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PLAYERMAKER'S PROPRIETARY RATING SYSTEM

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ABSTRACT

The need for an objective rating system in sports has been present for years. Players, parents, and coaches often disagree when ratings are based on subjective evaluation. Furthermore, areas where objective ratings exist, such as speed and endurance, are limited to physical tests, and to closed scenarios.

Advancements in sports technologies and AI methodologies have enabled the tracking of actions of footballers on the pitch. Playermaker has developed a wearable foot-mounted performance tracker device that captures athlete's data from the source of motion.

Initially, our football tracker provided data of the players' activities in training and matches. The next key milestone was the creation of **an objective skills rating system, that covers both physical and technical abilities, obtained during real world scenarios** of match play.

This article describes the rationale, the methodology, and the outcome of Playermaker's Proprietary Rating System (PRS). A system that turns data into insights and provides players with objective algorithm-based numeric scores for critical football skills. In addition, it provides players the context of their scores and an ability to understand their rating compared to age and gender benchmarks. Finally, the rating system is complemented with a call to action and content from a top football club, enabling players to maximise their skills.

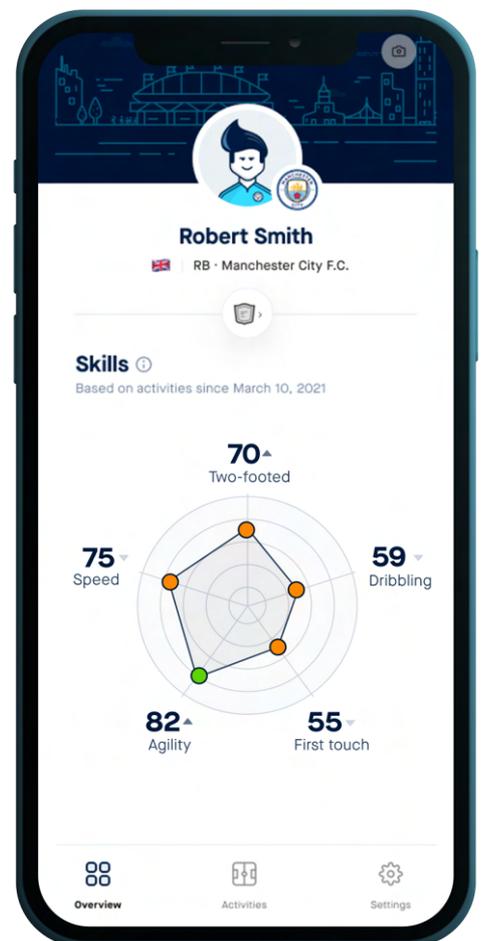


Figure 1. Visual representation of Playermaker's Rating System in a radar chart format

Keywords: Football, Rating System, Technical Skills, Physical Skills, Manchester City, Artificial Intelligence, Machine Learning, Talent Identification, Talent Development, Benchmarks, First Touch, Speed, Agility, Dribbling, Two-footed



PLAYERMAKER'S PROPRIETARY RATING SYSTEM (PRS)

Problem Statement

Every young male or female athlete engaged in sports frequently asks themselves three basic questions: **How skillful am I? How do I compare to my peers or heroes? How can I get better?**

Currently, despite numerous sports technology advancements, players are still facing the same three challenges.

1. There are traditional methods to measure physical skills in closed scenarios, such as speed, agility, power, and endurance. However, there are limited methods to measure technical skills.
2. Even once drill-based tests are conducted, players have limited ways to compare themselves to their peers or heroes.
3. Without this individual assessment, players struggle to identify tailored training regimes to improve their game.

Talent Identification

Talent identification is complex, and involves a solid understanding of players' physical, technical, psychological, sociological, and tactical skills. Overall, practical methods of youth talent identification are still based on watching players in a game or practice session, complemented by traditional tests of physical abilities in closed scenarios. Therefore, players rely on scouts, or agents to get noticed and to demonstrate their skills and talents. In global football it is commonly accepted to conduct a 10m/40m speed test, a 5-10-5 agility test, a Yo-Yo endurance (or Yo-Yo intermittent) test, and a vertical or broad jump power test (1). While the physical data from these tests is objective, technical ratings are based on observations alone, and thus, are subjective in nature and scenario dependent (2,3). Furthermore, often the subjective scale can be limited to a 5 or 7 point scale. Even when a larger point scale is selected, typically coaches utilise only a small portion of the total available scale. Finally, the weight given to physical skills may lead to a common error as, typically, players born in the first quarter of the year are the ones being selected due to their physical advantages (4).

It has been reported that players that progress to the higher levels possess strong technical skills, such as ball control and dribbling speed (5). Most research in this area is based on the assessment of drill-based dribbling performance (6).



Even if all data was objective and accurate, perhaps the most interesting question is: **what are the most critical skills that predict success?** Are these the ones that occur most frequently during the game? For example, dribbling contributes to approximately 8% of all in-game individual actions, whereas first touch and passing accounts for 46% of all in-game actions (6). Does that mean the latter is more important?

Larkin and O'Connor (7) from the University of Sydney thoroughly investigated this question. They used the Delphi method to understand what are the key attributes that coaches and recruiters perceive as most critical for selection of players. Out of 29 potential attributes, first touch, one-on-one ability, and striking the ball were rated at the top of the list. It should be noted that first touch is considered as one of the four core skills outlined by the Football Australia national curriculum (7).

Consumer Insights

In addition to the coach's perspective on critical skills, it is of value to listen to players' point of view on the matter. In a consumer insight study conducted by our company (8), 296 players were asked "**what aspect of your game do you most want to improve?**" Both dribbling and first touch were ranked among the top five technical skills that players selected to improve. As part of our data-driven decision making, the importance of dribbling and first touch for players were considered when we developed our rating system.

It is worth noting here that specific skill training can improve performance (1). In another survey among players that investigated how much players would like to see various game metrics, leg balance (two-footed) was rated as the second most important metric for a game scenario. Combining coaches' and players' opinions on critical skills drove the selection of the first five skills to be included in the new rating system.

The Women's Angle

The progress of the women's game is another motivation to better understand talent identification and talent development in global football. As a guiding principle, it is of high importance to develop women's specific benchmarks from the start, rather than to "adjust" men's benchmarks to female players. In reviewing the scientific literature, Kryger et. al. (9) searched large databases to investigate the quantity of research on women's football. They concluded that whilst there has been continuous growth in research on females, the numbers are not comparable to research studies on males.



Beyond the sheer number of research publications on male and female players, there is a growing body of research on gender differences in match performance. For example, it has been reported that male players covered larger distances and at higher speed thresholds, whereas no differences were found in technical events such as number of touches and time of possessions (10).

To better understand the demands of the women's game at various levels of play, a large research project has been conducted in the UK as a collaboration between the Football Association (FA) and Leeds Beckett University. In a recent publication, (11) data from 293 players from the Women's Super League ($n = 76$) and the Women's Championship ($n = 217$) teams over a 28-week period has been studied. The study described results and implications to women's practice planning in relation to game day.

On April, 2022 the FA announced that "after a successful two years working with Leeds Beckett University on a project that explores the demands of the women's game, the partnership has been extended for a third year and will see further developments providing even more in-depth insights into the locomotor and technical demands of the game." It is expected that additional research findings from this project will be published in the coming years.

It should be noted that Playermaker has provided the tracking units and analytics for this project.

To Summarise

Players of all ages need a simple and accurate way to allow them to measure their skills, compare themselves to global benchmarks, and give themselves an opportunity to improve their play.

Playermaker is using a unique, scientific, AI-based approach to comprehensively address these challenges and provide the tools for players, practitioners, and researchers to be able to measure, compare, and share their skills. This approach, the rating system, and the science behind it is described in detail in the next chapter. This rating system integrates data science based on thousands of matches, AI technological capabilities, biomechanical understanding of human motion, and football knowledge from leaders in the field. This integration in turn provides a product that enables any player to take ownership of their journey to maximising their skills.

METHODOLOGY

Rationale and Principles of PRS

Playermaker's ratings are based on three key principles:

1. Objective, AI-based measurements of both physical and technical skills.
2. Recorded during in-game situations, without interference.
3. Developed with global age and gender benchmarks. This approach is based on a deep belief that all players should have access to better understanding and easy accessibility to their skills scores.

Subjects and Data

Data was collected using a foot mounted IMU (Playermaker, patented technology). Detailed description of the unit was previously described (12). For the purpose of rating development, data from approximately 6,500 matches with approximately 2,000 different players that collectively had approximately 250,000 ball possessions was used. It should be noted that as of the end of August 2022, **7.1B** meters were covered and **267M ball touches** were recorded using our system.

The PRS currently contains **5 skills**: 3 technical and 2 physical. These include Two-Footed, First Touch, Dribbling, Speed, and Agility. All are considered critical for success in global football.

The Skills

The first five skills selected for the rating system are described below. The selection was based on both skills that were found to be critical for talent development and identification, as well as skills that were found to be important for players to improve.

All these skills are described and commonly used in global football literature and within top clubs academies.

1. **First Touch**: The ability to receive and control the ball with both feet at different speeds
2. **Dribbling**: The ability to move with and manipulate the ball with both feet at different speeds and directions
3. **Two-Footed**: The ability to use both feet for various interactions with the ball
4. **Speed**: The ability to run fast (without the ball)
5. **Agility**: The ability to quickly respond to game actions through fast turns or changes in pace

It is important to note that these scores are computed during matches, and that the scores are accompanied by additional metrics that are computed during both games and practice sessions.



Player Segments

To allow players to compare themselves to other players with similar match demands, different segments were defined. Each segment is a combination of gender, age and position category. For each segment, a scale of 40-99 was selected for presentation of the ratings. An average player is expected to get a score of around 70 in their segment; the top 5% will get 99 and the bottom 5% will get approximately 40.

Players are curious about their performance. Therefore, PRS utilises cloud technology to provide immediate comparative results. In order to help players understand the level of their skills a format of a radar chart is used. This visual provides a comprehensive look of the players critical skills. A score of 70 represents the average for your age and gender. Higher scores indicate strengths, while lower scores indicate opportunities for improvement.

The score per match is complemented with effort metrics. For example, for dribbling skill, a score is provided with additional three metrics: distance with the ball, top speed with the ball, and number of intense turns with the ball. The radar chart is based on the latest matches played. In addition, a progress report for comparison with previous sessions is provided.

Since internal and external factors may affect the match performance, skills are estimated based on multiple matches. Internal factors include the player position, fatigue, and mental condition; external factors include tactical changes, field condition, and the opponents.

Example of Score Development - Dribbling

In order to develop Playermaker's score for dribbling, match data from 1,270 players with 150,000 possessions was used. Possession refers to an action when players have control over the ball and they are ready to perform an action with the ball (passing, dribbling, shooting, or losing the ball). During ball possession, a player can touch the ball once, twice or multiple times. During two-touch or more, dribbling can be detected. Our rating for dribbling is based on algorithms that take into account elements such as how players carry the ball with speed and acceleration, as well as number of turns and the intensity of the turns during dribbling. When comparing players at different ages, a higher absolute score is observed as age increases.



Similar patterns of improved absolute scores with age are seen in all skills, except for two-footed. Absolute score refers to scores before they are adjusted for age and gender.

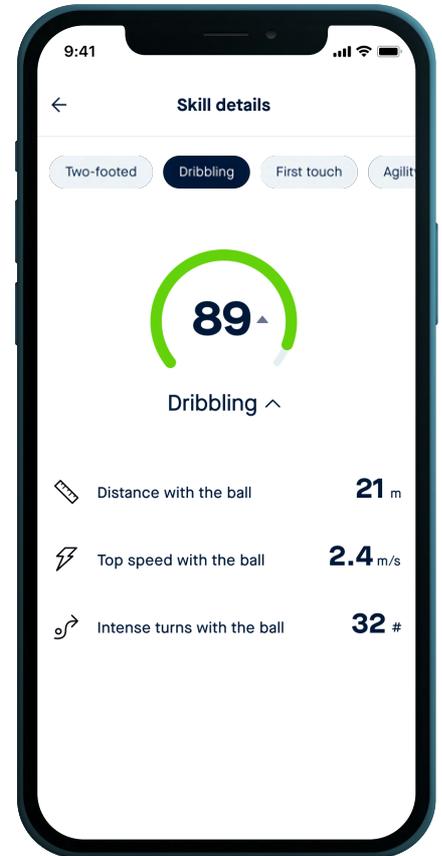
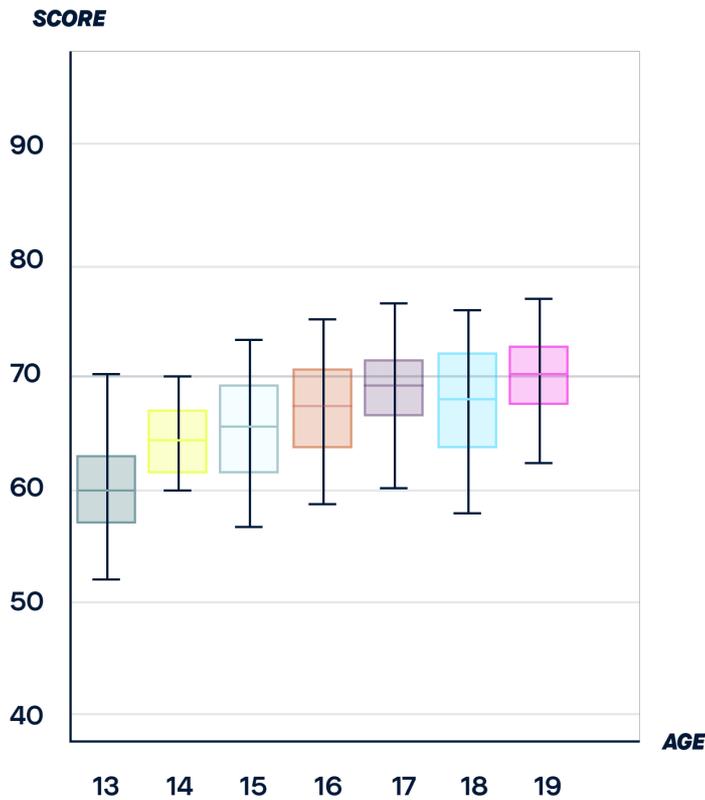


Figure 2. Dribbling score per different age groups (Left) and dribbling score and metrics for the latest match as they appear in the app (Right)

Implications

Once players know their scores, they wish to get better. Playermaker’s app contains a series of video practices from top level coaches of Manchester City, designed to help them improve these five skills and their overall game. Players have the freedom to select, based on a combination of their skill scores, their own intuition and their coach’s recommendation, which practices they wish to train on. For example, a player with a score of 55 in first touch and 85 in speed can choose whether to try improving their weakness (first touch) or keep focusing on their strength (speed). **Playermaker provides the complete platform for players to own their journey from rating to training and back to rating to assess improvement.**

From a player’s perspective, PRS allows them to **measure, compare and share their skills.** From a coach’s perspective, PRS can be used as an **objective tool for talent ID.**



SOLUTION AND RESULTS

PRS introduces the first objective in-game scores for football

The game of football is technical and physical in nature. Research has shown that players that emerge to higher levels are those who possess better technical skills (4). Testing of technical skills in global football is far less frequent compared with physical skills, in part due to operational challenges, such as equipment and measurement tools. The key technical skills that are often named are: dribbling, receiving, passing, and shooting. However, there is a limited number of objective technical tests. These include the Ronaldo Speed test for dribbling (13), or the McDonald Skill Test for trapping and passing (14).

PRS allows players and coaches for the first time to objectively and immediately obtain information about their technical and physical skills upon completion of a match. **The knowledge facilitates a fact-based conversation between coaches and players.** The data is comprehensive and combines both **skill rating** and **level of effort**, which together provide a complete performance picture.

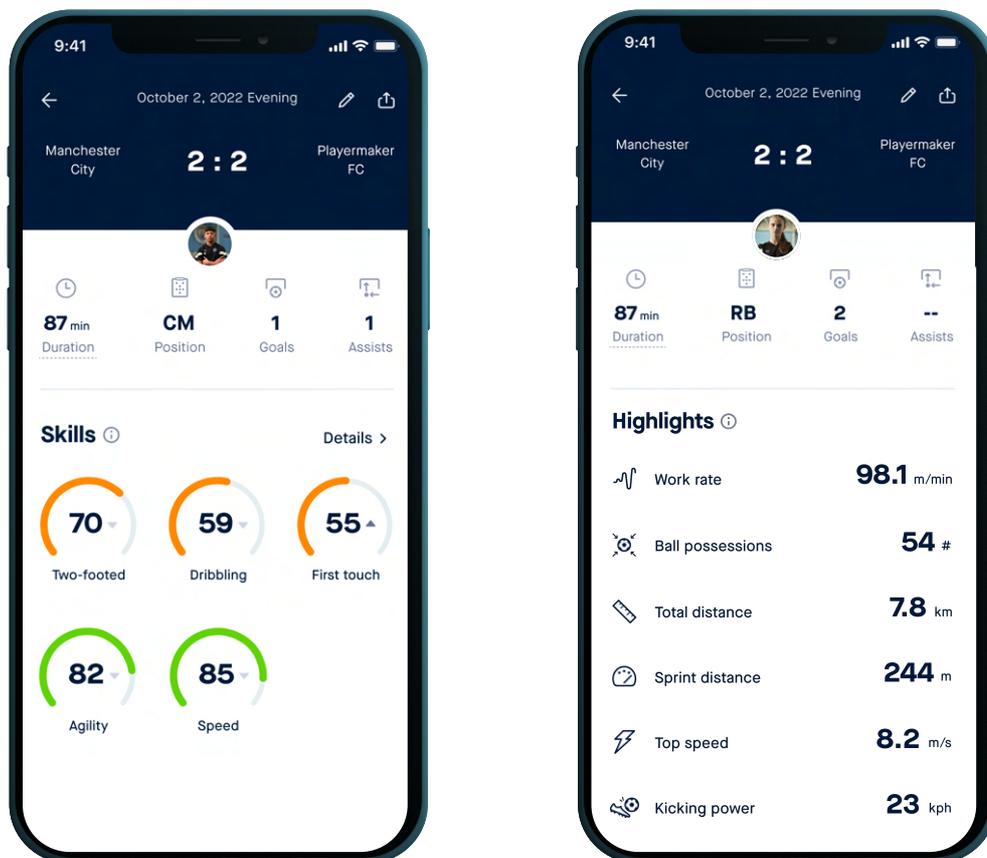


Figure 3. Examples of skill scores (Left) and game highlights (Right)



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PRS Introduces an age and gender based rating system

While it is critical for players and coaches to understand **what** they did, It is even more critical to draw insights from this information in a clear and meaningful manner. To enable this, PRS provides players with an opportunity to compare themselves to their peers immediately after the game. In other words, players can understand **how** they did, within the context of their age and gender. Whilst such comparison often leads to fun and laughter in the locker room, it is intended primarily to help players understand their strengths and areas of opportunity. For example, a score of 60 in first touch has a clear meaning for the player: they are below average in this skill compared to their global peers. Therefore, this insight helps them grasp the importance of furthering this skill. In other words, the **PRS turns information into insights.**



PRS Empowers players with a call to action

To close the performance triangle of “Data-Insights-Action”, the new rating system is complemented in the CITYPLAY App with high quality video content from top level coaches from Manchester City. These videos were created and designed to allow players to train and efficiently improve in a simplified setting.

For example, the player below demonstrated hard work and high involvement in the game as indicated by their work rate of 98.1 m/min, and the 54 possessions they had. With respect to their skills, they achieved high scores for speed (75) and agility (82). However, for technical skills of first touch and dribbling they achieved ratings of 55 and 59 respectively. In the app, they then used quality drills designed to train first touch and dribbling.

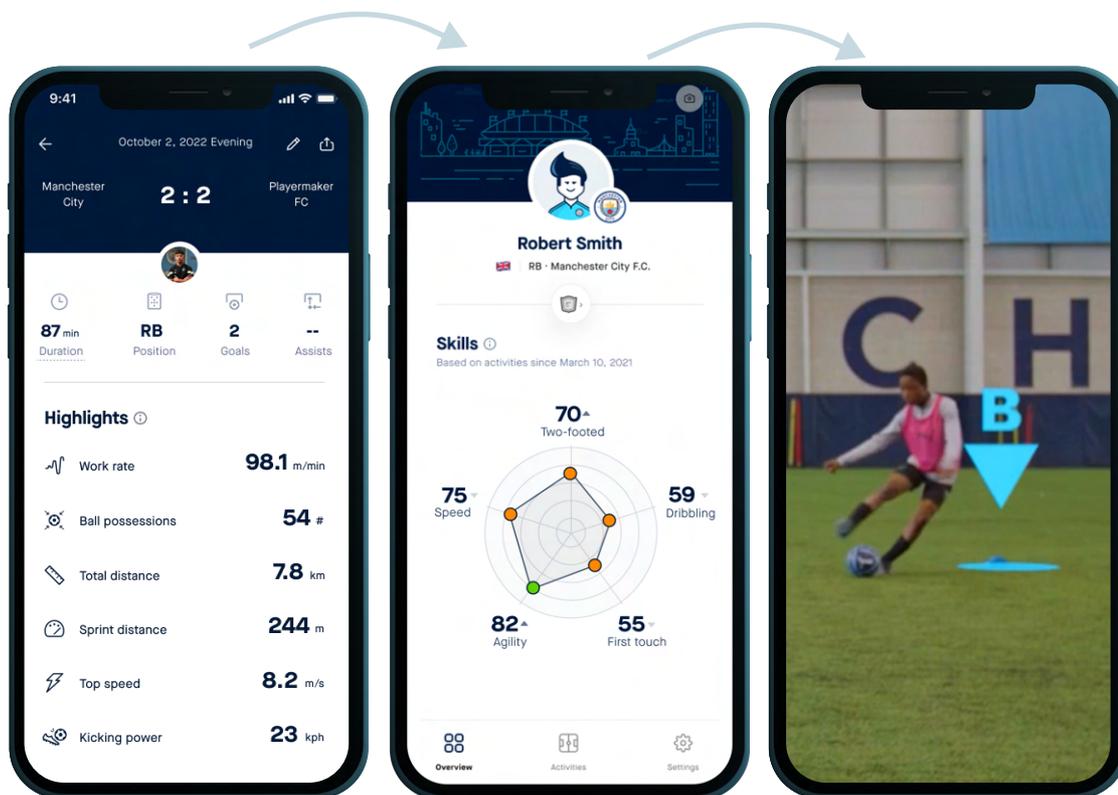


Figure 4. Game data (left), translated to player’s profile (Middle), and recommended training action (Right)

Summary

PRS is an innovative, scientifically-based objective rating system that has been created and presented as part of a holistic approach to performance, talent identification, and talent development. It is the center of the three pillars of this approach that includes data, insights, and actions. An approach that enables players of any age or gender to understand and maximise their skill levels.



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