

The Basketball Pass: A Systematic Review

by

Arturo Quílez Maimón¹, Javier Courel-Ibáñez², Francisco Javier Rojas Ruíz¹

The aim of this study was to review and organise current literature about the basketball pass and find the main factors that influence its learning skills and performance. Thirty-seven studies were included after the screening process. The documents were classified into main research topics. This review identified the following conclusions: (i) the assessment of passing performance should be made under uncertain and variable conditions to obtain information on players' responses to competitive scenarios, (ii) it is advisable to incorporate new and random activities to facilitate the transference of learning to the competition, (iii) it is recommended to include overwhelming factors during the practice to minimise the effect of pressure and choking, (iv) optimal physical conditioning is essential to maintain passing performance during a basketball game, (v) small sided games and changing environments stand as the best training situations to improve passing skills. Furthermore, limited information is available about biomechanical aspects and physical conditioning training programs to improve passing skills in basketball. Likewise, there is sparse data on passing skills development in children.

Key words: team sports, technique, tactics, learning, skills.

Introduction

The basketball pass is the most basic collective interaction and, after shooting, it constitutes the second most common technical action used in the game (Nunes et al., 2016). During the offence, players are required to keep the possession of the ball and cooperate to create optimal shooting options to increase effectiveness. Teams that assist more (i.e., give a pass that leads to a score) are more likely to win the game (García et al., 2013; Gomez et al., 2013). On the other hand, reductions in turnovers (i.e., lost possession) increase the winning odds, particularly in close games (Ribeiro and Sampaio, 2001). According to Gómez et al. (2009) the pass error/success ratio is the main distinguishing factor between starters and non-starters in elite competitions. Therefore, players' performance and season-long success in basketball are particularly based on passing skills.

Hence, studies exploring the basketball pass become essential to improve the training processes and to enhance players' performance

and skills, on an individual and collective basis. Considering the complex nature of the pass, studies should involve technical-tactical, physical and mental factors (Passos et al., 2017). In recent years, sports scientists from different areas of knowledge have paid increasing attention to collective behaviour in basketball (Courel-Ibáñez et al., 2017). Although these contributions provided valuable insights into the basketball pass from isolated perspectives, there is an ongoing challenge to design integrative and holistic approaches, combining as many factors as possible to achieve excellence (Schelling and Torres-Ronda, 2016). In this sense, a better understanding and organization of the current literature on the basketball pass is required to determine which factors are most significant for improving training and performance.

Thus, the aim of the current paper was to systematically review and organise the current literature related to the basketball pass to identify

¹ - University of Granada, Faculty of Sport Sciences, Department of Physical Education and Sport, Granada, Spain.

² - University of Murcia, Faculty of Sport Sciences, Department of Physical Education and Sport, Murcia, Spain.

the most common research topics, the main findings, the shortcomings of the analysis made but, at the same time, the gaps in the specific literature. This information may be of great interest to coaches and instructors, contributing to better characterise the basketball pass processes and subsequent development of training enhancement programs.

Methods

Literature search

Systematic review principles were carried out (Moher et al., 2015; Nakagawa and Cuthill, 2007) to conduct a search on the main electronic databases (Web of Science, Scopus, and Sport Discus) using the following keyword combinations: *Basketball and pass*. The keywords combination was deliberately chosen in order to avoid potential bias, despite the fact that the screening process would last longer. The last search was carried out on January, 2017.

Inclusion and exclusion criteria

Studies written in Spanish, English, and Portuguese languages were inclusion criteria. Studies had to be published from 2000 onwards, be original as well as peer-reviewed. Exclusion criteria were adapted from Courel-Ibáñez et al. (2017): (a) non-regulated basketball competitions, (b) wheelchair basketball, and (c) included sample matches before 2000. Last exclusion criteria were set up because of the modification of rules (i.e., reducing the time from ten to eight seconds for offensive players to pass the ball into the front court, besides the time reduction to take a shot from thirty to twenty-four seconds). No sample restrictions related to age, sex or category were considered.

Identification and selection of studies

Figure 1 presents a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart summarizing the search results. In total, 1402 studies were identified in the original database search from year 2000 onwards (Scopus = 464; Web of Science = 574; SportDiscus (full text) = 364). After removing duplicates, the first stage of screening of titles was performed to reduce the amount of studies. Manuscripts not eliminated (257) were subjected to a second-stage screening of articles assessed for eligibility based on inclusion and exclusion criteria (67). At the end of the process a total of 37 studies were included

for current systematic review.

Results

A summary of included studies in the systematic review is provided in Tables 1, 2 and 3. There has been a significant growth in basketball pass publications in the last years (2010-2017: 26/37, 70.2%). Overall, this review comprised: 25,458 ball possessions, 843 matches, 1,090 players and 124 coaches/experts. The present review identified five areas of knowledge explored. Studies were summarized and classified accordingly: performance analysis (n = 16), biomechanics (n = 3), physical conditioning (n = 6), mental factors (n = 5) and motor skills (n = 12). Studies explored three game situations: match (n = 24), analytical situations (n = 7) and small sided games (n = 6). The majority of studies explored male samples (n = 21) or both sexes (n = 13), while only three showed exclusively female results (n = 3). The cohort included seniors (n = 20), youths (U18 and U20, n = 7), adolescents (U14 to U16, n = 8) as well as children (U11 and U12, n = 2).

Discussion

Analysis of the literature allowed a clear understanding of specific research topics. The present review was based on a total of 37 studies from 2000 to 2017 aimed at investigating the basketball pass. Research was conducted on five main areas of knowledge: performance analysis, motor control, biomechanics, physical conditioning and mental factors. In this article, some gaps in existing knowledge were detected, which might help future research on basketball passing. Studies have been grouped to provide a detailed discussion on key areas, and the main findings were transferred from this scientific knowledge to the practical field. This article may serve as a starting point for future research providing further insights into this research topic.

Performance analysis

The findings revealed that passing skills are essential to increase points scored in top level basketball competitions such as the NBA, ACB or Euroleague (Courel-Ibáñez et al., 2016; García et al., 2013; Gómez et al., 2015; Gómez et al., 2016; Marmarinos et al., 2016). These authors have shown particular interest in the role of passing skills in pick and roll situations (Gómez et al., 2013), fast break (Cárdenas et al., 2015), and the

inside pass (Courel-Ibáñez et al., 2013) to increase the number of assists and the effectiveness of the attack. In addition, players selected passing rather than any other action when they faced increased defensive pressure (Csapo et al., 2015). This supports recommendations on monitoring passing skills during real competitive situations (Sachanidi et al., 2013). In this task, the use of technological resources such as location-based

positioning systems (GPS), inertial measurement units, and video track systems, provides a huge amount of data which can be used for training purposes. Likewise, authors highlighted including training tasks such as small sided games (Conte et al., 2016; Iglesias et al., 2003) and decision making drills (Iglesias et al., 2003) to increase the number of passes and decrease the turnovers.

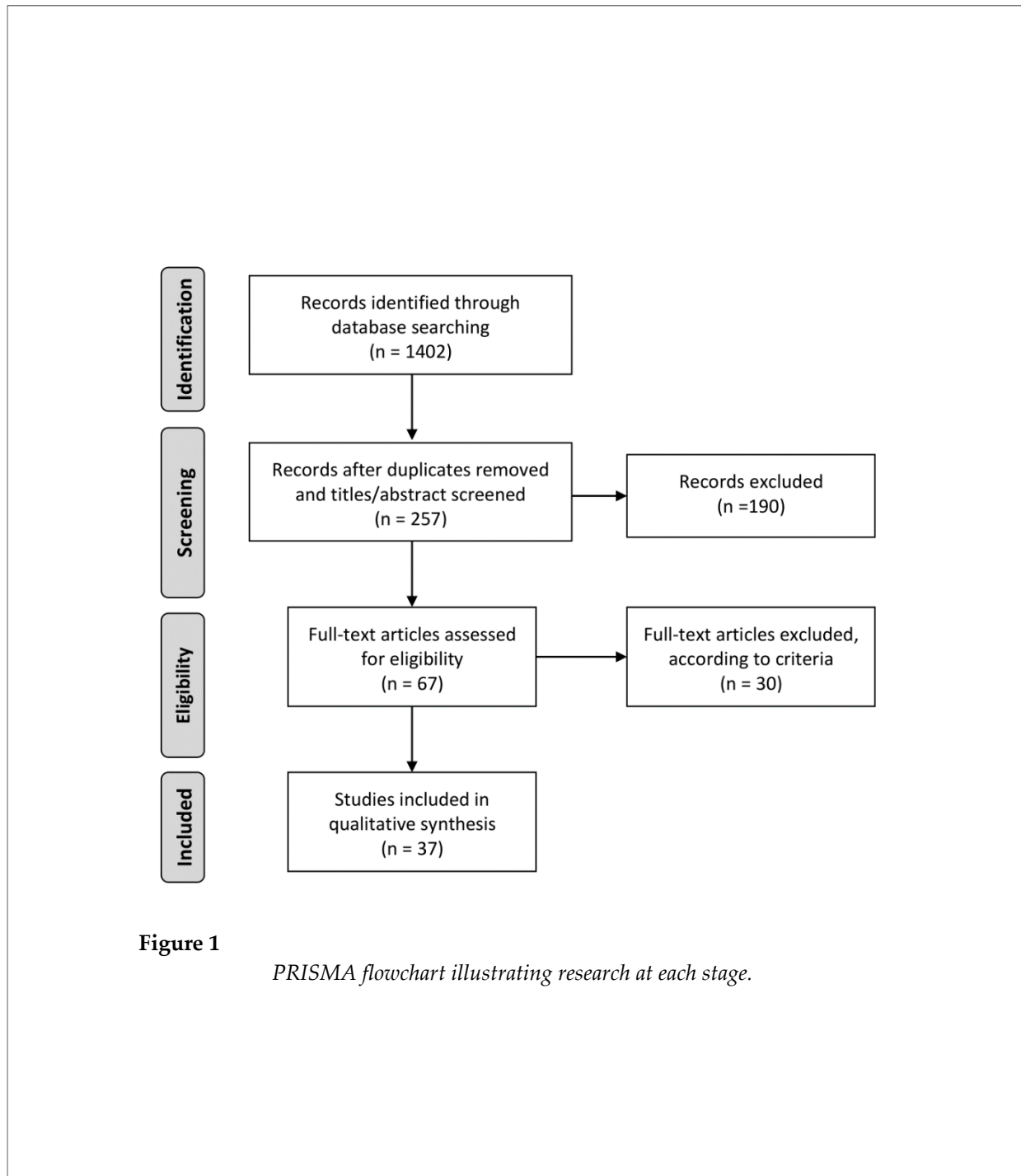


Figure 1

PRISMA flowchart illustrating research at each stage.

Table 1
Summary of studies exploring the basketball pass (2002 to 2011)

Year, 1 st author	Area	Game Situation	Sample and cohort	Key Finding(s)
2002, Perkos	Motor skills	Match	n = 62 novice players U14 (M)	- Efficacy of passing skills acquisition through an instructional self-talk
2003, Iglesias	Performance Analysis Motor skills	Match	n = 12 players U15 (M)	- Training under real conditions improves success percentage and decision making in basketball pass.
2006, Lyons	Physical conditioning Motor skills	Analytic	n = 20 players S (B)	- High intensity exercises improve players' skills.
2006, Ortega	Performance Analysis	Match	n = 184 players U16 (M)	- Point guards make a higher number of passes than other positions.
2007, Bogdanis	Physical conditioning	SSG	n = 27 players U16 (B)	- Passing skills increased in a basketball regular drill context compared with a non-basketball drill context within physical conditioning aspects.
2008, Coelho-e-Silva	Biomechanics	Match	n = 59 players U16 (B)	- Only height was positively correlated with passing skills
2008, Gordon	Mental factor	Analytic	n = 18 players S (B)	- No difference between optimism/pessimism regarding self-efficacy.
2008, Ibáñez	Performance Analysis	Match	n = 145 records S (M)	- Assists are the best predictor of best teams.
2009, Delextrat	Physical conditioning	Match	n = 30 players S (F)	- Specific fitness and passing skills training must be undertaken according to the playing position. - Point guards pass significantly better than rest of positions.
2009, Hill	Mental factor Motor skills	Match	n = 4 psychologists S (B)	- The player perceives that his resources are insufficient to meet the demands of the situation, what leads to choking.
2009, Ibáñez	Performance Analysis	Match	n = 223 games U20 (B)	- The main statistic was related to turnovers, so that winning teams had better pass skills than losing teams.
2010, Ortega	Motor skills	Match	n = 102 coaches U14 players (B)	- U14 Players need to devote more time to pass and progression than the rest of Basic Tactical Media Collective (BTMC) to achieve better performance
2010, Porter	Motor skills	Analytic	n = 60 students S (B)	- A contextual interference program facilitates skill learning.
2010, Sampaio	Performance Analysis	Match	n = 198 players S (M)	- Stronger teams were superior in terms of passes; important players made fewer errors at passing.

S: Senior, U20: Under 20 years old, U18: Under 18 years old, etc; M = Male, F = Female, B = Both, Male and Female.

Table 2
Summary of studies exploring the basketball pass (2012 to 2014)

Year, 1 st author	Area	Game Situation	Sample and cohort	Key Finding(s)
2011, Izzo	Biomechanics	Match	n = 150 games U18 (M)	- Two handed chest pass is the most used (39,9%); one handed bouncing pass (11,2%) is the faster basketball pass.
2012, Afsanepurak	Performance Analysis Motor skills	Match	n = 45 players U15 (M)	- Retention and transfer scores of the groups with contextual interference were significantly better.
2012, Arias	Performance Analysis Motor skills	SSG	n = 54 players U11 (M)	- Reduction of ball mass (440 g) enabled the children to go from paying attention to ball to handling to aspects of game interpretation.
2012, Nikolaos	Physical conditioning	Analytic	n = 26 players S (B)	- Improvement in players' passing skills following the implementation of a balance and proprioception routine.
2012, Shafe	Biomechanics	Match	n = 3 players U18 (M)	- Overthrown pass set as the best pass to execute in a fast break.
2013, Ahmed	Physical conditioning	Analytic	n = 24 players U18 (M)	- Passing accuracy decrease when upper fatigue appears.
2013, Conte	Motor skills	SSG	n = 21 players U11 (B)	- Passing skills are better acquired by performing an understanding education.
2013, Courel-Ibáñez	Performance Analysis	Match	n = 1,324 possessions S (M)	- When inside pass is done, teams achieve a larger amount of points. - A passer location and immediate receiver action determinate a successful inside pass.
2013, García	Performance Analysis	Match	n = 323 games S (M)	- Winning teams had a larger number of assists than losing teams.
2013, Gómez	Performance Analysis	Match	n = 7,234 possessions S (M)	- Larger number of passes, is one of the main performance indicator in predicting effectiveness in basketball.
2013, Sachanidi	Motor skills	Match	n = 33 players U16 (M)	- Passing efficiency in games could predict final performance of the athlete.
2014, Tahmasebi	Motor skills	Analytic	n = 72 students S (B)	- Motivational self-task helps to improve precision in passing

S: Senior, U20: Under 20 years old, U18: Under 18 years old, etc; M = Male, F = Female, B = Both, Male and Female).

Table 3

Summary of studies exploring the basketball pass (2015 to 2017)

Year, 1 st author	Area	Game Situation	Sample and cohort	Key Finding(s)
2015, Cárdenas	Performance Analysis	Match	n = 172 fast breaks S (M)	- Elite teams usually made maximum two passes (96.4%). - Fast break successfulness increased when the initial action was a pass.
2015, Conte	Performance Analysis	SSG	n = 23 players U18 (M)	- No-dribble-game-drill condition elicited a greater physiological demand and a higher number of passes than the regular-drill one.
2015, Csapo	Performance Analysis	Match	n ₁ = 18 coaches n ₂ = 20 players S (M)	- Players selected "pass" regardless of the previous performance when they faced increased defensive pressure.
2015, Galatti	Mental factor	Match	n = 7 players S (F)	- Excellent performance is directly related with tactic training and group cohesion.
2015, Gómez	Mental factor	Match	n = 147 closed games S (B)	- Mental interventions should be undertaken during the last critical minutes to avoid negative consequences.
2015, Kinrade	Mental factor	SSG	n = 38 players S (M)	- Ruminative thoughts lead to worse performance when making complex decisions under pressure.
2016, Conte	Performance Analysis	SSG	n = 21 players U18(B)	- The 2 vs 2 condition showed a higher number of passes and a higher success ratio than 4 vs 4 condition.
2016, Courel-Ibáñez	Performance Analysis	Match	n = 4,207 possessions S (M)	- Attacks including an inside pass were 1.4 to 2.0 times more effective. - A dynamic reception attitude from the weak side is suggested to enhance scoring options.
2016, Jiménez	Motor skills	Match	n = 46 players U18 (F)	- Results support Contextual Interference (CI) effect in pass learning skill acquisition
2016, Marmarinos	Performance Analysis	Match	n = 12,376 pick & rolls S (M)	- Pick and roll effectiveness could predict the final score.
2017, Quílez	Biomechanics	Analytic	n = 10 players S (M)	- Uncertainty increases reaction time in basketball pass.

S: Senior, U20: Under 20 years old, U18: Under 18 years old, etc; M = Male, F = Female, B = Both, Male and Female).

Biomechanics

Limited research has been conducted focused on biomechanical aspects of the basketball pass. Nonetheless, the results reviewed identified several key points to consider in the success of the pass. Under uncertain conditions, reaction time increased and the accuracy of the pass decreased (Quílez and Rojas, 2017). Thus, exercise variability (i.e., 1-on-0 including dribbling before passing or 1-on-1 situations with an opponent) should be considered when assessing players' technical passing skills. Izzo and Russo (2011) explored passing techniques among 150 games in the top-level Italian League, NCAA and NBA, concluding that the two-handed chest pass was the most common and easiest, while the one-handed (the second most common) showed the worst effectiveness. In addition, Shafe and Kanon (2012) highlighted the importance of a quick pass, such as with one-hand, in fast-break situations. However, as the increasing speed of the game forces players to solve tasks under limited time constraints, improving the one-hand passing skill stands as a primary training goal in modern basketball (Shafe and Kanon, 2012). Regarding formative stages, Coelho-e-Silva et al. (2008) observed that height may account for better passing skills in U16 players.

Physical conditioning

Authors agreed that optimal conditioning is essential to maintain passing performance during a basketball game (Ahmed, 2013; Bogdanis et al., 2007; Lyons et al., 2006). Ahmed (2013) observed decrements in passing accuracy when the upper extremities were fatigued. Bogdanis et al. (2007) found that decrements on the total on-court training time resulted in smaller improvement of basketball technical skills. Lyons et al. (2006) suggested high intensity exercises to improve players' passing skills. More specifically, Delextrat and Cohen (2009) suggested that fitness and passing skills training must be undertaken according to specific playing positions. Other authors reported improvements in passing skills following a 12-week intervention of a balance and proprioception routine in amateur basketball players (Nikolaos et al., 2012). However, there is still limited information regarding specific conditioning programs to increase passing performance in basketball.

Mental factors

Most studies were focused on choking

episodes, which are defined as a mental disruption in which performance declines during stressful situations, compared with the expected standards (Hill et al., 2009). Gómez et al. (2015) observed that choking situations made players take bad passing decisions, which led to increments in turnovers. In this sense, authors agreed to include pressure and choking situations into regular drills to improve players' performance in real competition (Gordon, 2008; Iglesias et al., 2003; Kinrade et al., 2015). In addition, Kinrade et al. (2015) highlighted the importance of avoiding ruminative thoughts when making complex decisions under pressure. Finally, Galatti et al. (2015) stated that excellent performance was directly related with tactical training and group cohesion. Thus, emotional stability in group drills should be included as another constraint which players have to cope with during the development of passing skills.

Motor skills

The study of passing skills within the motor control paradigm has been mainly focused on contextual interference, which emphasizes the benefits of mixing training items across blocks rather than repeating them (Afsanepurak et al., 2012; Conte et al., 2013; Jiménez et al., 2016; Porter and Magill, 2010; Tahmasebi et al., 2014). The authors underlined the importance of the individual, environment and task constraints that the player had to deal with, to maximize the learning process. Including training drills simulating real situations improved the success rate of the passes and the quality of decisions made (Hill et al., 2009; Iglesias et al., 2003). Small sided games appear to be an effective way to accomplish this objective by increasing the number of passes and reducing the turnovers during practice (Conte et al., 2013). One remarkable point is that practice needs to be adapted to the players' current condition and objective to promote self-task training and learning, which has been proven to be more effective than traditional methodology (Conte et al., 2013; Perkos et al., 2002). Furthermore, training tasks should be new, random and inspiring, to fulfil the contextual interference objectives and promote skill learning (Jiménez et al., 2016). Regarding formative stages, Arias et al. (2012) recommended using a reduced-mass ball (440 g) to facilitate ball handling in U11 players, which increased passes and pass receptions

compared to the standard ball (485 g). Finally, Ortega (2010) found that coaches agreed on the importance of passing and drive to the rim, from the initial formative stage.

Conclusions

The present review adds relevant insights into basketball passing skills training, suggesting an integrative approach including biomechanics, performance analysis, physical conditioning, mental factors and motor skills aspects. The summary of existing knowledge regarding these main areas may help coaches and researchers in designing specific training tasks according to players' needs to maximise passing skills development. The assessment of passing skills and performance should be made under uncertain and variable conditions to obtain information on

players' responses to competitive scenarios. Small sided games and changing environment stand as the best training situations to improve passing skills. Training sessions should include new and random activities to transfer skills learning to the competition. This review also found it advisable to include training drills under pressure to improve passing skills under competitive conditions similar to the real game. Limited information is available about biomechanical aspects and physical conditioning training plans to improve passing skills in basketball. Likewise, there is scarce data on passing skills development in children. The current review may be of great interest for coaches, contributing to better characterise the basketball pass and subsequent development of training enhancement programs.

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Corresponding author:**Arturo Quílez Maimón**

University of Granada, Faculty of Sport Sciences
Carretera de Alfacar, s/n, 18011, Granada, Spain
Phone number: (+34) 648209692,
E-mail: arturoquilez@gmail.com