EXPLORATORY SPATIAL ANALYSIS OF HIT DISTRIBUTION IN RECURVE ARCHERY

Hayri Ertan¹, Fikret Er¹, Andrew J. Callaway²

¹Anadolu University, Eskisehir/Turkey
²Bournemouth University, Bournemouth/UK.

Introduction

An end consists of either 3 or 6 arrows in archery. Archers walk to the target to score and retrieve their arrows. The scores are typically written on a sheet of paper without having exact information on the location of each arrow (Ertan et al., 2005). As the arrows are only scored from highest to lowest, this level of data input has limitations in the degree of analysis. Distribution patterns of the hits on the target and their spatial positioning are not possible to evaluate with traditional scoring methods. Because of that, some certain scientific methods are needed to identify spatial patterns of the hits on the target and explain the patterns in relation to sport archery (Callaway & Broomfield, 2012). Exploratory spatial data analysis is a statistical method to make observations from a sample of points upon an underlying continuous spatial distribution (Haining et al., 2000 & Jhonson, 2001). So, the purpose of the current study is to define hit distribution patterns on recurve archery target by using exploratory spatial data analysis methods among archers at different performance levels.

Methods

9 high-level, 13 middle-class and 7 beginner archers were volunteered to participate in the current study. Each archer shot 72 arrows in the distance of 18 m. The hits on the target were photographed after each end and they have been placed on a coordinate system for further analysis by using a Matlab script. Scattered diagrams and box plots have been drawn of each archery group.

Results

The mean values of the hits on target for each group were analyzed, identifying the difference between the values of x and y-axis. The high-level archers have the closest mean values (x-axis=-0.7898±2.2005 and y-axis=-1.2358±1.9448) to the center of the target. Their standard deviations are also lower than the other groups. The mean values (x-axis=1.5589±11.7983 and y-axis=1.4600±14.3393) of beginner archers’ hits are closer to the center of the target compared to the middle-class archers (x-axis=-4.1850±5.8041 and y-axis=1.0308±4.2571). However, the highest standard deviation values have been measured from beginner archers.

Discussion

The mean values of the hits on the target have been compared if there have been any difference between the values of both axis. The only statistically significant difference in between x-axis and y-axis values has shown in the beginner group (p<0.002). It can be concluded that the high-level, middle-class and beginner archers have high accuracy-high precision, low accuracy-high precision and high accuracy-low precision respectively.

References