South African Journal for Research in Sport, Physical Education and Recreation, 2012, 34(1): 1-11.
Suid-Afrikaanse Tydskrif vir Navorsing in Sport, Liggaamlike Opvoedkunde en Ontspanning, 2012, 34(1): 1-11.
ISBN: 0379-9069

DISTANCES AND SHOOTING ZONES AS A FUNCTION OF MASS OF BASKETBALL AMONG 9- TO 11-YEAR-OLD MALE PLAYERS

José L. ARIAS*, Francisco M. ARGUDO** & José I. ALONSO***
**Department of Physical Activity and Sport Sciences, Catholic University St. Anthony of Murcia, Murcia, Spain*
***Department of Physical Education, Sport and Human Movement, Autonomous University of Madrid, Madrid, Spain*
****Department of Plastic, Musical and Dynamic Expression, University of Murcia, Murcia, Spain*

ABSTRACT

The goal of this study was to analyse with which ball the participants attempted a greater number of shots and achieved more successful shots from distances greater than four meters and from positions outside the free throw lane. The 54 participants included nine to 11-year-old children from six basketball teams. Three situations were established in which the participants played four games with each of the following balls: a regulation ball (485g, 69-71cm); a ball of smaller mass (440g, 69-71cm); and a ball of greater mass (540g, 69-71cm). The procedures that followed included: defining the variables; instructing the observers and obtaining reliability; monitoring the properties of the ball and filming the games; and recording the data from the observation. Kruskal-Wallis H was applied to determine in which categories there were significant differences. Then, post-hoc comparisons were performed with Mann-Whitney's U to determine with which balls these differences occurred. The results did not reflect any statistically significant differences for attempted and successful shots from any distance and shooting zone with any ball. Shots were attempted with greatest frequency from a distance of less than four meters and from inside the free throw lane with all three balls.

Key words: Basketball; Mini-Basketball; Children; Rule modification; Team sport; Game analysis.

INTRODUCTION

Various studies support the use of basketball equipment that is suitable to children's characteristics and needs (Isaacs & Karpman, 1981; Juhasz & Wilson, 1982; Satern *et al*., 1989; Regimbal *et al*., 1992; Chase *et al*., 1994). Children normally lack the strength and physical characteristics that are required for the use of equipment and rules of adult sport (Evans, 1980; Kirk, 2004). However, no studies performed during real games were found that analyse whether the decrease in ball mass contributes to youth players' not concentrating their throws predominantly inside the free throw lane.

Motor praxeology has conceptualised each sport as a motor system (Parlebas, 1999). Each motor system is defined by a set of rules. The rules determine four types of participants' relationships that cause the game action to emerge: (a) with other participants; (b) with the game space; (c) with the equipment; and (d) the way they must adjust to the game time.

When changing a rule of the motor system, such as the game ball, game actions may change. This requires the use of studies that analyse game action. Game action is revealed in motor behaviours that can be objectively observed.

The ball is one of the most important pieces of equipment that mediates confrontation in team sports. The literature consulted in the area of motor learning and development recommends a ball with a smaller circumference (63.83cm) to learn to dribble (Burton & Welch, 1990). An increase in the circumference tends to make throwing more difficult (Burton *et al*., 1992).

A literature review of youth basketball found several studies that analysed the effect of ball dimensions through shooting tests. These studies indicated that a ball of smaller dimensions (496-538.65g and 70.8-73cm) led to better shot technique (Regimbal *et al*., 1992) or did not impair it (Satern *et al*., 1989), satisfied the children's preferences (Regimbal *et al*., 1992), increased levels of perceived self-efficacy (Chase *et al*., 1994), and increased shot efficacy (Isaacs & Karpman, 1981; Regimbal *et al*., 1992) or did not impair it (Satern *et al*., 1989; Chase *et al*., 1994).

Piñar (2005) conducted a study during actual youth games. One of the goals was to increase the number of shot attempts from distances greater than four meters and from positions outside the free throw lane. Piñar (2005) modified a series of rules during two championships and found differences in the percentage of the distances and shooting zones after introducing the modifications (0-3m: 70% vs. 56.2%; 3-4m: 22.7% vs. 26.8%; more than 4m: 7.3% vs. 17%; free throw lane: 70.1% vs. 56.2%). Arias *et al*. (2011) compared the effect of two shapes of the three-point line on the shooting zone, among other variables. The results revealed an increase in the percentage of shot attempts from distances greater than four meters (2.3% vs. 1.3%) and from positions inside the free throw lane (56.4% vs. 50.3%) with the three-point line delimited by the free throw lane. After analysing the positions during the regular season, Piñar *et al*. (2002) found that most of the shots were attempted from inside the free throw lane (81%).

Studies have shown that changes in ball mass may improve shot performance and other ball-handling skills. However, the studies have paid little attention to the effect of modifying ball mass on the shot during real games in youth basketball. The changes to be made in youth basketball rules should favour shooting from distances greater than four meters and from outside the free throw lane, to allow greater variability in this behaviour (Wissel, 1994; ASEP, 1996; Piñar *et al*., 2002, 2003; Piñar, 2005; Arias *et al*., 2011). The shot is the action that youth basketball players most prefer (Palao *et al*., 2004). Children claim to derive the most fun from shooting, and it is one of the aspects they feel best performing (Piñar *et al*., 2007). Shooting near the basket produces higher percentages of efficacy (Cruz & Tavares, 1998; Piñar *et al*., 2003; Tavares & Gomes, 2003). However, this does not justify children not shooting from other distances and zones, from the time they begin their initial training. Shots from distances greater than four meters and from outside the free throw lane are the least frequent shots during the game (Cruz & Tavares, 1998; Piñar *et al*., 2002, 2003; Tavares & Gomes, 2003; Piñar, 2005; Ortega *et al*., 2006; Arias *et al*., 2011). Thus, such shots are the ones that should be favoured. Depriving children of these experiences means limiting their training in the most important content of the game. Working on shooting variability is necessary in youth basketball. Quantity and the variability of practice are essential variables in the process of training children (Thomas, 1994; Schmidt & Lee, 2005).

PURPOSE OF THE STUDY

The goals of this study were: (a) to analyse with which ball the participants attempted a greater number of shots from distances greater than four meters and from positions outside the free throw lane; and (b) to verify whether the number of successful shots from a distance greater than four meters increased. In accordance with the literature consulted, the hypothesis was that the frequency of attempted and successful shots from a distance greater than four meters and from the outside of the free throw lane would increase with a ball of lower mass.

METHODOLOGY

Participants

The participants included 54 children (age: M=10.63, SD=0.55) from 6 basketball teams, aged between 9 to 11 years. They had practised basketball on official, federated teams for 2.52 years (SD=0.75). Each week, they practised an average of 3.57 (SD=0.51) days for a total of 5.03 (SD=0.80) hours. The teams were federated and played regionally. The sample consisted of 2 100 ball possessions from 12 games, of which 736 corresponded to the 4 games played with the regulation ball (485g), 660 to the 4 games played with the ball of smaller mass (440g), and 704 to the 4 games played with the ball of greater mass (540g). The selection of the teams and players was deliberate, because these teams fulfilled the following inclusion criteria: (a) that the teams participate in all the scheduled games; and (b) that the children from each team are the same in all the games. The selection of the ball possessions was through total sampling (Anguera, 2003). The parents of the participants and the coaches completed an informed consent form to participate in the study. The Research Ethics Committee of the university approved the study.

Experimental design

Three situations were established that consisted of all participating teams playing with three balls that differed only in their mass: four games with the regulation ball (485g, 69-71cm); four games with the ball of smaller mass (440g, 69-71 cm); and four games with the ball of greater mass (540g, 69-71cm). A 3-day tournament was organised consisting of 12 games in which the 6 teams were randomly matched. Each day, the teams played between 1 and 2 games. The game ball for each game was also randomly chosen. Among all the teams, 4 games were played with each ball. Each team played a minimum of 1 game and a maximum of 2 games with each ball.

The ball mass was selected according to the most extreme proposals within those of least mass included in studies about ball modification and in agreement with the proposals stating that the difference between balls should be greater than 57g (Chase *et al*., 1994) and 60g (Juhasz & Wilson, 1982). For the lower mass, one near to 467.76g was selected as proposed by Satern *et al*. (1989). For the higher mass, approximately between 538.65g proposed by

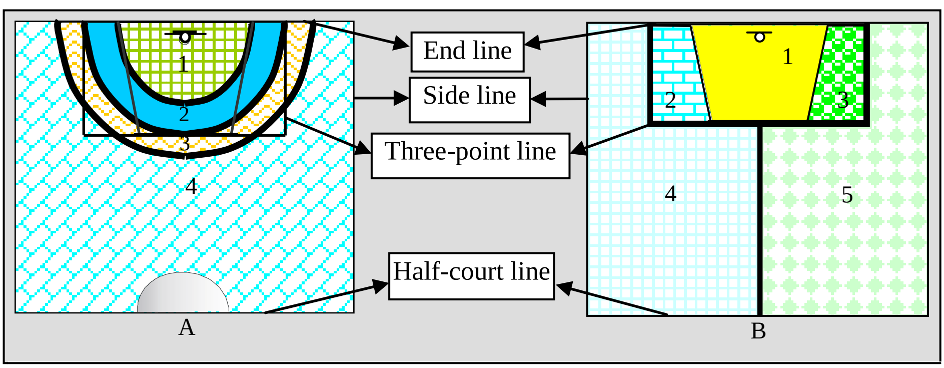
Chase *et al*. (1994) and 552.8g proposed by Isaacs and Karpman (1981), Satern *et al*. (1989) and Regimbal *et al*. (1992) was selected.

The coaches and the players did not know the objective of the study. One month before, the principal researcher informed the coaches that they would play in a tournament: (a) with the balls that the organising committee provided; (b) in which the games would be previously determined; (c) in which all the participants would receive a diploma; and (d) in which they would have to respect the inclusion criteria, as well as the prerequisites of inter-sessional consistency. In all the games, the requirements were: (a) the players were always the same players; (b) the participants played all the games on identical courts (28x15m); (c) rest interval between games was a minimum of 1 hour; (d) each game consisted of 4, 10-minute periods; (e) the participants warmed up with a ball that was similar to the game ball; (f) individual defence was compulsory, (g) the height of the baskets was 2.60m; (h) the balls were the same in texture, colour, circumference and bounce; and (i) the games followed the same rules.

Procedure

A group of 6 experts delimited and defined the variables and their categories. Three of the experts were researchers who specialised in basketball. The other 3 experts were coaches with experience of coaching 9 to 11-year-old basketball players. The categories for each variable were exhaustive and mutually exclusive (Anguera, 2003; Gorospe *et al*., 2005). The categories were coded using a numeric system to facilitate its register. The variables were the following:

1. *Shooting distance* [Distance from which the participants shot (Piñar, 2005)]. The categories were (Figure 1A): from 0-3m; from 3-4m; from 4-5m; and greater than 5m.
2. *Shooting zone* [Zone from which the participants shot (Arias *et al*., 2011)]. The categories were (Figure 1B): zone 1; zone 2; zone 3; zone 4; and zone 5.
3. *Successful shots*. The two categories were baskets scored and baskets not scored.



Key: **1**= 0-3m, **2**= 3-4m, **3**= 4-5m, **4**= more than 5m (**A**) and front court zones (**B**)

FIGURE 1: **DISTANCE TO BASKET**

By adapting a Microsoft Excel 2003 worksheet (Microsoft Corporation, United States of America [USA]) a register instrument was created to which a tool was added to capture and process the videos (Virtual Dub, v. 1.7.0.). This instrument allowed the observers to register the number corresponding to each category in the Excel sheet while viewing the recording at a speed of 25 frames per second.

Four observers were trained according to the training stages suggested by Anguera (2003). The observers accumulated a minimum of 30 hours of experience. Observer reliability was obtained through intra-observer evaluation at the end of the training process. For this purpose, the observers observed 123 ball possessions, which meant a 20-minute interval from 2 game periods. Subsequently, the observers again observed the same fragment after 7 days of no observation. Reliability of the observation was measured through an inter-observer evaluation at the end of the observation process. For this assessment, 15% of the ball possessions of the investigation games were used. Thus, the observers observed 5 randomly selected periods, which meant 50 minutes of game and 315 ball possessions. Reliability was calculated with Kappa's coefficient. Observer reliability ranged between 0.95 and 1, and for the observation, it was 1.

In accordance with Crisco *et al*. (2005) in addition to basketball regulations, the properties of the ball that were controlled were: mass; circumference; and bounce height. Three collaborators monitored this for 30 minutes before and after each game, following a protocol that was adapted by Crisco *et al*. (2005). This consisted of taking 3 measurements of each property and calculating the mean. The mass should be 440g for the lightest ball, 540g for the heaviest ball, and 485g for the regulation ball. The circumference should be 69-71cm. To monitor bounce, the collaborators let the ball fall from a height of 1.8m (from the bottom of the ball) and they measured the height it reached after bouncing (at the top of the ball) (Hamilton & Reinschmidt, 1997; Huston & Grau, 2003). Recording the height points and extrapolating them through the calibration mark were the measurements taken. For this purpose, with the video camera (Everio Full HD-GZ-HD7, JVC, Japan) connected to the computer (Acer Aspire 3630, Acer Inc., Taiwan), the image was sent to the Virtual Dub 1.6.15 program. The height of the dribble should be between 1.2 and 1.4m (Hamilton & Reinschmidt, 1997). Measurements with a horizontal component were eliminated.

Two collaborators recorded the games, each one with a video camera (Everio Full HD-GZ-HD7, JVC, Japan). The camera was situated transversally to the basketball court, on the opposite side from the scoring table. The camera was placed 5m off the ground and 2m from the side-line. The focus was on the centre of the court and with the open field in order to record the greatest possible space. The camera rotated on the tripod axis when necessary. As a general rule, the recording included the player with the ball, the court, and the basket, in addition to the rest of the players.

The four observers recorded the data using a systematised register from the observation of the game videos (Anguera, 2003). The unit of analysis was ball possession. The study variables were coded on the registry instrument (Anguera, 2003; Gorospe *et al*., 2005). The observers used a protocol of observing each ball possession 2 times at real speed in order to increase observation reliability. If necessary, the observers observed each possession at a speed of 25 frames per second. The observers registered the numeric code that corresponded to each variable on which the observation was focused. Each observer observed and registered 3 games.

Statistical analyses

The statistical analysis of the data was performed with the Statistical Package for Social Sciences (SPSS) v. 17.0 for Windows (SPSS, Inc., USA). Descriptive analyses through frequencies and percentages were conducted. The normality of the data was determined with the Kolmogorov-Smirnov test. From this test, it was determined that the data were non-parametric. The Kruskal-Wallis H was used to assess the categories in which there were significant differences. Then, post-hoc comparisons were performed with Mann-Whitney's U to determine with which balls these differences occurred. Statistical significance was set at $p \leq 05$.

RESULTS AND DISCUSSION

The goals of this study were: (a) to analyse with which ball the participants attempted a greater number of shots from distances greater than 4 meters and from positions outside the free throw lane; and (b) to verify whether successful shots from a distance greater than 4m increased. The results did not confirm the hypothesis.

TABLE 1: **FREQUENCIES, PERCENTAGES AND SIGNIFICANT DIFFERENCES OF MEANS OF COMPARED VARIABLES**

Variables	**Ball** 440g		Regulation		540g		χ^2	**p**
	n	%	n	%	n	%		
Distance								
0-3m	309	46.8	301	40.9	308	43.8	4.975	.084
3-4m	32	4.8	26	3.5	28	4.0	1.571	.456
4-5m	14	2.1	17	2.3	18	2.6	0.286	.867
More than 5m	62	9.4	50	6.8	65	9.2	3.935	.140
Zone								
Zone 1	309	46.8	301	40.9	308	43.8	4.957	.084
Zone 2	11	1.7	15	2.0	17	2.4	0.951	.622
Zone 3	35	5.3	28	3.8	29	4.1	2.038	.361
Zone 4	32	4.8	22	3.0	35	5.0	4.366	.113
Zone 5	30	4.5	28	3.8	30	4.3	0.489	.783
Successful shots								
From less than 4m	150	44.0	135	41.3	128	38.1	2.429	.297
From more than 4m	25	32.9	19	22.9	15	22.4	4.957	.077

As shown in Table 1, the results reflected no statistically significant differences either for shots from any distance and shooting zone or for successful shots from distances smaller and greater than 4m, with any ball. These results do not seem to agree with the studies consulted about improvement of shooting performance and other handling skills when reducing ball mass (Isaacs & Karpman, 1981; Burton & Welch, 1990; Regimbal *et al*., 1992; Pellett *et al*., 1994). Nor is this result in accordance with the proposals stating that the difference between the balls to be compared should be greater than 57g (Chase *et al*., 1994) and greater than 60g (Juhasz & Wilson, 1982).

The greatest number of attempted shots with the 3 balls occurred from a distance of 0-4m. In contrast, the smallest number of attempted shots with the 3 balls occurred from a distance greater than 4m. These values were 11.5% for the 440g ball, 9.1% for the regulation ball, and 11.8% for the 540g ball. When considering the number of attempted shots as the unit of analysis, the results obtained did not produce significant differences. From a distance of up to 4m, the values were 81.77% with the 440g ball, 83% with the regulation ball, and 81% with the 540g ball. These results are similar to the 83% found after the modification of the rules (court size, free-throw line, 3-point line, game duration, and number of players) reported by Piñar (2005).

More shots were attempted with all 3 balls from inside the free throw lane (zone 1). In contrast, fewer shots were attempted with all 3 balls from outside the free throw lane. These values were 16.3% for the 440g ball, 15.8% for the regulation ball, and 12.6% for the 540g ball. The number of shots attempted from outside the free throw lane with the 3 balls was higher than that obtained by Arias *et al*. (2011) when the participants played on the court with the 3-point line delimited by the free throw lane. This result suggests that the 3-point line proposed in the study of Arias *et al*. (2011) did not match the players' possibilities and needs.

When considering the number of attempted shots as the unit of analysis, the results obtained did not produce significant differences. From inside the free throw lane, the values were 74.1% with the 440g ball, 76.39% with the regulation ball, and 73.5% with the 540g ball. The number of shots attempted from inside the free throw lane was less than the 81% found by Piñar *et al*. (2002) after analysing 4 male mini-basketball games in which the participants played without the 3-point line. In contrast, this value was higher than the 69.5% observed by Piñar *et al*. (2003) and the 56.2% obtained by Piñar (2005) after changing the rules. Such large differences in comparison to the study by Piñar (2005) could be due to the series of modifications introduced. It seems that it is necessary to analyse other modifications in the regulations in order to increase the number of shots from outside the free throw lane.

The percentage of successful shots from distances greater and smaller than 4m was similar with all 3 balls, although the differences in percentage were slightly higher with the 440g ball. Moreover, from a distance greater than 4m, there are signs of statistical significance, which indicates that the differences in percentage were near to not being a cause of randomness. These results suggest that the ball of lesser mass did not facilitate success when increasing the distance to the basket. Various studies allude to the fact that the reason why children are not more successful is the absence of strength (Juhasz & Wilson, 1982; Chase *et al*., 1994; Cleary *et al*., 2006), but the ball of lesser mass of this study did not lead to the players' increasing their successful shots. These results are similar to those found by Satern *et al*. (1989) and Chase *et al*. (1994), who reported no positive effect with the ball of lesser mass, but they are contrary to those found by Isaacs and Karpman (1981) and Regimbal *et al*. (1992), who reported that the reduction in ball dimensions increased effectiveness.

Nevertheless, the percentage of successful shots with the 440g ball from distances smaller (44%) and greater (32.9%) than 4m was higher than the 39.44% and 20%, respectively, achieved by the participants of the study by Piñar *et al*. (2003).

These results may be related to three arguments. Firstly, shots from a distance of less than 4m and from inside the free throw lane are the most frequent during the game (Cruz & Tavares, 1998; Piñar *et al*., 2002, 2003; Tavares & Gomes, 2003; Piñar, 2005; Ortega *et al*., 2006; Arias *et al*., 2011). This is a consequence of coaches' favouring shots near the basket due to the demands involved in shooting from outside the free throw lane. Thus, players often resort to shooting from outside the free throw lane when they cannot shoot from close positions. Secondly, shots near the basket produce higher percentages of efficacy (Cruz & Tavares, 1998; Piñar *et al*., 2003; Tavares & Gomes, 2003). This increases the levels of perceived self-efficacy and reinforces shooting from zones where the players are more successful (Vollmer & Bourret, 2000; Wilson *et al*., 2007). Thirdly, and due to the above reasons, the shooting pattern with regard to distances and shooting zones seems to be so well-established that it was not affected by a short-term modification in ball mass. The modified component did not produce any critical fluctuation in the context to cause behaviour to change. That is, the ball mass was not a sufficiently relevant stimulus to cause the distances and shooting zones to change. However, this does not justify children's not shooting from other distances and zones from the beginning of their training (Wissel, 1994; ASEP, 1996; Piñar *et al*., 2002, 2003; Tsitskaris *et al*., 2002; Piñar, 2005; Arias *et al*., 2011).

There were several limitations in this study: (a) only boys were studied; and (b) anthropometrical characteristics, biological age, strength, and skill level were not controlled. These conditions may limit the generalisation of the results and restrict them to participants with similar characteristics to those in this study.

CONCLUSION

In conclusion, the present study provides evidence of the effect of the modification of ball mass on variables during real games in youth basketball. The results showed that the distances and shooting zones and successful shots from distances smaller and greater than four meters did not vary with any of the balls. Youth basketball should favour attempted and successful shots from distances greater than four meters and from outside the free throw lane, so that children can practise from different positions (Wissel, 1994; ASEP, 1996; Piñar *et al*., 2002, 2003; Palao *et al*., 2004; Piñar, 2005; Arias *et al*., 2011). This would allow them to discover their possibilities with regard to game constraints. Thus, teachers and coaches would attend to children’s needs, preferences and progress (Palao *et al*., 2004; Piñar *et al*., 2007).

In this study, the lower ball mass did not lead to attempted and successful shots from distances greater than four meters and from positions outside the free throw lane. This result reveals the need to study other modifications. The literature proposes adapting the three-point line (Piñar *et al*., 2002; Piñar, 2005; Ortega *et al*., 2006; Arias *et al*., 2011). Nevertheless, teachers and coaches should not restrict training children in the most important content of the game at the expense of achieving higher efficacy from positions near the basket. They should propose tasks that favour the variability of this behaviour by increasing shooting from distances greater than four meters and from outside the free throw lane. The predominance of these game variables may provide more enjoyable experiences for the children; in turn, they may choose to continue practising basketball and put out more effort for a longer time.

In future studies, other game variables should be studied to assess whether the modification of ball mass (maintaining its circumference) favours a game that is suitable for children's characteristics and needs.

REFERENCES

ASEP (AMERICAN SPORT EDUCATION PROGRAM) (1996). *Coaching youth basketball* (2nd ed.). Champaign, IL: Human Kinetics.

ANGUERA, M.T. (2003). La observación. [Observation] In C. Moreno (Ed.), *Evaluación psicológica. Concepto, proceso y aplicación en las áreas del desarrollo y de la inteligencia* (271-308). Madrid (Spain): Sanzy Torres.

ARIAS, J.L.; ARGUDO, F.M. & ALONSO, J.I. (2011). Effect of two different forms of three-point line on game actions in girls' mini-basketball. *South African Journal for Research in Sport, Physical Education and Recreation*, 33(1): 9-22.

BURTON, A.W.; GREER, N.L. & WIESE, D.M. (1992). Changes in overhand throwing patterns as a function of ball size. *Paediatric Exercise Science*, 4: 50-67.

BURTON, A. & WELCH, B. (1990). Dribbling performance in first-grade children: Effect of ball and hand size and ball-size preferences. *The Physical Educator,* 47(1): 48-52.

CHASE, M.A.; EWING, M.E.; LIRGG, C.D. & GEORGE, T.R. (1994). The effects of equipment modification on children's self-efficacy and basketball shooting performance. *Research Quarterly for Exercise and Sport,* 65(2): 159-168.

CLEARY, T.J.; ZIMMERMAN, B.J. & KEATING, T. (2006). Training physical education students to self-regulate during basketball free throw practice. *Research Quarterly for Exercise and Sport*, 77(2): 251-262.

CRISCO, J.; DREWNIAK, E.; ALVAREZ, M. & SPENCINER, D. (2005). Physical and mechanical properties of various field lacrosse balls. *Journal of Applied Biomechanics,* 21(4): 383-393.

CRUZ, J. & TAVARES, F. (1998). Notational analysis of the offensive patterns in cadets basketball teams. In M. Hughes & F. Tavares (Eds.), *IV World Congress of Notational Analysis of Sport* (112-129). Porto, Portugal: FCDEF-UP.

EVANS, J. (1980). Objectivity and game modification: The next step. *Australian Journal for Health, Physical Education and Recreation,* 89: 13-17.

GOROSPE, G.; HERNÁNDEZ, A.; ANGUERA, M.T. & MARTÍNEZ, R. (2005). Desarrollo y optimización de una herramienta observacional en el tenis de individuales. [Development and optimisation of an observational tool for singles tennis] *Psicothema,* 17(1): 123-127.

HAMILTON, G.R. & REINSCHMIDT, C. (1997). Optimal trajectory for the basketball free throw. *Journal of Sports Sciences,* 15: 491-504.

HUSTON, R.L. & GRAU, C.A. (2003). Basketball shooting strategies - the free throw, direct shot and layup. *Sports Engineering,* 6: 49-64.

ISAACS, L.D. & KARPMAN, M.B. (1981). Factors effecting children's basketball shooting performance: A log-linear analysis. *Carnegie School of Physical Education and Human Movement,* 1: 29-32.

JUHASZ, M. & WILSON, B.D. (1982). Effect of ball size on shooting characteristics of junior basketballers in comparison to adults. *Australian Journal of Sport Sciences,* 2(2): 16-20.

KIRK, D. (2004). Framing quality physical education: The elite sport model or sport education? *Physical Education and Sport Pedagogy,* 9(2): 185-195.

ORTEGA, E.; CÁRDENAS, D.; SAINZ DE BARANDA, P. & PALAO, J.M. (2006). Analysis of the final actions used in basketball during formative years according to player's position. *Journal of Human Movement Studies,* 50(6): 421-437.

PALAO, J.M.; ORTEGA, E. & OLMEDILLA, A. (2004). Technical and tactical preferences among basketball players in formative years. *Iberian Congress on Basketball Research,* 4: 38-41.

PARLEBAS, P. (1999). *Jeux, sports et sociétés. Lexique de praxéologie motrice.* [Games, sport, and society. Dictionary of motor praxeology] Paris (France): INSEP-Publications.

PELLETT, T.L.; HENSCHEL-PELLETT, H.A. & HARRISON, J.M. (1994). Influence of ball weight on junior high-school girls' volleyball performance. *Perceptual and Motor Skills,* 78: 1379-1384.

PIÑAR, M.I. (2005). *Incidencia del cambio de un conjunto de reglas de juego sobre algunas de las variables que determinan el proceso de formación de los jugadores de minibasket (9-11 años).* [Effect of rule modifications on some of the variables that determine the formative process of mini-basketball players (9-11 year olds)] Granada (Spain): University of Granada.

PIÑAR, M.I., ALARCÓN, F., PALAO, J.M., VEGAS, A., MIRANDA, M.T. & CÁRDENAS, D. (2003). Análisis del lanzamiento en el baloncesto de iniciación. [Shot analysis in youth basketball] In A. Oña & A. Bilbao (Eds.), *Actas del II Congreso Mundial de Ciencias de la Actividad Física y el Deporte. Deporte y Calidad de Vida* (202-208). Granada (Spain): Editors.

PIÑAR, M.I.; ALARCÓN, F.; VEGAS, A.; CARREÑO, F. & RODRÍGUEZ, D. (2002). Posiciones y distancias de lanzamiento durante la competición en minibasket. [Positions and shot distances during competition in mini-basketball] In A. Díaz, P.L. Rodríguez & J.A. Moreno (Eds.), *Actas del III Congreso Internacional de Educación Física e Interculturalidad* (127-133). Murcia (Spain): Consejería de Educación y Cultura de la Región de Murcia.

PIÑAR, M.I.; CARDENAS, D.; CONDE, J.; ALARCON, F. & TORRE, E. (2007). Satisfaction in mini-basketball players. *Iberian Congress on Basketball Research,* 4: 122-125.

REGIMBAL, C.; DELLER, J. & PLIMPTON, C. (1992). Basketball size as related to children's preference, rated skill and scoring. *Perceptual and Motor Skills,* 75: 867-872.

SATERN, M.N.; MESSIER, S.P. & KELLER-MCNULTY, S. (1989). The effects of ball size and basket height on the mechanics of the basketball free throw. *Journal of Human Movement Studies,* 16: 123-137.

SCHMIDT, R.A. & LEE, T.D. (2005). *Motor control and learning: A behavioural emphasis* (4th ed.). Champaign, IL: Human Kinetics.

TAVARES, F. & GOMES, N. (2003). The offensive process in basketball: A study in high performance junior teams. *International Journal of Performance Analysis in Sport,* 3(1): 34-39.

THOMAS, K. (1994). The development of sport expertise: From Leeds to MVP legend. *Quest,* 46: 199-210.

TSITSKARIS, G.; THEOHAROPOULOS, A.; GALANIS, D. & NIKOPOULOU, M. (2002). Types of shots used at the Greek national basketball championships according to the division and position of players. *Journal of Human Movement Studies,* 42: 43-52.

VOLLMER, T.R. & BOURRET, J. (2000). An application of the matching law to evaluate the allocation of two- and three-point shots by college basketball players. *Journal of Applied Behaviour Analysis,* 33(2): 137-150.

WILSON, G.; SIMONS, J.P.; WILSON, J. & RODRIGUEZ, W. (2007). The nonemergence of an especial skill: Good is not enough. *Journal of Sport & Exercise Psychology,* 29(Suppl.): 140-141.

WISSEL, H. (1994). *Basketball: Steps to success*. Champaign, IL: Human Kinetics.

Dr. José L. ARIAS: Department of Physical Activity and Sport Sciences, Catholic University St. Anthony of Murcia, Murcia, Spain. Tel.: 0034 968 278 873. E-mail: jlae84@hotmail.com

(Subject Editor: Dr. Maya van Gent)