

Differences between unguarded and guarded shots of winning and losing mini-basketball teams

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Abstract

The main aim of this study was to establish differences between unguarded and guarded shots of winning and losing mini-basketball teams. A total sample of 12 matches played during the 2017–2018 boys U12 championships were analysed. The shots were divided into five basic shot type categories: layup unguarded and guarded; jump shot unguarded and guarded; free throws. We decomposed shot locations by distance (in meters) and divided the court into 4 zones: close range (<2.5 m); mid-range (<5 m) and (5–6.75 m); long range (>6.75 m). Descriptive analysis was performed using the mean of the count of the event and standard deviation. To compare the shot differences of winning and losing teams, Pearson's Chi-squared and Mann–Whitney U tests were applied, and the statistical significance level was set at $p < 0.05$. The effect sizes (ESs) were calculated using Cramer's V test. The most common shot types during U12 mini-basketball championship games were layup (47.7%) and jump shot (52.3%). Compared to losing teams, winning teams made more unguarded jump shots from close range ($p < 0.05$) and more unguarded layups ($p < 0.05$). Winning teams had better shooting accuracy from different distances (both guarded and unguarded), which allowed to assume that they also had a more efficient defence. The obtained results showed large differences between winning and losing teams in unguarded layups made [$p < 0.002$; effect size (ES) = 1.47]. Winning teams also made more unguarded layups (ES = 0.68), unguarded jump shots ($p < 0.004$; ES = 1.18) and missed unguarded jump shots (ES = 0.89). Our study determined that the difference between winning and losing teams was in shooting. Specifically, winning teams made more field goals from different range and had better jump shot and layup field goal percentage from different distances. Though winning teams had better field goal percentage of guarded and unguarded shots, the amount and accuracy of free throws was similar for both losing and winning teams.

Key Words: layup, jump shot, free throws, shot type

Introduction

Shooting is one of the most important skills in basketball; shooting accuracy affected the final score and the overall success of the game (Zambová & Tománek, 2012; Erčulj & Štrumbelj, 2015; Okazaki & Rodacki, 2018). Among various shooting techniques, jump shots provide several advantages such as accuracy (Okazaki et al., 2015), velocity (Podmenik et al., 2017), protection against opponents (Rojas et al., 2000; Oudejans et al., 2002) and execution from several distances from the basket (Okazaki & Rodacki, 2018). Choosing which place of the court is the most efficient to attack from during a specific moment of the game is a complex skill in basketball. It has been proven that on-the-court decision making is a skill that an individual can learn (Llorca-Mirallas et al., 2013).

Mini-basketball players are first taught the techniques of a jump shot and a layup (Podmenik et al., 2017). It is essential to learn the shooting technique at an early age because children can learn new moves faster and more efficiently; thus, it is important to focus on specialized training of the children and not on general training (Kasa, 2006; Zambová & Tománek, 2012; Matulaitis et al., 2019; Dania & Harvey, 2020; Matulaitis et al., 2020). It is determined that layups, jump shots and free-throws are the most common elements in basketball regardless of the age group (Zambová & Tománek, 2012; Calderini et al., 2020).

In previous studies, scientists and coaches aimed to better understand variables that affect shooting performance, e.g., physical characteristics of the player (Matulaitis et al., 2020), playing experience (Okazaki et al., 2015), basket height and ball size or weight (Okazaki & Rodacki, 2005), fatigue (Woolstenhulme et al., 2004), shooting distance (Miller & Bartlett, 1993; Okazaki & Rodacki, 2012), additional technique skills and movements that occur before the shot, field of view (Oudejans et al., 2002), defender's effort (Rojas et al., 2000), and psychological factors (Sushko et al., 2019).

One question, which has not been investigated so far in mini-basketball is how the efficiency of different shots from different distances changes while the player is heavily guarded. In the game of basketball, a player with the ball is frequently in close proximity to one or more opponents during the game. The offensive player is frequently required to perform a jump shot when guarded by an opponent who is trying to block his shot (Rojas et al., 2000; Oudejans et al., 2002).

There have been many studies on high-level basketball teams and youth basketball teams, ages 16–20 (Tavares & Gomes, 2003; Vencúrik et al., 2021), during which differences between winning and losing teams were investigated (Csataljay et al., 2012; Ciampolini et al., 2017). In addition, though there are several studies on the peculiarities of shooting techniques (Okazaki et al., 2015; Podmenik et al., 2017; Okazaki & Rodacki, 2018), there are also studies that analyse various training programs (Zambová & Tománek, 2012; Matulaitis et al., 2020) that search for ways to improve shooting accuracy. However, there is a lack of studies on mini-basketball players. Therefore, it is important to analyse different shots during the game to identify tendencies of winning and losing teams in mini-basketball. Having different shooting statistics of U12 boy’s teams will allow coaches to analyse and correct the training process of their teams to select an optimal game strategy and will allow the players to know what shots from which distances must be improved the most.

The aim of this study was to investigate differences between the winning and losing teams in U12 mini-basketball regarding: (i) the types and number of shots; (ii) shot efficiency from different distances; (iii) how defence impacts shot efficiency; (iv) efficiency and importance of free throws.

Methods

Match sample

A total sample of 12 matches played during the 2017–2018 *Lithuanian School Children Basketball League* boys U12 championship was analysed. The total number of units for statistical analysis collected during these mini-basketball games was 2377 shots, corresponding to each possession of the teams participating in the U12 championship. Table 1 shows the distribution of different shots, various shot types and different distances. All analysed shots were distributed into two groups, i.e., (i) unguarded shots and (ii) guarded shots. The data were obtained from a publicly accessible website (<https://www.youtube.com/moksleiviulyga>). All shots are analysed using the special computer software Kinovea, version 0.8.15 (<https://www.kinovea.org/>).

Table 1. Number of shots analysed by type and range

Shot type and range (metres)	Winning					Losing				
	Close range (<2.5)	Mid-range (<5)	Mid-range (5–6.75)	Long range (>6.75)	Free-throw (4.6)	Close range (<2.5)	Mid-range (<5)	Mid-range (5–6.75)	Long range (>6.75)	Free-throw (4.6)
Made layup unguarded	66					27				
Missed layup unguarded	24					17				
Made layup guarded	123					93				
Missed layup guarded	263					269				
Made jump shot unguarded		49	19	36			13	10	21	
Missed jump shot unguarded		37	31	107			18	26	68	
Made jump shot guarded		47	3	23			36	9	17	
Missed jump shot guarded		85	24	70			91	32	93	
Made free-throw						124				125
Missed free-throw						135				146

The current study protocol was approved and followed the guidelines stated by the University Human Research Ethics Committee and conformed to the principles outlined in the Declaration of Helsinki.

Target Variables

The target variables of winning and losing mini-basketball games were analysed. In our study, shots were divided into 5 basic shot type categories (Erčulj & Štrumbeļ, 2015):

Jump shot: Shooting the ball above the head, looking from under the ball towards the rim. This shot type is the most often used shot-type when shooting from distance but can also be utilized near the basket.

Layup: A one-handed shot made by holding the ball from below and releasing it after an upwards motion of the arm. This shot is typically executed near the basket with jumping from one leg. The layup and jump shots were divided into guarded and unguarded.

Layup unguarded and jump shot unguarded are the shots taken without any disturbance from the defenders.

Layup guarded and jump shot guarded are the shots taken with disturbance from the defenders.
Free throws are shot after contact with an offensive player who is in the act of shooting or after contact with any player if the team committing the foul has already accumulated 4 fouls in the quarter.

The location of the shot on the basketball court with respect to the basket considerably affects shot type selection. We decomposed shot locations by distance (in meters) and divided the court into 4 zones:

Close range shot: A close range shot is a jump shot, layup that is taken anywhere from the basket up to 2.5 m from the basket.

Mid-range shot: A mid-range shot is a jump shot that is taken within the distance of 2.5–5 or 5–6.75 m from the basket.

Long range shot: A long range shot is a jump shot that is taken anywhere from the zone of 3pt line (6.75 or more) and further from the basket.

Reliability

We collected data from 12 games, which were analysed through systematic observation by two experienced analysts (basketball coaches with more than 5 years of experience in basketball performance analysis). The reliability of the data was assessed regarding the actual agreement and Cohen’s kappa (Robinson & O’Donoghue, 2007). Intra-rater test-retest reliability was examined after 10 days by assessing 10 variables randomly selected from 3 games (approximately 198.3 shots per game). The obtained results showed very good kappa values (range = 0.88–0.95) for intra-observer reliability; while inter-observer reliability showed very good values (range = 0.91–0.94) according to Altman (1991).

Statistical analysis

Descriptive analysis was performed using the mean of the count of the event and standard deviation. In addition, a confidence interval (CI) is used, which shows the range (lower and upper) in which, with slight probability, the real indicators exist. To compare differences between the shots of winning and losing teams, Pearson’s Chi-squared and Mann–Whitney U tests were applied, and the statistical significance level was set at $p < 0.05$. The effect sizes (ESs) were calculated using Cramer’s V test, and their interpretation was based on the following criteria: 0.10 = small effect, 0.30 = medium effect and 0.50 = large effect (Robinson & O’Donoghue, 2007). All statistical tests were performed using the software package IBM SPSS version 23.0 for Windows (IBM Corp., Armonk, NY, USA).

Results

Results for all shots types for winning and losing teams are shown in Table 2. Large differences were observed between unguarded layups of winning and losing teams [$p < 0.002$; effect size (ES) = 1.47]. Of note, winning teams more often make unguarded layups (ES = 0.68), unguarded jump shots ($p < 0.004$; ES = 1.18) and miss unguarded jump shots ES = 0.89.

Because winning teams have better shooting percentage, we can state that their defence is more active and efficient. Table 3 and Figures 1 and 2 show that the difference between winning and losing teams is observed in the difference in the efficiency of layups made from close range (<2.5 m): unguarded +11.9%; guarded +6.2%. The situation is similar in the efficiency of jump shots made from close range (<5.0 m) unguarded ($p < 0.005$; ES = 1.12, difference +15.1%), and also from close range (<5 m) unguarded (ES = 0.8, difference + 7.3%). It was also determined that winning teams made more unguarded long-range (>6.75 m) unguarded shots (ES = 0.70, difference +1.6%) and missed shots from long-range (>6.75 m) unguarded shots (ES = 0.72). However, Figure 2 shows that losing teams made more shots from mid-range (5–6.75 m): guarded (ES = -0.78, difference +10.9%), unguarded (ES = 0.50, difference -10.2%). Winning teams shot and made slightly more three-point shots, though the differences are not significant. Winning teams were more efficient from >6.75 m range: unguarded, difference +1.6%; guarded, difference +9.2%.

Table 2. Descriptive statistics and differences between shot types of winning and losing mini-basketball teams

Shot type	Winning		Losing		p-Value	Winning vs. losing teams	
	Mean	SD	Mean	SD		ES (95% CI)	Interpretation
Made layup unguarded	5.50	2.47	2.25	1.48	0.002	1.47 (1.02; 1.92)	Large
Missed layup unguarded	2.00	1.41	1.42	1.31	0.301	0.44 (0.12; 0.76)	Small
Made layup guarded	10.25	3.98	7.75	3.31	0.104	0.68 (0.19; 1.17)	Moderate
Missed layup guarded	21.92	6.54	22.42	6.10	0.794	-0.08 (-0.62; 0.46)	Trivial
Made jump shot unguarded	8.67	4.85	3.67	2.42	0.004	1.18 (0.49; 1.86)	Moderate
Missed jump shot	14.58	6.02	9.33	5.76	0.049	0.89 (0.21; 1.57)	Moderate

unguarded							
Made jump shot guarded	6.33	3.42	5.17	2.12	0.445	0.40 (-0.08; 0.88)	Small
Missed jump shot guarded	14.92	4.48	18.00	6.02	0.259	-0.57 (-1.10; -0.05)	Small
Made free-throw	10.33	4.08	10.42	4.87	0.885	-0.02 (-0.58; 0.54)	Trivial
Missed free-throw	11.25	6.44	12.17	4.49	0.385	-0.17 (-0.81; 0.48)	Trivial

Note: SD: standard deviation; ES: effect size; CI: confidence interval

Table 3. Descriptive statistics and differences between jump shot types and ranges of winning and losing mini-basketball teams

Jump shot type and range (metres)	Winning		Losing		P-Value	Winning vs. losing teams	
	Mean	SD	Mean	SD		ES (95% CI)	Interpretation
Made close and mid-range (<5) unguarded	4.08	2.99	1.08	1.24	0.005	1.12 (0.45; 1.79)	Moderate
Missed close and mid-range (<5) unguarded	3.08	2.23	1.50	1.31	0.059	0.8 (0.30; 1.33)	Moderate
Made close and mid-range (<5) guarded	3.92	2.02	3.00	1.71	0.231	0.49 (0.09; 0.89)	Small
Missed close and mid-range (<5) guarded	7.08	2.91	7.58	3.63	0.642	-0.15 (-0.64; 0.33)	Trivial
Made mid-range (5–6.75) unguarded	1.58	1.68	0.83	1.27	0.210	0.50 (-0.05; 1.05)	Small
Missed mid-range (5–6.75) unguarded	2.58	3.40	2.17	2.13	0.531	0.14 (-0.59; 0.88)	Trivial
Made mid-range (5–6.75) guarded	0.25	0.45	0.75	0.75	0.075	-0.78 (-1.14; -0.42)	Moderate
Missed mid-range (5–6.75) guarded	2.00	1.21	2.67	1.44	0.271	-0.51 (-0.85; -0.16)	Small
Made long range (>6.75) unguarded	3.00	2.0	1.75	1.42	0.082	0.70 (0.24; 1.17)	Moderate
Missed long range (>6.75) unguarded	8.92	4.9	5.67	3.82	0.147	0.72 (0.05; 1.39)	Moderate
Made long range (>6.75) guarded	1.92	1.62	1.42	1.24	0.460	0.35 (-0.10; 0.79)	Small
Missed long range (>6.75) Guarded	5.83	3.04	7.75	5.12	0.381	-0.44 (-1.11; 0.22)	Small

Note: SD: standard deviation; ES: effect size; CI: confidence interval

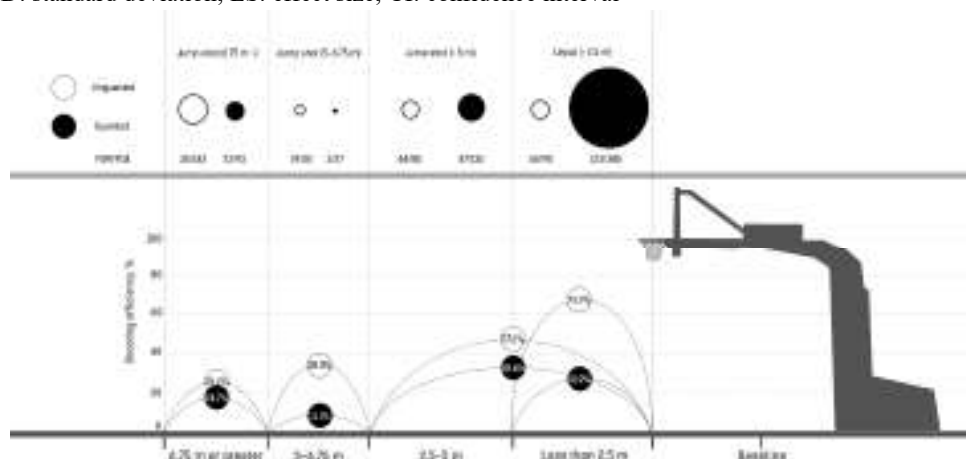


Figure 1. Shooting percentage of different shot types from different ranges of winning mini-basketball teams

Note: FGM: [field goals](#) made; FGA: [field goals](#) attempted

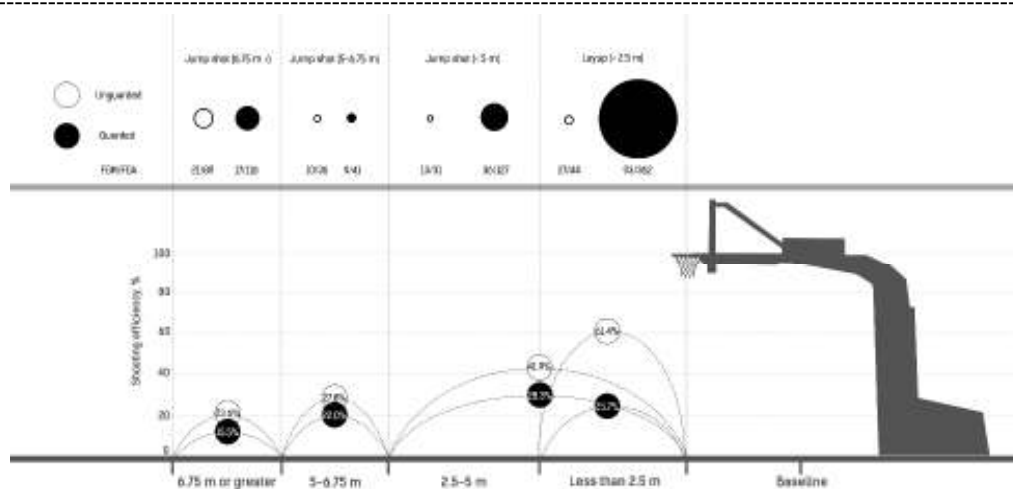


Figure 2. Shooting percentage of different shot types from different ranges of losing mini-basketball teams
 Note: FGM: [field goals](#) made; FGA: [field goals](#) attempted

Discussion

The main aim of this study was to establish that mini-basketball players chose layups (47.7%) and jump shots (52.3%) almost the same number of times. In general, our results suggest that the difference between winning and losing teams is shown in shooting: (i) more field goals from different ranges; (ii) having a better jump shot and layup field goal percentage from different distances; (iii) winning teams have a better field goal percentage of guarded and unguarded shots; (iv) the amount and percentage of free throws are similar.

The obtained results have shown that the most significant differences between winning and losing teams are in making unguarded and guarded layups, which are essential to winning the game. Winning teams also make more guarded and unguarded jump shots. This may be affected by better technical skills of the players and faster break possessions. Layups make up almost half of all shots of winning (47.3%) and losing (48.3%) U12 mini-basketball teams analysed. Calderini et al. (2020) determined that layups make up 20.5% of all shots. That is why it is thought that the number of layups decreases with age.

The performed analysis showed that players miss more than half of guarded layups (winning teams missed 55.3%; losing teams missed 66.3%). This means that during practice, coaches must focus on one-on-one situations during which ending the possession in a guarded layup is drilled. Csataljay et al. (2013) determined that elite winning men’s basketball teams have a higher field goal percentage from close range and from the three-point field goal zone. In addition, there are previous studies that reported similar results in U16 boy’s Eurobasket (Lorenzo et al., 2010) and youth U19 basketball World Cup (Tavares & Gomes, 2003). However, some basketball coaches build up their defensive philosophy to avoid layups from close distance and 3- point shots from set positions after a pass from a penetrating player or a player in the low post. Their philosophy aims to force the opponent to try mid-range jump shots after one or two dribbles. This is considered to be one of the less effective individual technical skills in modern basketball.

Our results showed that winning mini-basketball teams take more shots than losing teams, though the distribution of 2pt and 3pt shots is similar. Winning teams take 76.6% of all their shots from the 2pt field goal zone and 23.4% from the 3pt field goal zone. Losing teams take 76.3% off all their shots from the 2pt field goal zone and 23.7% of all shots from the 3pt field goal zone. Previous studies (Matulaitis & Stonkus, 2009) determined that the number of shots from mid and close range tends to decrease: U16 – 72.3%, U18 – 69.1%, U20 – 62.1% and men – 57.6%; however, the number of long range shots increases: U16 – 27.7%, U18 – 30.9%, U20 – 37.9% and men – 42.4%. The accuracy of close and mid-range shots of winning boy’s U12 teams was 39.8%, losing teams – 42.4%. It was determined that the accuracy of 3pt shots of winning basketball teams was 25.0%, losing teams – 19.1%. Matulaitis and Stonkus (2009) stated that the accuracy of shots from the 2pt field goal zone increases with age: U16 – 38.1%, U18 – 44.5%, U20 – 52.6%, men – 47.1%; the accuracy of 3pt shots is unpredictable: U16 – 28.7%, U18 – 30.4%, U20 – 33.4%, men (elite) – 30.9%. Furthermore, winning teams of Spain’s ACB make more shots from the 2pt field goal zone than losing teams. (Gómez et al., 2008). Moreover, the accuracy of shots depends on the player’s ability to lose the defender before taking a shot. Thus, the player’s individual skill also affects the accuracy of shots (Ciampolini et al., 2018). The other main difference between winning and losing teams was the better shooting performance from long range distance shots guarded. Previous studies determined that defensive pressure greatly affects shooting efficiency and contributes to achieving long-term team success (Gómez et al., 2008; Csataljay et al., 2013). Defensive pressure as a process variable was used to provide a comprehensive explanation for performance differences between shooting efficiency of winning and losing basketball teams. The results of statistical analysis identified differences between shooting percentages and defensive performances of winners and losers.

The obtained results showed that both winning and losing mini-basketball teams made and missed the same number of free throws. Furthermore, the accuracy of free throws was similar: winning teams – 47.9%; thus, coaches must know that their players must have free throw accuracy better than 46.1%. Csataljay et al. (2012) determined that made free throws is a statistically important indicator that positively affects the result of the game.

Conclusions

This study indicates that guarded close range layups were the most commonly used type of shot. Winning teams made more unguarded close range jump shots ($p < 0.05$) and layups ($p < 0.05$) than losing teams. Winning teams also had a better guarded and unguarded shot accuracy from different ranges and distances, which indicated that the defence of winning teams was more efficient.

After analysing a large number of shots, the obtained results can be a great guide for coaches to optimize the training process and to evaluate their players' shooting during the match regarding the chosen shooting type, distance and under what conditions the shot is made. We obtained the following data for 12-year-old boys during the game:

- Unguarded layup (<2.5 m) accuracy: 61.4–73.3%;
- Guarded layup (<2.5 m) accuracy: 25.7–31.9%;
- Unguarded jump shot (<5 m) accuracy: 41.9–57%;
- Guarded jump shot (<5 m) accuracy: 28.3–35.6%;
- Unguarded jump shot (5–6.75 m) accuracy: 27.8–38%;
- Guarded jump shot (5–6.75 m) accuracy: 11.1–22%;
- Unguarded jump shot (>6.75 m) accuracy: 23.6–25.2%;
- Guarded jump shot (>6.75 m) accuracy: 15.5–24.7%;
- Free throw accuracy: 46.1–47.9%.

Compared to previous studies, the results of this study show that mini-basketball players use similar strategies of shooting just like elite players. At the same time, new questions arise regarding the importance of layups in mini-basketball. Future studies will help answer these questions.

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