Identifying individual playing roles in professional and semi-professional male and female basketball players. A systematic review

Identificación de roles individuales de juego en jugadores y jugadoras de baloncesto profesionales y semiprofesionales. Una revisión sistemática

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Received: 14-09-25
Accepted: 13-01-26

How to cite in APA

Coma Ribes, M., Altarriba-Bartés, A., Conte, D., José-Ibáñez, S., & Calleja-González, J. (2026). Identifying individual playing roles in professional and semi-professional male and female basketball players. A systematic review. *Retos, 77*, 199-219. https://doi.org/10.47197/retos.v77.117617

Abstract

Introduction. Basketball is a globally popular sport requiring optimization of players' physical, physiological, psychological, and tactical performance. Traditional position-based classifications (guards, forwards, centers) are often inadequate to reflect players' tactical behavior. Recent studies focus on identifying individual playing roles for a more detailed understanding of performance.
Objective. This systematic review aimed to synthesize literature on individual playing roles and examine methodologies used to identify them in professional and semi-professional male and female players.
Methodology. Following PRISMA guidelines, a structured search was conducted in PubMed, Scopus, and Web of Science using PICOS criteria, completed on May 19, 2025. Risk of bias was assessed with the Agency for Healthcare Research and Quality checklist and the JBI Critical Appraisal Checklist for Case Series. The review was registered in PROSPERO (ID: CRD42023485223).
Results. Twelve studies met inclusion criteria: nine case-series and three cross-sectional. Ten analyzed game-related statistics, three assessed anthropometric measures, and two employed physical tests for lower limb performance. Additional factors included age, nationality, and GPS data. Seven recurrent individual playing roles emerged paint protector, shooter, role player, floor general, defensive player, versatile player, and explosive player.
Conclusions. Differences in individual playing roles appear to result from methodological heterogeneity among studies. Therefore, this review emphasizes the need for a unified, high-quality methodological approach to better identify and describe basketball individual playing roles using game-related statistics. A standardized framework could enhance understanding of athletes' specific demands and foster the development of more individualized, performance-oriented training programs.

Keywords

Team sports; tactical analysis; players' classification; individual performance.

Resumen

Introducción. El baloncesto es un deporte popular a nivel mundial que requiere optimizar el rendimiento físico, fisiológico, psicológico y táctico de los jugadores. Las clasificaciones tradicionales basadas en posiciones (escoltas, aleros, pívots) suelen ser insuficientes para reflejar el comportamiento táctico de los jugadores. Estudios recientes se centran en la identificación de roles individuales para una comprensión más detallada del rendimiento.
Objetivos. Esta revisión sistemática tuvo como objetivo sintetizar la literatura sobre roles individuales de juego y analizar las metodologías empleadas para identificarlos en jugadores y jugadoras profesionales y semiprofesionales.
Metodología. Siguiendo las guías PRISMA, se realizó una búsqueda estructurada en PubMed, Scopus y Web of Science utilizando los criterios PICOS, finalizada el 19 de mayo de 2025. La evaluación del riesgo de sesgo se efectuó con la lista de verificación de la Agency for Healthcare Research and Quality y la JBI Critical Appraisal Checklist for Case Series. La revisión fue registrada en PROSPERO (ID: CRD42023485223).
Resultados. Doce estudios cumplieron los criterios de inclusión: nueve series de casos y tres estudios transversales. Diez analizaron estadísticas relacionadas con el juego, tres evaluaron medidas antropométricas y dos realizaron pruebas físicas para el rendimiento de las extremidades inferiores. Se consideraron factores adicionales como edad, nacionalidad y datos de GPS. Surgieron siete roles individuales de juego recurrentes: protector de la pintura, tirador, jugador de rol, organizador, jugador defensivo, jugador versátil y jugador explosivo.
Conclusiones. Las diferencias en los roles individuales de juego parecen deberse a la heterogeneidad metodológica entre estudios. Por ello, esta revisión enfatiza la necesidad de un enfoque metodológico unificado y de alta calidad para identificar y describir los roles individuales de juego en baloncesto utilizando estadísticas de juego. Un marco estandarizado podría mejorar la comprensión de las demandas específicas de los atletas y favorecer el desarrollo de programas de entrenamiento más individualizados y orientados al rendimiento.

Palabras clave

Deportes colectivos; análisis táctico; clasificación jugadores; rendimiento individual.

Introduction

Basketball is one of the most popular sports in the World (Anđelić et al., 2021), with an increasing number of people participating in competitions at all levels (Jia & Chen, 2023). When considering high-level teams, the main aim of coaching staff is to enhance players' performances from a physical, physiological, psychological, and technical-tactical perspective (Asal et al., 2025; Ibáñez et al., 2023). To reach this aim, it is essential to understand individual players' characteristics, including their on-court position. In previous research (Stojanović et al., 2018), players have been classified in two (backcourt and frontcourt), three (guards, forwards and centers) or even in five (shooting guard, point guard, small forward, power forward and center) positions, based not only on their prevalent area of competence on the court but also on their technical-tactical performance (R. Chen et al., 2023; Hatem et al., 2020). These classifications, which have traditionally encompassed also top-tier competitions like the NBA (National Basketball Association) (Hedquist, 2022), has been recently reviewed since it tends to be too simple and consider only players' skillsets (Hedquist, 2022). Besides, recent studies (Anıl Duman et al., 2021; Gómez-Carmona, Feu, et al., 2021) have suggested different ways of regrouping players to identify their individual playing roles (IPRs) according to various factors. The current trend is to specialize players in specific IPRs within the game using their performance profiles (PP) (Hedquist, 2022), which has been defined as a tool that compiles the main indicators of successful accomplishment that represents an athlete or group (Butterworth et al., 2013). This tool has evolved over the years and some authors have described it using mainly players' sport-specific physical tests (PTs) (O'Donoghue, 2005), game-related statistics (GRS) (De et al., 2021; Escudero-Tena et al., 2021; Hernández-Beltrán et al., 2024) and anthropometric measures (Kalman & Bosch, 2020) to evaluate their performance.

Considering PT for the PP classification, previous studies (García et al., 2013; Morrison et al., 2022a) have recognized basketball match-play as inherently complex, requiring players to develop a diverse range of physical attributes to enhance their on-court performance (Ramirez-Campillo et al., 2022). This approach allows for a more accurate evaluation of players' pure physical capacities, providing valuable insights for training, competition and performance optimization (Morrison et al., 2022b). Additionally, GRS are commonly used to describe PPs (Dehesa et al., 2019) and can be considered as quantifiable measures used to assess the success of a team, or athlete in achieving performance objectives (Herold et al., 2022). Moreover, GRSs are usually utilized for analysing basketball team performances, but they can also be very useful to analyze individual player's performance. Therefore provide valuable insights for the PP classification (Lorenzo et al., 2019). However, anthropometric measures as height, body mass, and wingspan have also been shown to play an important part in determining the PP of a player (Dean Oliver, 2004). Other authors have considered additional indicators to describe this PP such as age, nationality and global positioning system (GPS) variables (Rangel et al., 2019; X. Wang et al., 2022).

Due to the evolution of basketball in the last few decades, the identification of the IPRs via PP is fundamental for basketball coaches to accomplish the best of each player potential. Indeed, in a distinct but equally relevant contest, some contemporary players can have different characteristics and roles on the court regardless of the general classification (R. Chen et al., 2023). An example of these multiple playing roles, has been shown in the point guards that has being slightly more involved in shooting actions. However, small guards and small forwards being only the second option in this regard, highlighting the high degree of versatility among players in these positions, is generally shown by players accomplishing multiple tactical demands (Rösch et al., 2022).

Moreover, PP is a convenient tool for players' selection conducted by scouts, general managers, and other front-office personnel, before NBA teams make their choices (Hogan et al., 2023).

In scientific literature, a growing number of studies have been focused on the identification of IPRs via PP (Ibáñez et al., 2023; Mancha-Triguero et al., 2021; García-Rubio et al., 2021). The primary aim of this review is to synthesize all previous studies and establish baselines for future research aiming to improve this classification.

Nevertheless, to the best of the authors' knowledge, no previous research has synthesized related studies on this topic. This study is essential to understand the evolution of players' classification and to communicate to the athlete a clear function inside the team. Specifically, it seeks to synthesize the IPRs and examine the methodologies employed to describe them, with a particular focus on PT, GRS and anthropometric measures in professional and semi-professional male and female basketball players.

Method

Design

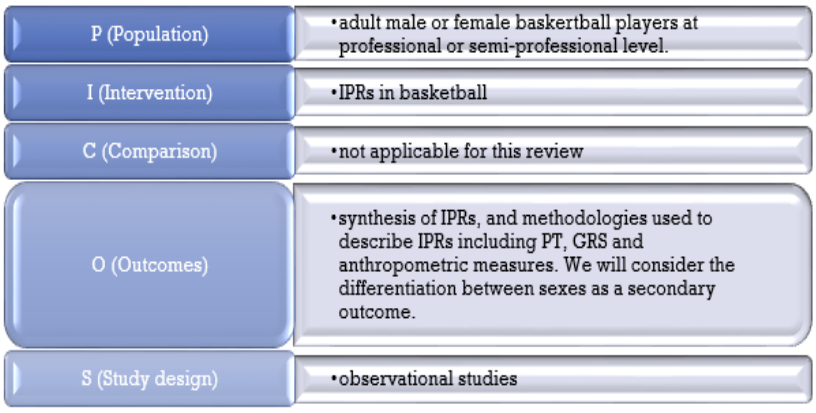
This systematic review followed the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)® statement (Liberati et al., 2009). Before the search, we developed a comprehensive review protocol adhering to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) ® guidelines (Shamseer et al., 2015), it was completed with (S1 File) and registered in PROSPERO (ID = CRD42023485223). The review protocol was updated during the review process and is available at https://www.crd.york.ac.uk/prospero/#myprospero (8 November 2024).

Search strategy and study selection

A systematic computerized literature search was performed using three databases: Medline (PubMed), Scopus, and WOS (Web of Science). The search included articles published from 2013 to 2024, a 10-year timeframe provides an adequate balance between breadth and manageability of the available literature, while minimizing the risk of incorporating outdated studies with limited applicability to current practice. Starting on the 31 of October of 2023 and finishing on the 19 of May in 2025. All databases were searched using Boolean operators with the following Medical Subject Headings (MeSH) and free text words for critical concepts related to performance profiles and basketball by the next equation: ["*Basketball*" (MeSH Terms) AND "*Athletes*" (MeSH Terms) OR "players" (All Fields)] AND ["*players physical fitness*" (MeSh Terms) OR "players physical profiles" (All Fields) OR "profiles" (All Fields) OR "roles" (All Fields) OR "positions" (All Fields) OR "assessments" (All Fields) OR "strength and conditioning" (All Fields)] AND ["*match analysis*" (MeSH Terms) OR "sports analytics" (All Fields) OR "metrics" (All Fields) AND "*notational analysis*" (MeSH Terms) OR "performance analysis" (All Fields)].

The eligibility of studies was determined based on the PICOS criteria (Saaiq & Ashraf, 2017) reported in Figure 1. The terms searched were related to flywheel training and B. Additionally; no other terms were used to increase the power of the analysis. Through this equation, all relevant articles in the field were obtained. The reference sections of all identified articles were also examined by applying the "*snowball methods*" strategy, based on examining the reference sections of the identified articles (Greenhalgh & Peacock, 2005).

Figure 1. PICOS model for the definition of the inclusion criteria



Specifically, studies and theses were included if: 1) were descriptive and observational; 2) participants were adult male or female basketball players classified as tier 3 or higher according to the participant classification framework (McKay et al., 2022); 3) PPs were described using physical tests; 4) PPs were described using game-related statistics 5) PPs were described using anthropometric measures. Studies were excluded if: 1) not related to traditional five-on-five basketball; 2) studies that analyse collective

team tactics without focusing on individual player roles; 3) studies that do not attempt to create alternative player classifications beyond the traditional positional roles in basketball. Only full-text publications in English were considered.

The complete search strategy of the entire database can be found in the supplementary file (S2). The reference sections of all identified articles were examined, and a snowball technique (Palinkas et al., 2016) was used to find any further potentially relevant studies.

One author (MC-R) searched the information, identified the studies, and collected titles and abstracts. Two authors (MC-R and JC-G) were discussing to identify the study to be included in the current systematic review and in case of disagreement, a third author (AA-B) was consulted to take a final decision. All titles and abstracts were assessed to identify duplicates and potential missing studies. Titles and abstracts were selected for a final full-text review.

Data extraction

The data were extracted from included studies using inclusions/exclusion criteria application, extraction form by one reviewer (MC-R). The following details were extracted: study design, study source (author's and year of publication), population characteristics (competitive level, number of participants, and sex), methods, variables (independent and dependent), primary and secondary outcomes, conclusion, limitations, quartiles, and future research.

It is important to note that the process of data extraction and clustering was not a straightforward task as some studies lacked certain information or had inconsistencies in their reporting. However, by carefully reviewing the studies and discussing discrepancies between authors, a comprehensive understanding of the relevant data was achieved. Furthermore, it is worth mentioning that the studies included in this analysis were selected based on rigorous criteria. This ensured that the studies were of high quality and provided reliable information for the analysis (Table 1).

Table 1. Hierarchical level of the studies selected

Study	Hierarchical Level
García-Rubio et al., 2024	2B
Ibáñez et al., 2023	2B
Madinabeitia et al., 2023	2B
Wang et al., 2022	2B
Anıl Duman et al., 2021	2B
Gómez-Carmona et al., 2021	2B
Kalman & Bosch, 2020	3B
Mateus et al., 2020	4
Dehesa et al., 2019	2B
Rangel et al., 2019	3A
Bianchi et al., 2017	4
Patel, 2017	5

Overall, the process of data extraction and pooling played a crucial role in the analysis of the studies as it allowed for a systematic and comprehensive examination of relevant data. Through this process, important patterns and trends were identified, providing valuable insights related to physical tests (PT), game-related statistics (GRS), and anthropometrics measures in professional and semi-professional male and female basketballers.

Risk of bias and quality of studies

The authors evaluate the risk of bias of the cross-sectional studies (CSSs) and case series studies (CS) through two scales, the Agency for HealthCare Research and Quality tool (AHQR) (Mamikutty et al., 2021) and the JBI (Joanna Briggs Institute) (Munn et al., 2019), the two scales were synthetized in Table 2.

The AHRQ tool (Mamikutty et al., 2021), specifically designed for systematic reviews, focuses on methodological quality and internal validity, crucial aspects when assessing the risk of bias in individual studies. It comprises 11 items covering key methodological aspects of cross-sectional studies, with a scoring system that awards one point per item if the study meets the methodological standard. The

overall score classifies studies into high (0-4 points), moderate (5-7 points), or low (8-11 points) risk of bias categories. This evaluation tool is accessible online at the AHRQ website (Mamikutty et al., 2021).

In contrast, the JBI tool was developed specifically for case series studies, making it more suitable than generic tools (Munn et al., 2019). It consists of 10 items, each evaluated using "yes," "no," "unclear," or "not applicable" responses. This tool is particularly valuable in scenarios where higher-level evidence is scarce, allowing systematic reviewers to assess the methodological quality of case series studies, which may represent the best available evidence in certain contexts (Munn et al., 2020).

To obtain reliable conclusions, it has used the STROBE® guideline (Strengthening the Reporting of Observational Studies in Epidemiology) was used to evaluate the quality of the publications, following the guidelines of the Cochrane Collaborations (Higgins & Green, 2008). The STORBE® guidelines for reporting observational studies were also utilized (Vandenbroucke et al., 2007).

Table 2. Evaluation of Bias Risk in the Studies

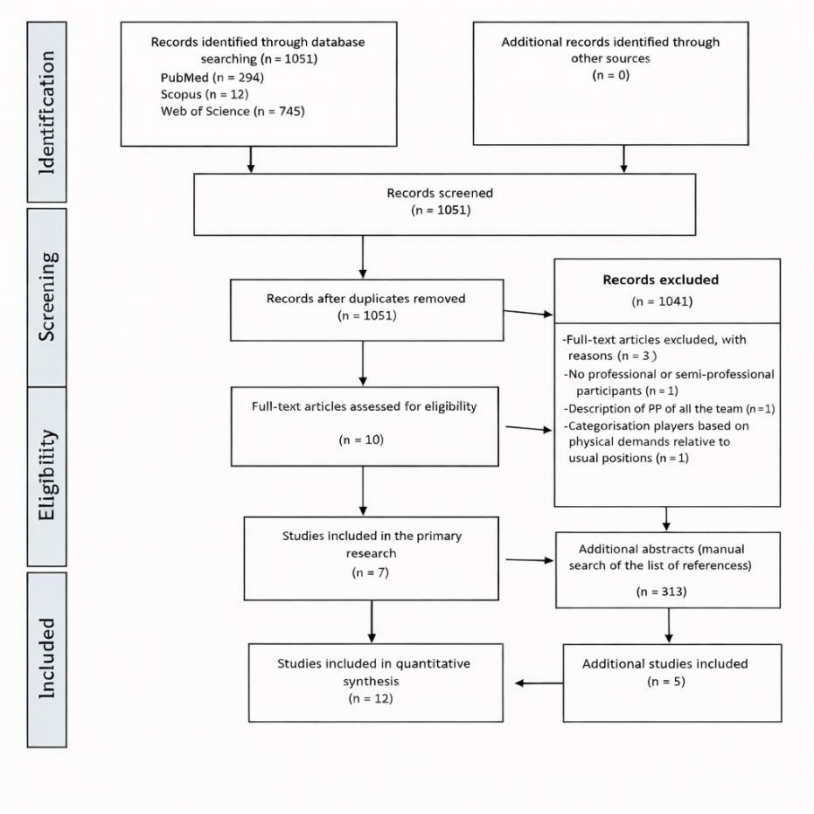
Study	Year	Design	AHRQ	JBI	Overall synthesis	Notes
Anıl Duman et al. – Cluster analysis of NBA players by position	2021	Observational; analysis secondary (NBA data from multiples seasons)	Moderate	Moderate (analytic transversal)	Moderate	Big sample, clear statistic methods; clear statistics; limitations: confusion (context), no experimental control.
Bianchi et al. – Role revolution: new positions in basketball	2017	Observational; (SOM + clustering)	Moderate	Moderate (analytic transversal)	Moderate	Reproducible procedures; possible risk of bias by variable selection and unique season.
Dehesa et al. – Key game indicators profiles NBA	2019	Observational; analysis transversal	Moderate	Moderate	Moderate	Acceptable internal validity; risk due to uncontrolled confounding and convenience sampling
García-Rubio et al. – Load profiles in ACB practice	2024	Observational; short cohort (two microcicles) with sensors	Moderate	Moderate (cohort/observational)	Moderate	Instrumental meditation standardized; n=12, short time and limitation generalization.
Gómez-Carmona et al. – Perfiles de fitness por PCA (semiprofesional)	2021	Observational; transversal analytic (PCA)	Moderate	Moderate	Moderate	Adequate multivariate analysis; possible selection bias and limited sample size.
Ibáñez et al. – Fitness and performance in female basketball	2023	Observational; profesional team study (longitudinal)	Moderate-low	Low–Moderate	Moderate	Longitudinal data; a single roster (n=12) limits external validity.
Kalman & Bosch – Lineup analysis with clustering (Sloan)	2020	Observational; machine learning (EM, clustering)	Moderate	Moderate	Moderate	Clear methodology; risk of overadjust/limitated validation.
Madinabeitia et al. – High performance profiles Liga ACB	2023	Observacional; cluster + decisión trees	Moderate	Moderate	Moderate	Large number of individual performances; partial control of context; no causal inference.
Mateus et al. – Clustering Euroleague and National leagues	2020	Observational; two-step cluster + discriminate	Moderate	Moderate	Moderate	Large multi-league sample; contextual variables partially considered
Patel (tesis) – Clustering NBA (one season)	2017	Observational; t-SNE/PCA + k-means	Moderate–high	Moderate–high	Moderate–high	Thesis without peer review; limited external validation
Rangel et al. – ML to classify positions and explain with LIME (NBA/leagues)	2019	Observational; data mining (trees, ensembles, LIME)	Moderate	Moderate (cross-sectional analytical / historical series)	Moderate	Public secondary data; validation with interpretable ML techniques; risk of uncontrolled confounding
Wang et al. – Perfiles nativos/extranjeros y árbol de decisión en CBA	2022	Observational; GMM clustering + CART (2011–2019)	Moderate-low	Moderate	Moderate	Large multi-season sample; validity verification reported (ICC 0.91; generalizability e^2=0.96); limitations due to omitted variables.

Results

The initial search identified 1051 references (Figure 2). Due to the considerable heterogeneity across study designs, populations, and outcome measures, a quantitative meta-analysis was not feasible, therefore, the findings are presented in a narrative synthesis.

After the identification of duplicates, 1050 titles and abstracts were screened. Ten studies remained for further full-text analysis. Subsequently, three studies were excluded since did not meet the inclusion criteria (Figure 2). Following the snowball process, five new articles met the inclusion criteria and were added to our systematic review. Therefore, twelve studies (Anıl Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Garcia-Rubio et al., 2024; Gómez-Carmona, Mancha-Triguero et al., 2021; Ibáñez et al., 2023; Kalman & Bosch, 2020; Madinabeitia et al., 2023; Mateus et al., 2020; Patel, 2017; Rangel et al., 2019; Wang et al., 2022), were included in the final review process. The final number of studies included (n=12) was relatively low compared to the initially identified records (>1000). This discrepancy reflects the limited exploration of the field to date, as well as the highly restrictive nature of the inclusion criteria applied.

Figure 2. Study selection flowchart (This work is licensed under CC BY 4.0. To view a copy of this license, visit https://creativecommons.org/licenses/by/4.0/ (accessed on 30 October 2024)).



Description of studies

Nine CS studies (Anıl Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Kalman & Bosch, 2020; Madinabeitia et al., 2023; Mateus et al., 2020; Patel, 2017; Rangel et al., 2019; Wang et al., 2022) and three CSSs (Garcia-Rubio et al., 2024; Gómez-Carmona, Mancha-Triguero et al., 2021; Ibáñez et al., 2023) were included in this review. Table 3 presents a detailed description of the results referred to IPRs from each of study. A total of 37,610 participants were included in the current scientific review, with a mean age of 25 ± 5 years (range = 19 - 43 years).

Table 3. Characteristics of the included case-series studies and cross-sectional studies.

Studies, years; journals	Key words	Level; sample size (n); gender	Methods	Variables	Primary outcomes	Secondary outcomes	Conclusions	Limitations	Quartiles	Applications; future research
García-Rubio et al., 2024; Journal of Sports Engineering and Technology	Inertial devices, professional, basketball, strength and conditioning, WIMUPRO, ACB League, Small-sided games, guard, forward, center	Professional players of the top-level basketball league in Spain (ACB League); n= 12; male	Observational research. Using a cross-sectional methodology	Independent: Game positions (PG, SG, SF, PF and C) Dependent: GPS variables	IPRs Versatile player, explosive player, dynamic player and fast player Others Average heart rate, distance (m), explosive distance (m), Acc., Dec, number of high intensities acc., number or high intensity Dec., maximum acc., maximum Dec., maximum speed, average speed, total number of impacts, total number of high intensity impacts, and player load.	NI	These results are useful for determining the physical and conditioning needs of each player.	The study was conducted during the preseason of an ACB team. This phase of the season could affect the IPRs obtained.	Q2 (2023)	Coaches can design different loads and tasks for players, based on what they do on the court rather than their specific IPRs.
Ibáñez et al., 2023; International Journal of Environmental Research and Public Health	Woman; inertial device; game indicators; physical fitness; match analysis; notational analysis; predictive analysis; game position	Professional team of the Spanish competition "*Liga Femenina Challenge"; n = 12; female*	Method quasi-experimental. Empirical study, with a quantitative, descriptive, and cross-sectional methodology.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: PT & GRS	IPRs EP, SCP, DNB, and DFB. PT ABK, multiple jumps, RSA, centripetal force (R and L), aerobic capacity, anaerobic capacity, T-test ball, and T-test without ball. GRS Min, Pnt, %2P, %3P, %FT, DR, OR, TR, FC, FR, AST, BLK, STL, TO and PIR.	NI	A positive relationship was shown between the tests used and sports statistics.	Analysis of a complete team, and a high-cost technology to replicate it.	Q1 (2021)	Facilitate physical work for the coach or coaching staff.
Madinabeitia et al., 2023; International Journal of Performance Analysis in Sport	Basketball, performance analysis, match analysis, cluster, decision tree	Professional teams of the *"Liga Endesa"*; n = 7913; male	Case – series study. Cluster Analysis, two-step cluster.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: GRS	IPRs FLC, FHC, and SLC. GRS Pnt, %FT, %2P, %3P, FR, FC, DR, OR. TO, AST, BLK, BLKR, and STL.	NI	Facilitate the identification of diverse performance profiles in the men's Spanish league.	Consider the influence of more variables,	Q3 (2022)	Develop a more team-specific model.
Wang et al., 2022; Frontiers in Psychology	Performance analysis, game statistic, cluster analysis, performance profiles, Chinese	Professional players of the Chinese league between seasons 2011 – 2019; n = 2197; male	Case – series study. Cluster analysis, unsupervised clustering method.	Independent Game positions: (PG, SG, SF, PF, and C) Dependent: PT & GRS	IPRs Local players (N1 - N9) and foreign players (F1 - F6). GRS PER, Pnt, Min, %2P, %3P, %FT, TO, AST,	NI	This study provides a new understanding of player positions in the game, distinguishing fifteen	The new positions obtained cannot fully reflect the ability of each player.	Q1 (2021)	Set up teams and optimize preparation for individual player cluster

	basketball association				STL, BLK, FC, OR, DR and USG%. Anthropometric measures Height and weight Other factors Nationality		performance profiles.			
Anıl Duman et al., 2021; Journal of Sports Engineering and Technology	Sport analytics, performance analysis, basketball positions, clustering, cluster validity indices	Players of the National Basketball Association (NBA) season 2000/2001; n = 2507; male	Case–series study. Cluster Analysis summarized by Ward method.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: GRS	IPRs PG 1-4, SG 1-4, SF 1-3, PF 1-5, and C 1-6. GRS PER, TS%, 3PAr, FTr, ORB%, DRB%, AST%, STL%, BLK%, TO%, and USG%.	NI	If teams want to succeed, they must bring together players that are compatible with each other, according to playing styles.	Only NBA players were used in the analysis, and only SRS was used when clustering players.	Q3 (2020)	A system that examines players' game developments and predict their next playing styles for the next season.
Gómez-Carmona et al., 2021; International Journal of Performance Analysis in Sport	Team sports, sex-related differences; physical demands; assessment; inertial devices	Semi-professional teams in the Spanish league competition; n = 26; male and female	Cross-sectional study.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: PT & sex characteristics	IPRs Continuous efforts and aerobic capacity, intermittent and explosive efforts, male: Jump performance, female: Jump and curved sprint performance, male: Curved sprint performance, female: Deceleration capacity. PT 6,75 m test, unilateral jump, ABK, Multi-jump-, RSA (16,25 m), 30-15 IFT, 3 vs 3 SSG.	Sex differences Differentiation between male and female performance profiles. Male: Jump and curved sprint. Female: Deceleration, sprint, and jump	Differences related to sex were found in the level of physical fitness, with higher values in male players.	Sample size, these results cannot be generalized	Q3 (2020)	New evaluation with specific physical test of basketball and classified the profiles based on principal components analysis.
Kalman & Bosch, 2020; Sports Analytics conference	NI	Players of the National Basketball Association (NBA); n = 5512; male	Case – series study. K-means cluster analysis.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: PT & GRS	IPRs High used PG, tall small F, shooter PG, traditional C, versatile player, a big player in mid-range, scorer player, and ball-dominant. GRS %2P, %3P, %FT, DR, OR, TR, AST, BLK, FC y TO, USG, PER, %3P corner, DAR, %FGA 0ft-3ft, %FGA 3ft-10ft, %FGA 10ft-3p, 3P As and 2P As. Anthropometric measures	NI	NBA players can be grouped according to trends.	NI	NI	NBA front offices can utilize the methodology in draft strategies, free agency, and trades; Analyse two-man or three-man lineup combinations.

Mateus et al., 2020; International Journal of Sports Science & Coaching	Contextual variables, game statistics, performance profiles, player-related variables	Players from the Euroleague competition; n = 16268; male	Case–series study. Two-step cluster analysis and Schwartz's Bayesian criterion.	Independent: Game positions: (PG, SG, SF, PF, and C), contextual variables Dependent: GRS	Height IPRs Young players, experimented players, and players with better global performance. GRS %2P, %3P, %FT, DR, OR, RT, AST, BLK, FC, TO, STL, Pnt, and Min. Other factors DST	NI	The higher the competitive level, the narrower the spectrum of possible performance profiles.	NI	Q4 (2019)	Allows beyond recognizing the importance of specific playing roles according to different competition.
Dehesa et al., 2019; Kinesiology	Collective behaviour, decision-making, game statistics, machine learning, cluster analysis, elite basketball	Players of the National Basketball Association (NBA); n = 472; male	Case – series study. Two-step cluster analysis and Schwartz's Bayesian criterion.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: MOS, GRS, and quarters	IPRs Regular season: Cluster 1 – 5 Playoffs: Cluster 1 - 4 GRS %2P, %3P, %FT, DR, OR, RT, AST, BLK, FC, TO, STL, PT, Min, 1st quarter (ON), 2nd quarter (ON), 3rd quarter (ON), and 4th quarter (ON).	NI	Allowed identifying several different performance profiles using KPIs.	Measured individual performance, not only depends on the record of the team.	Q3 (2018)	Coaching staffs can fine-tune these profiles to develop more team-specific models
Rangel et al., 2019; International Journal of Sport Science & Coaching	Performance analysis, playing positions, sport analytics, playing roles	Players of the Brazilian National League (NBL) seasons 2008-2017; n = 1497; male	Case-series study. Predictive model supported by the Automated Machine Learning (AutoML).	Independent Game positions: (PG, SG, SF, PF, and C) & Location Dependent GRS	IPRs Brazil PG (1-4), Foreign PG (1-4), Brazil SG (5), Foreign SG (5), Brazil SF (6-8), Foreign SF (6-8), Brazil PF (9-11), Foreign PF (9-11), Brazil C (12), Foreign C (12). GRS 2PS, 2PM, 3PS, 3PM, FT, DK, STL, AST, OR, DR, FR, FC Other factors Nationality	NI	The AutoML method was successful in characterizing players' versatility.	The validation and test sample sizes may have limited performance of the predictive method.	Q4 (2018)	Procedures that teams and leagues can reproduce, basketball organizations may benefit from this approach to characterize players' tactical profiles.
Bianchi et al., 2017; Electronic Journal of Applied Statistical Analysis	Sport analytics, self-organizing maps, fuzzy clustering, basketball	Players of the National Basketball Association (NBA) season 2010-11; n = .486; male	Case–series study. Self-Organizing Maps (SOM), cluster analysis.	Independent: Game positions: (PG, SG, SF, PF, and C) Dependent: GRS	IPRs AAS, SB, SR, PP, and RP. GRS PT, TR, AST, STL, TO, PF, and BLK.	NI	The mapping algorithm is an effective descriptor of the difference between players' statistical profiles.	Only used 7 statistical categories to describe profiles.	NI	Define new positions in basketball at any level and increase the number of statistical variables.
Patel, 2017; University of California	NI	Players of the National Basketball Association (NBA) season 2016-17; n = .486; male	Case – series study. K-means cluster analysis.	Independent: Game position (PG, SG, SF, PF, and C) Dependent: GRS	IPRs Paint protectors, supporters, shooters, and insiders GRS FG, FGA, %FG, 3P, 3PA, %3P, 2P, 2PA, %2P, FT, FTA, %FT,	NI	All NBA teams have equal players representation in the four clusters, but better NBA teams had players who resided	NI	NI	Cluster players using as many variables as possible and with variety of methods.

		OR, DR, AST, STL, BLK, and Pnt.	further away from cluster centroids than worse.

PG: Point guards, SG: Shooting guards, SF: Small forwards, PF: Power forward, C: Centers, EP: Explosive Players, SCR: Scoring Players, DNB: Defenders near basketball, DFB: Defenders far basketball, PT: Physical test, GRS: Game-related statistics, ABK: Abalakov Jump, SSG: Small-Sided Games, RSA: Repeated Sprint Ability, Min: Minutes, Pnt.: Total Points, 2P%: 2-Point Field Goal Percentage, 3P%: 3-Point Field Goal Percentage, FT%: Free Throw Percentage, DR: Defensive Rebounds, OR: Offensive Rebounds, TR: Total Rebounds, FC: Fouls Committed, FR: Fouls Received, AST: Assists, BLK: Blocks, STL: Steal, TO: Turnovers, PIR: Performance Index Rating, FLC: Foreigners with Low Contribution, FHC: Foreigners with High Contribution, SLC: Spaniards with Low Contribution, BLKR: Blocks received, PER: Performance Efficiency Rating, USG: Usage Ratio, PG 1-4: Point guard 1 to 4, SG 1-4: Small Guard 1-4, PF 1-5: Point Forward 1-5, C 1-6: Center 1-6, TS%: True Shooting Percentage, 3PAr: Three point attempt rate, ORB%: Offensive rebounds percentage, DRB%: Defensive rebounds percentage, AST%: Assists percentage, STL%: Steals percentage, BLK%: Blocks percentage, TO%: Turnovers percentage, DAR: Dunk Attempt Rate, USG%: Usage percentage, %FGA 0-3ft: 2-Point Field Goal Attempts within 0-3 feet, %FGA 3-10ft: 2-Point Field Goal Attempts between 3-10 feet, %FGA 10ft-3p: 2-Point Field Goal Attempts between 10 feet and 3-point line, 3P As: Assisted 3-Point Field Goals, 2P As: Assisted 2-Point Field Goals, DST: Total Distance Covered, AAS: All-Around All Stars, SB: Scoring Backcourt, SR: Scoring Rebounder, PP: Paint Protector, RP: Role Players, FTA: Free throws attempt, SPD: Average Speed, TCHS: Player Touches per Possession, PASS: Passes Made, PT/P: Points per Game, RB/P: Rebounds per Game, BL/P: Blocks per Game, AS/P: Assists per Game, TO/P: Turnovers per Game, ST/P: Steals per Game, CMJ: Countermovement jump, HR: Heart rate., PP: Performance profiles , MOS: Moment of the season, W-L: Wing – Lose.

Individual playing roles

Two articles were focusing on PT (Gómez-Carmona, Mancha-Triguero, et al., 2021; Ibáñez et al., 2023), specifically examining lower-limb evaluation. Both studies utilized jump tests and Repeated Sprint Ability (RSA) assessments, while (Ibáñez et al., 2023) also incorporated speed measures, including a sprinting curve test. Additionally, both studies assessed aerobic capacity.

A total of ten articles investigated GRS (Anıl Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Ibáñez et al., 2023; Kalman & Bosch, 2020; Madinabeitia et al., 2023; Mateus et al., 2020; Patel, 2017; Rangel et al., 2019; Wang et al., 2022). Common statistics highlighted in these studies included assists, defensive rebounds, offensive rebounds, shooting percentage for 3-point shots, and turnovers.

Two articles specifically concentrated on anthropometric measures (Kalman & Bosch, 2020; Wang et al., 2022) with height assessments being a key parameter in both investigations. Five articles focused on other factors than PT, GRS, or anthropometric measures, two of these focused on nationality (Madinabeitia et al., 2023; Rangel et al., 2019; Wang et al., 2022), another explored age (Mateus et al., 2020), and two utilized Global Position System (GPS) (García-Rubio et al., 2024; Mateus et al., 2020) to create these IPRs.

All studies have described IPRs (Anıl Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Garcia-Rubio et al., 2024; Gómez-Carmona, Mancha-Triguero et al., 2021; Ibáñez et al., 2023; Kalman & Bosch, 2020; Madinabeitia et al., 2023; Mateus et al., 2020; Patel, 2017; Rangel et al., 2019; Wang et al., 2022). Six authors described an IPR called paint protector (Anil Duman et al., 2012; Bianchi et al., 2017; Kalman & Bosch, 2020; Patel, 2017; Rangel et al., 2019; Wang et al., 2022), and five described a shooter (Anıl Duman et al., 2021; Dehesa et al., 2019; Ibáñez et al., 2023; Kalman & Bosch, 2020; Patel, 2017). Four studies labelled an IPR called “role players (Anil Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Patel, 2017) , defined as a player that is not excelling in a broad range of physical attributes of dominating specific game-related statistics. Two of them authors described one IPR as “floor general” (Bianchi et al., 2017; Ibáñez et al., 2023), considered as the "coach on the floor" because they are responsible for directing teammates, calling plays, and making strategic decisions during games. Additionally, two studies identified a “defensive player” (Bianchi et al., 2017; Ibáñez et al., 2023) as an IPR. Finally, the IPR of “versatile player and “explosive player” were each described in two studies (García-Rubio et al., 2024; Ibáñez et al., 2023) with the first one defined as a player who does it all on the court.

According to the authors, the IPRs that showed statistically significant differences are as follows: versatile player, explosive player, dynamic player, and fast player (García-Rubio et al., 2024). Explosive players, scoring players, defenders near the basket, and defenders far from the basket (Ibáñez et al., 2023). Foreign high contribution, foreign low contribution and Spanish low contribution (Madinabeitia et al., 2023). Defensive big, dominant centre (X. Wang et al., 2022). Floor general, shooter, team leader, big man (Anıl Duman et al., 2021). PC1, PC2, PC3, PC4 (Gómez-Carmona, Feu, et al., 2021). Versatile player, traditional big, three-point shooting guard, stretch forward, skilled forward, mid-range big, high usage guard, floor general, ball dominant scorer (Kalman & Bosch, 2020). Younger players with low

performance, older players with intermediate time played (Mateus et al., 2020). Bad performance, role player, defensive player, shooting player (Dehesa et al., 2019). Point guard Brazil 1, shooting guard Foreign 5, shooting forward Brazil 6, point forward Brazil 10, center Foreign 10 (Rangel et al., 2019). Scoring backcourt, paint protector (Bianchi et al., 2017). Paint protector, supporter, shooter, and insider.

In Table 4, there is a representation of a windows graphic where for each study are described IPRs, the variables they use to describe them, and statistical measurements.

Table 4. Windows graphic

Study	IPRs	Methodology	SM
García-Rubio et al., 2024	VRP	Accelerations, decelerations, distance, and player load	Percentage of vari: 48,64%
	EP	Speeds and accelerations	Percentage of vari: 17,69%
	Dynamic player	Change of pace	Percentage of vari: 10,18%
	Fast player	Most distance at speeds of 18-24 km/h	Percentage of vari: 4,98%
Ibáñez et al., 2023	EP	Height ABK, PIR and Pnt.	
	SP	Aerobic capacity, 2P, 3P, and FT	
	DNB	MJ, Fouls, BLK, and RB	p-value: <0,001
	DFB	Aerobic capacity, and STL	
Madinabeitia et al., 2023	FHC and SLC	W (CR)	Chi-square: 14,549; p-value: <0,001
		L (CR)	
		W (Le)	Chi-square: 342, 328; p-value: <0,001
		L (Le)	
	FLC	W	Chi-square: 127,328; p-value: 0,001
		L	Chi-square: 53,103; p-value: <0,001
Wang et al., 2022	N7: Defensive Big	DR and OR	
	N8: Dominant center	PER, PTS, %USG, and 2PM	p-value: 0,001
Anıl Duman et al., 2021	PG2: Floor general	PER	Z-score: 19,50
		%STL	Z-score: 2,83
		%AST	Z-score: 37,41
	SG1: Shooter	%TS	Z-score: 0,55
		3Par	Z-score: 0,43
		FTr	Z-score: 0,22
	SF2: Shooter	%TS	Z-score: 0,54
		3Par	Z-score: 0,44
		FTr	Z-score: 0,20
	PF4: Team leader	PER	Z-score: 25,3
		%TS	Z-score: 0,59
	C3: Big Man	%TS	Z-score: 0,59
		%FGA	Z-score: 0,62
		Dist.	Z-score: 3,48
Gómez-Carmona et al., 2021	PC1	30-15 test: male	Percentage vari: 31,01%
		30-15 test: female	Percentage vari: 36,00%
	PC2	Jump capacity; male	Percentage vari: 26,81%
		Jump capacity; female	Percentage vari: 22,91%
	PC3	Curvilinear sprint; male	Percentage vari: 16,15%
	PC4	Nº of decel; female	Percentage vari: 9,37%
Kalman & Bosch, 2020	VRP	Net rating	0,79
	TB		0,85
	TPSG		0,73
	STF		1,82
	SKF		0,67
	MRB		0,48
	HUB		0,26
	FLG		0,27
	BDS		2,71
Mateus et al., 2020	Cluster 1: Low performance	FGM and FGA	Chi-square: 3716,9; p-value:0,001
	Cluster 2: Older players, intermediate time played	RB, 3P, AST, and FT	Chi-square: 38,8; p-value:<0,001
	Cluster 3: Finest overall performance	Pnt, FGM, FGA, RB, 3P, and AST	Chi-square: 6099,8; p-value: <0,001
	Cluster 4 & 5: Older players, low level of time of play	Fouls, STL, and FT	Chi-square: 11,2; p-value: <0,001
Dehesa et al., 2019	Cluster 1: Bad performance players	TOV ON MAX NEG	
	Cluster 2: Role player	FGA MAX POS	
	Cluster 3: Defensive skills	FGM FGM	p-value: <0,001
	Cluster 4: Shooting player	TOV	

	Cluster 5: Bad performance layer	MAX NEG NI	
Rangel et al., 2019	PG Brazil 1 SG Foreign 5 SF Brazil 6 PF Brazil 10 C Foreign 10	AST 3PA DR OR	AutoML: 0,49 AutoML: 0,15 AutoML: 0,15 Auto ML: 0,49
Bianchi et al., 2017	SB Pai. Pro.	Pts and AS TOV and BLK	0,58 0,72
Patel, 2017	Pai.Pro. Sup. / Role Sho. In.	2PM, 3PM, RB, and BLK AST, STL, and 3P 2PM, and 3PM 2PM, RB, and BLK	NI NI NI NI

d: SM: Statistical measurement, GP: Game positions, IPRs: Individual playing roles, PT: Physical test, GRS: Game-related statistics, PP: mance profile, F: Forwards, C: Centers, G: Guards; PF: Point forwards, PG: Point guards, SF: Small forwards, RS: Regular season, PO: Playoffs, ntage Vari.: Percentage explained of the variance; AC: Aerobic capacity; SLJ: Single leg jump, Curve: 6,75m left and right Centripetal Force, Des: Dec) m/s², ES: Effect size, SV: Situational variables, C: Centres, MOTS: Moment of the Season, ON: Plus/minus (player on court), OFF: Plus/minus r off court), NET: Difference between ON and OFF, MAX POS: Maximum Negative Points Difference, MAX NEG: High negative points difference periods that the players was on the court,, W (Le): Wing league, L (Le): Lose league, W (CR): Win Copa del Rey, L (CR): Lose Copa del Rey, AS: . Paint. Pro.: Paint protector, SB: Scoring Backcourt, Sup.: Supporter, Sho.: Shooter, In.: Insider, 3PA: 3 points attempt, 3Par: Three point attempt 'RP: versatile player, TB: Traditional big, TPSG: Three point shooting guard, STF: Stretch forward, SKF: Skilled forward, MRB: Mid-Range Big, High Usage Guard, FLG: Floor General, BDS: Ball dominant scorer, OR: Offensive rebound, DR: Defensive rebound, FTM: Free throw made, Pts: , 2PM: 2 points made, 2PA: 2 points attempt, BLK: Blocks, FLC: Foreign low contribution, FHC: Foreign high contribution, SLC: Spanish low bution, N7: Native players group seven, N8: Native players group 8; EP: Explosive player, SP: Scoring player, DNB: Defensive near basket, DFB: sive far from basket, MJ: Multi jumps; Pnt: Points scored.

Secondary outcomes: Sex differentiation

One article differentiated tactic roles between male and female sexes (Gómez-Carmona, Mancha-Triguero, et al., 2021) . The main distinction was that male roles focused on jump and curvilinear sprint performance, while female roles emphasized jump, curvilinear sprint, and deceleration capacity (Gómez-Carmona, Mancha-Triguero, et al., 2021).

It was found that most of the investigated studies reported GRS as the main parameter to classify players' IPRs (n=10), other factors (n=5) the second most prevalent approach, followed by the use of anthropometric measures (n=3) and the least common method employed with the use of PT (n=1) (Table 5). In addition, one study made distinctions between sexes.

Table 5. Summary of individual tactic roles-related fields

Nº Studies	Thematic	Conclusions	References
2	IPRs using PT	Some specific PT as curvilinear sprints, unipodal jump, height ABK, and accelerative actions can be useful to describe IPRs.	Gómez-Carmona, Mancha-Triguero, et al., 2021; Ibáñez et al., 2023
10	IPRs using GRS	GRS are very useful to describe IPRs using predictive methods, cluster analysis.	Anıl Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Ibáñez et al., 2023; Kalman & Bosch, 2020; Madinabeitia et al., 2023; Mateus et al., 2020; Patel, 2017; Rangel et al., 2019; Wang et al., 2022
1	IPRs using a combination of PT and GRS	There are positive relationships between PT and GRS. The achievement of certain GRS in competition is influenced by the level of capacity in some PT.	Ibáñez et al., 2023
2	IPRs using anthropometric measures	Anthropometric measures, such as height, can be useful to describe IPRs.	Kalman & Bosch, 2020; Wang et al., 2022
5	IPRs using other factors	Other factors as age or nationality can be useful in the description of IPRs the combination of experienced players and different nationalities gives great **flexibility** to teams.	Garcia-Rubio et al., 2024; Madinabeitia et al., 2023; Mateus et al., 2020; Rangel et al., 2019; Wang et al., 2022

Legend: PT: Physical test, GRS: Game-related statistics, ABK: Abalakov Jump, IPRs: Individual playing roles.

For the above-mentioned reasons, it was not possible to conduct a meta-analysis, as data were not extensive enough for specific outcomes to be grouped according to certain player subgroups.

Discussion

This systematic review aimed to provide a comprehensive overview of the various IPRs studied in basketball and to explore how PP differ based on PT, GRS, and anthropometric measures. The increasing focus on tactical specialization, particularly in the analysis of GRS and physical actions, appears to align with the growing trend in basketball toward a higher volume and proportions of three point-offense during gameplay (Gou & Zhang, 2022). By examining these factors, this review seeks to contribute to a deeper understanding of player roles and their impact on team performance in modern basketball.

Physical tests

All sport-specific tests used to describe IPRs are based on lower extremities (Ibáñez et al., 2023; Mancha-Triguero, Reina, et al., 2021). This may be given that scientific literature indicates no significant relationship between upper body maximal strength and basketball shooting performance (Cabarkapa et al., 2022). However, other studies determined that upper body horizontal strength (UBHS) can be predicted by the number of years played at the top level and therefore seems to be a performance-related parameter (Reichert et al., 2023). Additionally, elite players demonstrated significantly better performance in one-repetition maximum bench press compared to intermediate players (Delextrat & Cohen, 2008). Based on these previous studies (Reichert et al., 2023), evaluating upper limb strength is necessary and is often required in basketball matches for actions where players compete to create and defend spaces (Morrison et al., 2022a). However, it is important to recognize that for isolated upper body strength to transfer into gameplay contributions from lower body force production components may be required (Morrison et al., 2022a). Among these physical tests related to lower limbs, the predominant use of jump tests can be explained by the fact that training load in basketball players accumulates more in the vertical plane than in the frontal or lateral planes (Svilar et al., 2018).

Thus, concerning game demands, players must perform repeated jumps to block shots or execute rebound actions (Morrison et al., 2022a). Additionally, the use of RSA is supported by studies emphasizing the importance of such efforts in team sports (Buchheit et al., 2010; Spencer et al., 2005). It has also been demonstrated that, during basketball competitions, players perform an average of 105 wrestling actions with sprint intensity varying between 15 and 19 m/min (Scanlan et al., 2011); therefore, the ability to repeat sprints appears to be a key factor for high-level performance (Scanlan et al., 2011). In particular, the use of aerobic capacity as a recurrent test can be explained by the fact that to achieve and maintain optimal performance levels, basketball players train with short sprints and changes of direction, with relatively short recovery times (10, 30, or 60 seconds). Although these actions are anaerobic, recovery from such actions depends on the aerobic abilities of the players, specifically their $VO_{2\,max}$ (Gottlieb et al., 2022). Curved sprinting is one of the most commonly used tests in basketball performance evaluation; this can be attributed because of the strong correlation with change of direction (CoD) ability (Baena-Raya et al., 2023). This ability is a crucial skill in basketball, because is characterized by frequent, high-intensity movements that require rapid directional changes (Ari et al., 2021). These findings highlight the importance of curved sprinting tests in assessing basketball-specific athletic performance (Shalom et al., 2024).

Game-related statistics

A key commonly in the description of IPRs is the use of GRS, in this case helps in identifying promising players by comparing their statistical profiles to those of successful players in similar roles (Njunge & Ng'etich, 2023). The sports statistics commonly used across articles include assists, defensive rebounds, offensive rebounds, shooting percentage for 3-point shots, and turnovers. In the realm of GRS, assists are one of the most crucial factors; this is because as players gain years of experience in first-division elite teams, their assists increase (Lorenzo et al., 2019). Additionally, a higher number of forced turnovers and defensive rebounds are having a greater likelihood of success in game (Conte et al., 2018). Another study demonstrated that performance in two-point shots (made and attempted) and three-point shots were statistically linked to winning games, with three-point shooting percentage being crucial for all games (Ektirici, 2023). Similarly, authors have highlighted that the GRS, which makes the difference in playoff games in the Euroleague, were three-point shooting percentage, two-point shooting percentage, turnovers, and free throw percentage (Berk Yilmaz et al., 2023). Following the discussion

on this GRS, winning teams had a higher percentage of efficiency in pick-and-rolls and contested and uncontested shots, in general, winners had a better shooting percentage based on catch-and-shot actions, cuts, pick-and-roll efficacy, and uncontested shots based on better collective behaviour (Bustamante-Sánchez et al., 2022).

Anthropometric measures

Anthropometric measures have been used to describe the IPRs. This could be because height is one of the commonly associated traits with basketball (Han et al., 2023; Tauda Tauda et al., 2025); also, as the lowest level of the league, the players are shorter than their counterparts in higher divisions (Alejandro et al., 2015).

Another aspect that can be important to consider is the strong correlation between body composition and sports performance, as lower body fat percentage is associated with greater lower limb strength in resistance exercises, sprint repeatability, and the ability to perform different types of jumps involved in basketball (Miguel-Ortega et al., 2023). It has also been observed that anthropometric demands are different according to the athlete's position; for example, centers are significantly taller, heavier, and have a higher fat percentage than forwards and guards (Čović et al., 2023).

Other factors

Some articles have concluded that nationality and age could be used to describe the IPRs. Nationality can be explained given that foreign players may differ from native players in their in-game skills (Ozmen, 2012), which leads to native players playing a secondary role in their team's offense (R. Chen et al., 2023). Age or experience of the players can be used given that the important role of both biological maturation and training experience on youth basketball players' performance and development (Guimarães et al., 2021) also, if we talk about performance in professional teams, the average age of NBA All-Stars is 26,5 years, while the average age of MVP winners is 27,9 years (J. Chen, 2024). These statistics suggest that players in their mid to late twenties often reach their prime, allowing them to take significant roles within their teams, however future studies must corroborate this conclusion.

The last factor used was the GPS variables (Mateus et al., 2020), these tools allow for great accuracy in detecting specific basketball movements, and when combined with players' physical characteristics, can be highly useful for monitoring external load in this sport (Torres-Ronda et al., 2022). Another aspect to consider is the observation that proper planning, incorporating such variables, has been shown to enhance the ability to repeat sprints and generate a significant, moderate to notable increase in jump performance (Aoki et al., 2017). About the GRS, some studies corroborate that there is a relationship among them; one example is the correlation between points scored and player load (PL), and field goals and PL/minute (García et al., 2013). By contrast, a recent study in professional men's basketball reported small associations between basketball performance metrics and game loads (García-Rubio et al., 2024).

Definitions from studies

As has been described in the results, some IPRs have been described in one or more articles (Anıl Duman et al., 2021; Bianchi et al., 2017; Dehesa et al., 2019; Kalman & Bosch, 2020; Madinabeitia et al., 2023; Mateus et al., 2020; Patel, 2017; Rangel et al., 2019; X. Wang et al., 2022) but with different names. Most of the studies have defined paint protector as an IPR, this could be a relevant IPRs because this type of player provides advantages in both offensive and defensive play, such as higher shooting release points and better reach for rebounds or blocks (Zarić et al., 2020). The shooter role stands out as particularly crucial in basketball, this emphasis aligns with previous research findings that highlight shooting percentage as the most significant contributor to performance in the sport (Okazaki & Rodacki, 2012). A comprehensive analysis of NBA data from the past decade revealed that shooting performances were key predictors of championship teams (Okazaki & Rodacki, 2012). The study concluded that true NBA champions were characterized by balanced teams excelling in both offense and defense, with a particular emphasis on strong shooting capabilities. This underscores the critical role that accurate and consistent shooters play in a team's success at the highest level of professional basketball (Okazaki & Rodacki, 2012). The role players are another of the most mentioned in the studies, this could be important because is the type of player who understands and accepts his role on the team. While on the bench, the good role player keeps his/her head in the game and observes the different technical aspects

that are in the game (*Basketball Role Players, Coach's Clipboard Basketball Coaching*, n.d.). Another IPR that has been repeated is the floor general, this player is considered the "coach on the floor" because they are responsible for directing teammates, calling plays, and making strategic decisions during games (Anıl Duman et al., 2021). This type of player has a big importance in team cohesion, and it is an effective method to increase athlete engagement (L. Wang et al., 2024). Furthermore, the IPR that has been defined is the defensive player, this can be important because defense plays a vital role in determining game outcomes, a study analyzing NBA data from the past decade found that defensive performances, measured by advanced metrics like defensive rating, were significant predictors of championship teams (Burkett et al., 2021). Also, another study analyzing the same league with the same period of sample has highlighted the importance of defensive rebounding, showing a moderate impact on game outcomes favouring win (Buyukcelebi et al., 2024). The last two IPRs that are described are the explosive player and the versatile player. Explosive actions in basketball are the most determinant in the outcome of the game (Conte et al., 2017). Recent research indicates that these high-intensity movements, such as jumps, sprints, and rapid CoD, occur frequently and are crucial for success in basketball (Shalom et al., 2024). Player versatility is a crucial aspect to consider in basketball, the ability of a player to perform multiple IPRs reflects the growing emphasis on tactical flexibility in modern basketball (Eberle et al., 2021).

The lack of consensus in IPRs could be attributed to the diversity of methodologies used, as well as the different study populations and sporting contexts analyzed. Therefore, fostering greater collaboration between researchers and coaches, as well as standardizing evaluation methods, is crucial to obtaining more reliable and generalizable results (Eberle et al., 2021). Additionally, it is essential to consider the particularities of each sport, such as American football, handball, or soccer, among others, and the constant evolution of physical and technical demands in today's sports arena. Integrating attributes of rigor and quality with recommended best practices for qualitative research design in health professions not only optimizes the process of designing, conducting, and reporting such research but also fosters an increase in both the quantity and quality of studies (Johnson et al., 2020) on IPRs across diverse teams, thereby advancing our comprehension of athletes' specific needs. Consequently, this optimization can lead to improved design of training programs and strategic decision-making in the sports domain (Silva et al., 2021).

Sex differentiation

Few studies have differentiated the IPRs based on sex in basketball (Mancha-Triguero, García-Rubio, et al., 2021; Portes et al., 2020). Research findings on deceleration patterns in women's basketball present conflicting conclusions. Some studies suggest that deceleration is a specific action in women's basketball, possibly due to various aspects related to morphological and musculoskeletal development (Gómez-Carmona, Mancha-Triguero, et al., 2021),other studies observed, observed a lower quantity of decelerations in female players, which may also be linked with strength-related mechanisms (Portes et al., 2020). These contradictory findings could be attributed to several cofounding factors including: the limited sample size, differences in the competitive level of the player studied, or the variation in methodologies used to register decelerations. Future research could employ similar methodologies to those already utilized, or implement a longitudinal study design to evaluate this parameter in female basketball players over time.

Conclusions

From our perspective, the findings of this systematic review could serve as a starting point for understanding the emerging IPRs in basketball. Additionally, it could be useful for consolidating existing knowledge and defining innovative profiles based on the various studies mentioned in this review. The goal would be to achieve consensus in understanding this evolution in the game. A lack of a unified methodology for identifying playing roles is evident. Therefore, this review represents the first step towards creating a standardized framework and establishing the foundation for future research. In addition, it contributes to the development of a unified methodology for the study of IPRs.

Acknowledgements

The authors would like to give explicit thanks to the authors of the articles included in this systematic review that provided data used in the original analyses.

Financing

The authors declare no funding sources.

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