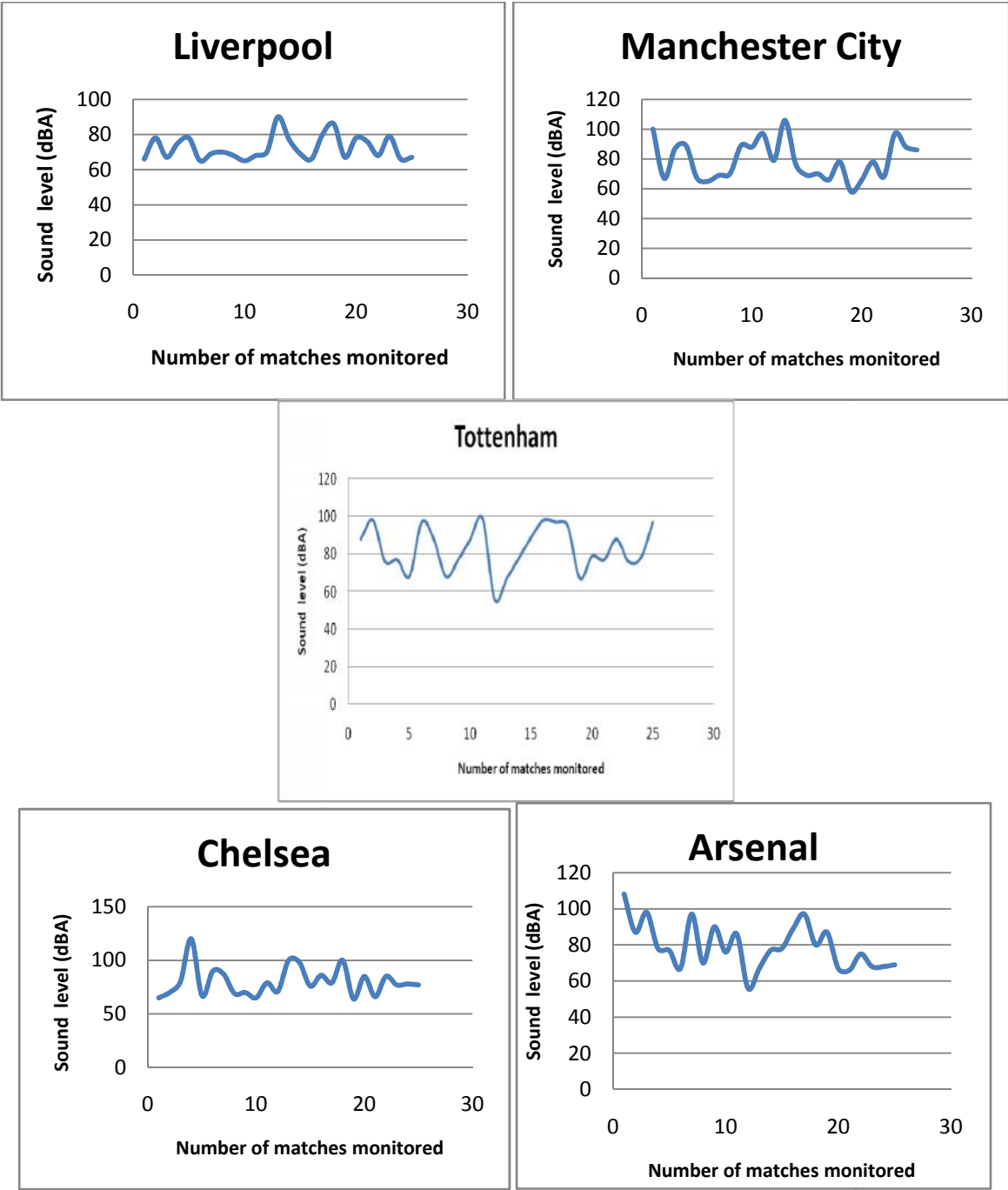


Fig 3. Noise levels obtained from five top English Premier League matches (English Clubs)

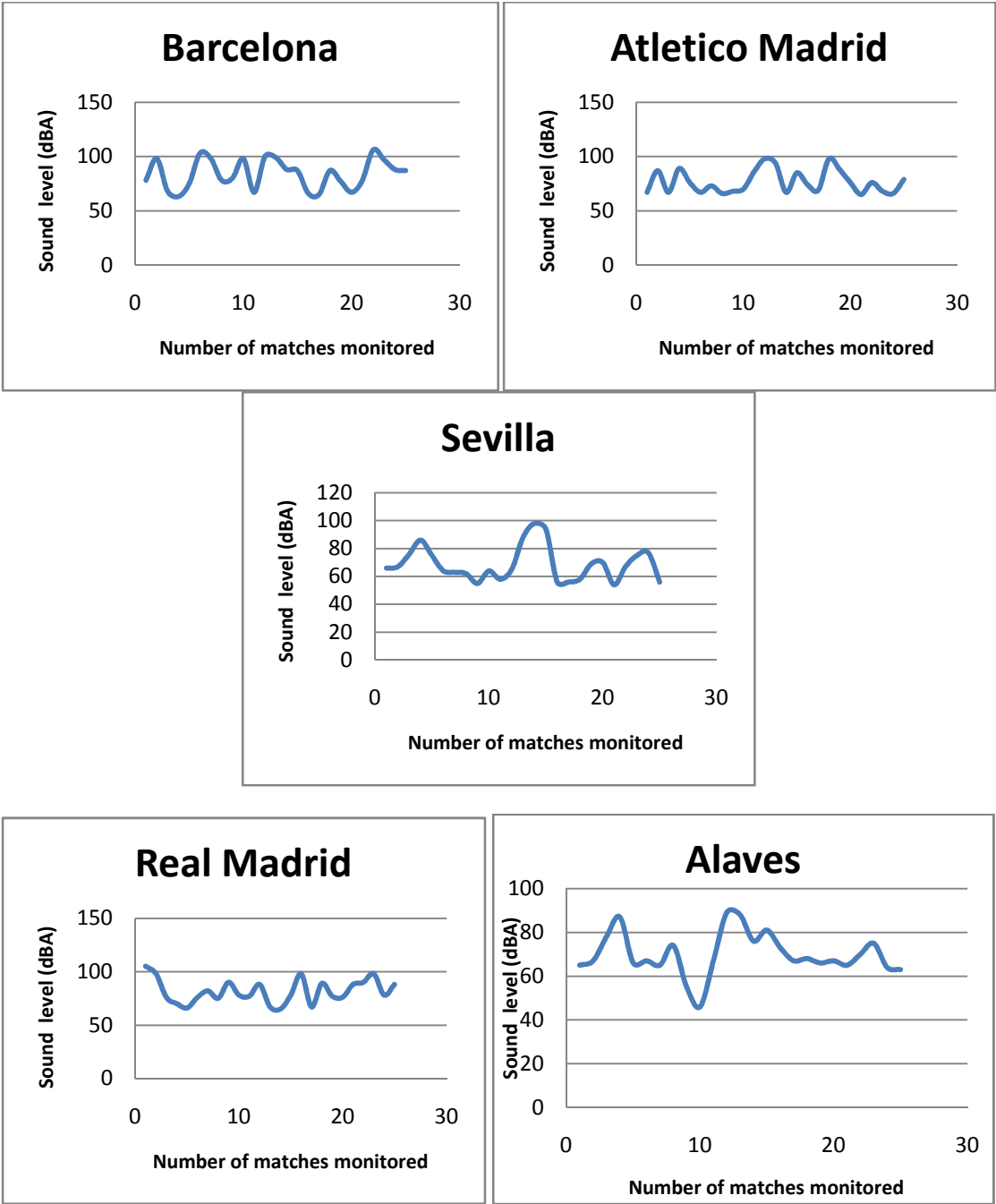


Fig 4. Noise levels obtained from five top La Liga League matches (Spanish Clubs)

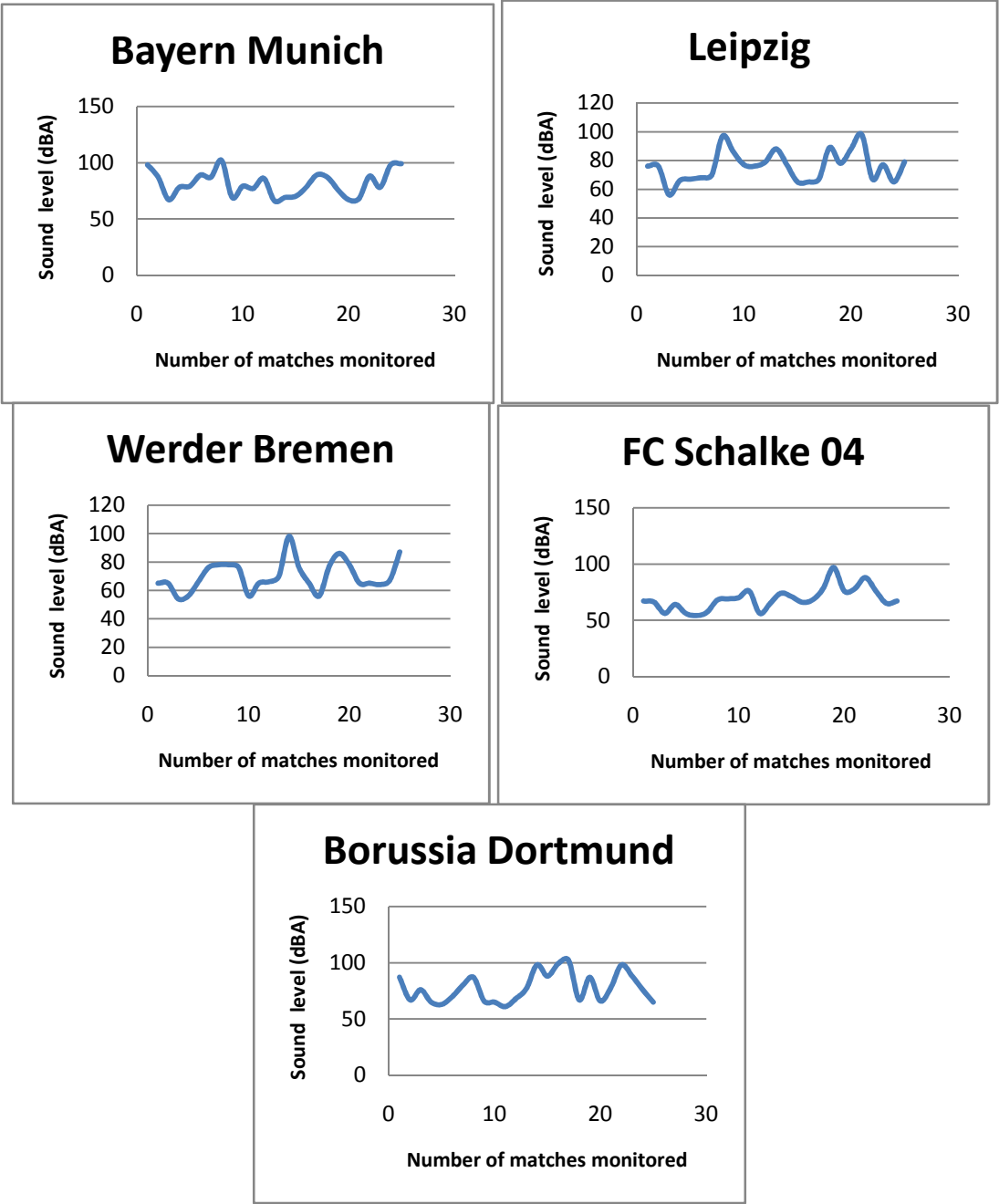


Fig 5. Noise levels obtained from five top Bundesliga League matches (German Clubs)

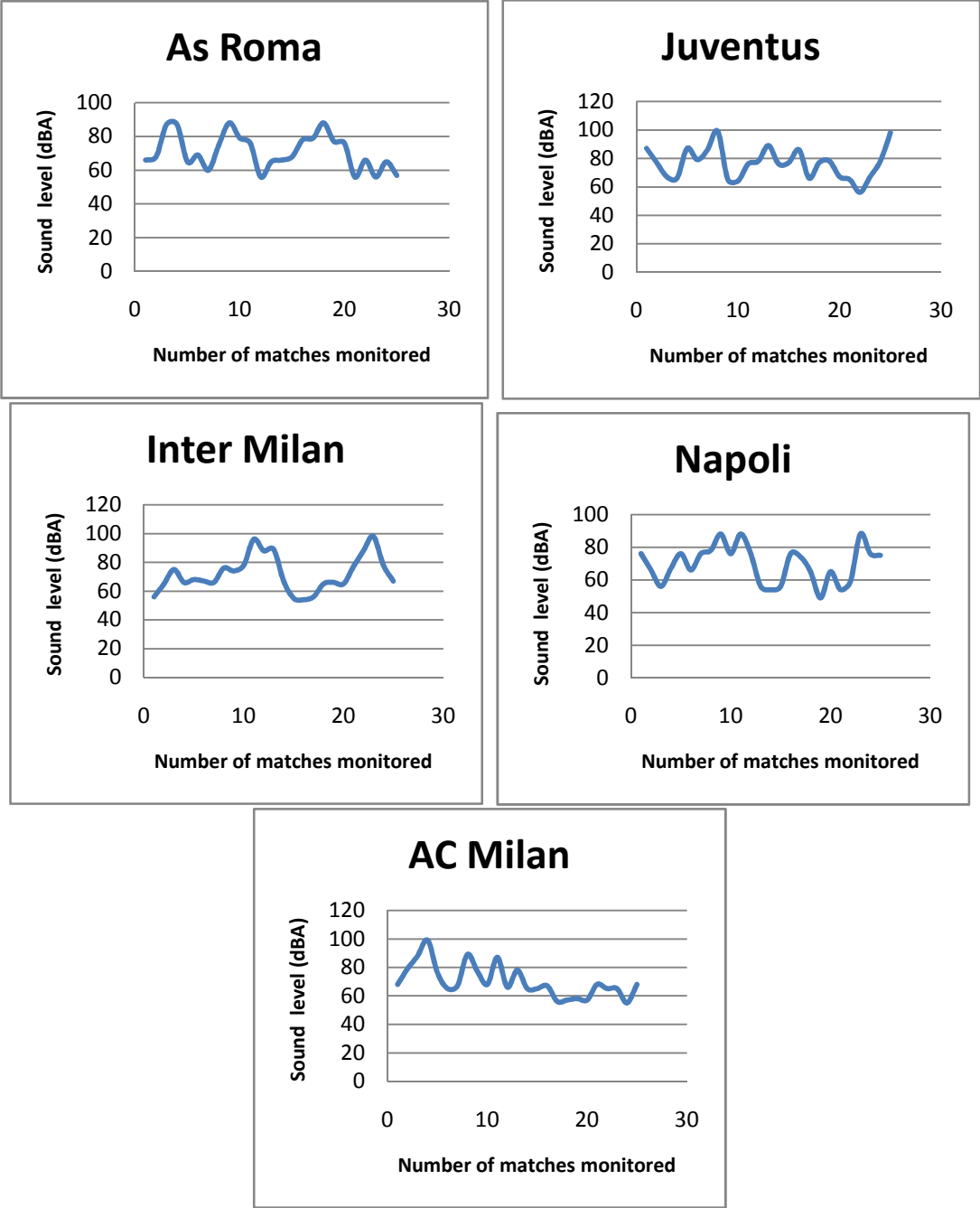


Fig 6. Noise levels obtained from five top Serie A matches (Italian Clubs)

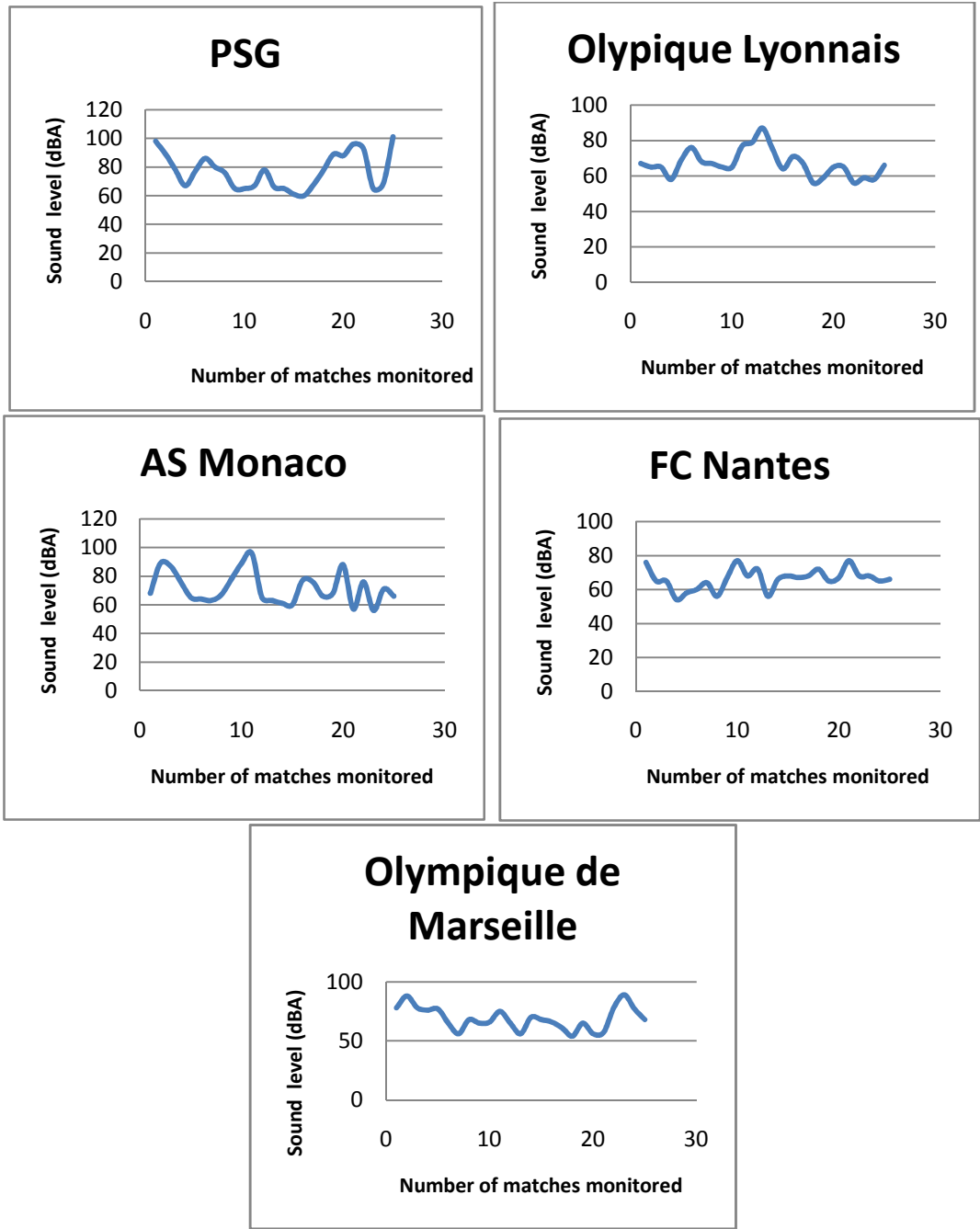


Fig 7. Noise levels obtained from five top Lique 1 matches (French Clubs)

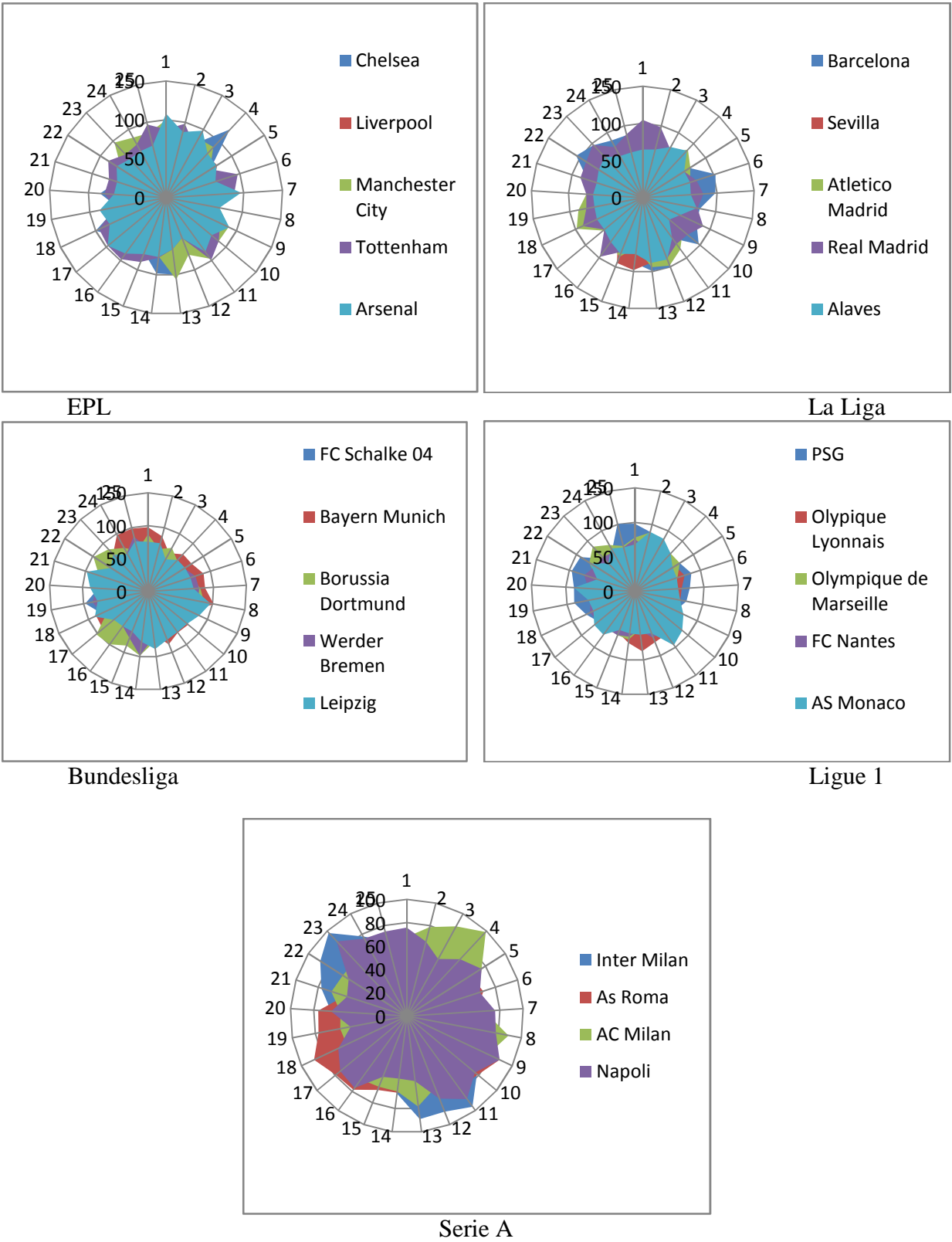


Fig 8. Radar analysis data of noise levels obtained for all the top clubs



Fig 9. Matrix plots of noise levels obtained all the top clubs

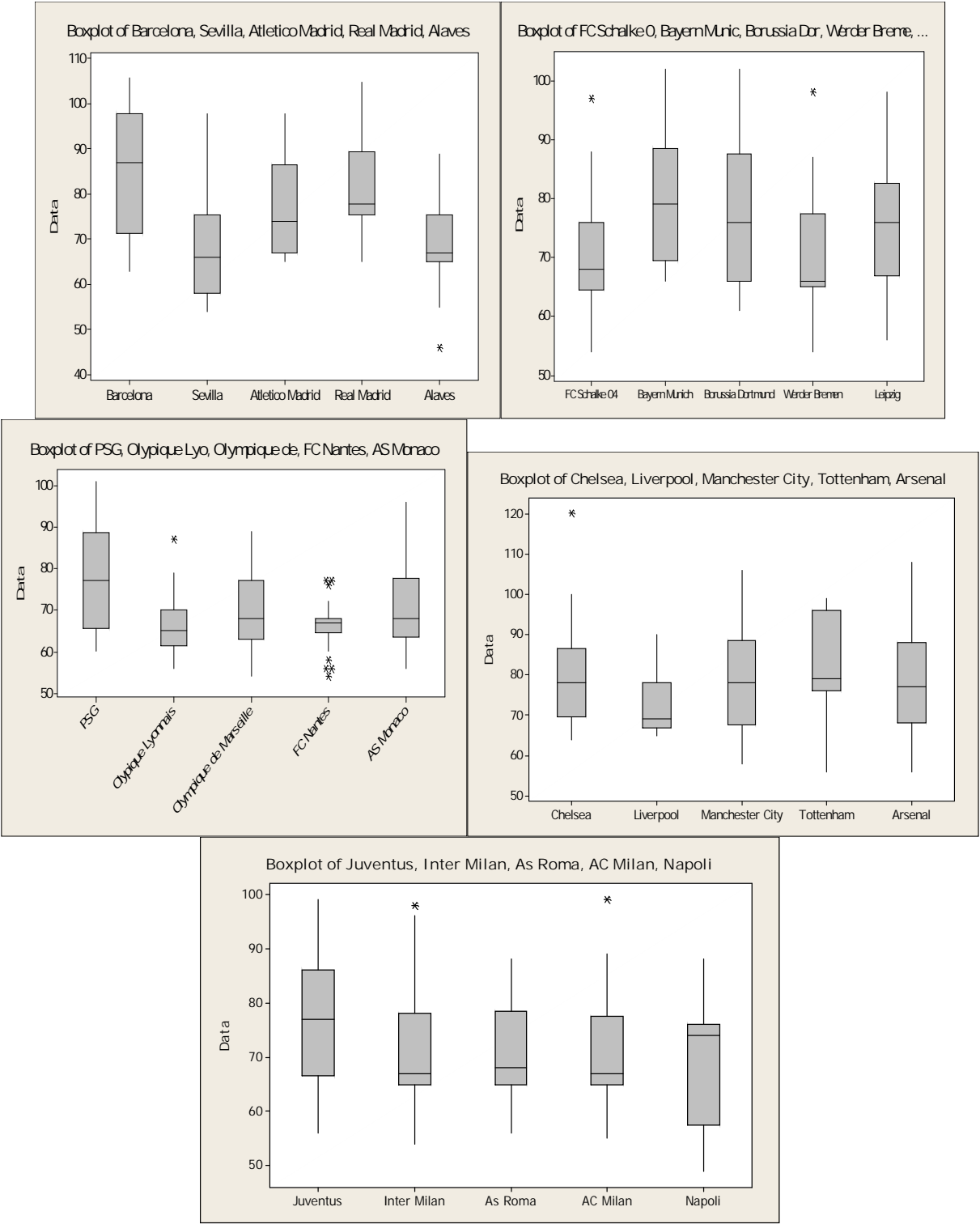


Fig 10. Boxplots of noise levels obtained for all the top clubs

References

Abulude F.O., Fagbayide S.D., and Akinnusotu A (2018). Assessments of noise levels from noise sources in Akure, Nigeria: a preliminary study. *Iraqi J. Sci.*, In press.

Adetiloye D (2018). Football viewing center business plan in Nigeria. <https://dayoadetiloye.com/football-viewing-centre-business-plan-in-nigeria/>, Accessed 12th November 2018.

Ammon R, Mahoney K, Fried G, Al Arkoubi K., and Finn D (2015). Roar of the crowd: Noise-related safety concerns in sports. *J. Legal Aspects of Sports*. 25, 10-26.

Barnard, Andrew, Scott Porter, Jason Bostron, Ryan Termeulen, and Stephen Hambric. 2011. "Evaluation of Crowd Noise Levels during College Football Games." *Noise Control Engineering Journal* 59 (6): 667-80.

Brandon P (2018). Noise pollution ad older adults-A real health hazard. <http://www.ageucate.com/blog/noise-health-hazard-seniors-dementia/>.

Concha-Barrientos M., Campbell-Lendrum D., and Steenland K. (2004). Occupational noise. Assessing the burden of disease from work-related hearing impairment at national and local levels. Environmental Burden of Disease Series, No. 9. World Health Organization Protection of the Human Environment Geneva. https://www.who.int/quantifying_ehimpacts/publications/en/ebd9.pdf.

Complete Sports (2018). Science Shows That Watching Football Is An Emotional Rollercoaster. <https://www.completesportsnigeria.com/science-shows-that-watching-football-is-an-emotional-rollercoaster/>. Accessed 21st May 2018.

Cranston, Cory J., William J. Brazile, Delvin R. Sandfort, and Robert W. Gotshall. (2013). "Occupational and Recreational Noise Exposure from Indoor Arena Hockey Games." *Journal of Occupational and Environmental Hygiene* 10 (1): 11-6.

Firdaus G and Ahmad A (2010). Noise pollution and Human Health: A case study of municipal corporation of Delhi. *Indoor and Built Environment*, <https://doi.org/10.1177/1420326X10370532>.

Flamme, G.A., and Williams, N. (2013). Sports officials' hearing status: Whistle use as a factor contributing to hearing trouble. *Journal of Occupational and Environmental Hygiene*, 10(1), 1–10. doi:10.1080/15459624.2012.736340.

Jariwala H.J., Syed H.S., Pandya M.J., Gajera Y.M (2017). Noise pollution and Health: A review. file:///C:/Users/USER/Downloads/NAP2017paper_HiralJariwala.pdf. Uploaded in ResearchGate on 29 August 2017.

Latitude.to (v1.33 beta), (2018). GPS coordinates of Akure, Nigeria. <https://latitude.to/articles-by-country/ng/nigeria/34527/akure> (Accessed 18th December 2018).

Morris, Gary A., Bassam H. Atieh, and Randal J. Keller. 2013. "Noise Exposures: Assessing an NCAA Basketball Arena on Game Day." *Professional Safety* 58 (8): 35.

National Environmental Standards and Regulations Enforcement Agency (NESREA). National Environmental Protection (Effluent Limitation) Regulations [S.I. 8 of 1991.] under section 40 [15th August, 1991].

National Institute for Occupational Safety and Health (NIOSH) (2001). General estimates of work-related noises. DHHS (NIOSH) Publication No. 2001-104

National Institute on Deafness and Other Communication Disorders (NIDCD). (2014). Noise-induced hearing loss. Retrieved from <http://www.nidcd.nih.gov/health/hearing/pages/noise.aspx>.

Occupational Safety and Health Administration (OSHA). (2014b). Penalties. Retrieved from https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=OSHACT&p_id=3371

Panhwar M.A, Memon D.A., Bhutto A.A., and Jamali Q.B (2018). Noise pollution on human health at industrial site area Hyderabad. *Indian Journal of Science and Technology*, Vol 11(31), DOI: 10.17485/ijst/2018/v11i31/130436.

Rink, Taylor (2018) "Development of Wireless Sensing Unit for Environmental Noise Monitoring". *17th Annual Celebration of Undergraduate Research and Creative Performance (2018)*. Paper 14. https://digitalcommons.hope.edu/curcp_17/14.

Sjödin F (2018). Noise exposure and hearing related risks for technical officials during a major badminton tournament. <https://jacobsublishers.com/noise-exposure-and-hearing-related-risks-for-technical-officials-during-a-major-badminton-tournament/>.

Savale P. A (2014). Effect of Noise Pollution on Human Being: Its Prevention and Control. *J. Environ. Res. Develop.* Vol. 8 No. 1026-1036.

UN (2018). About Sustainable Development Goals. United Nations. <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>. Accessed 8th November 2018.