Technical-Tactical Performance from Data Providers: A Systematic Review in Regular Football Leagues

Fernando Manuel Otero-Saborido *, Rubén D. Aguado-Méndez , Víctor M. Torreblanca-Martínez and José Antonio González-Jurado

Abstract: In recent years, the number of technology companies providing data to football teams has multiplied. At first, the provided information focused more on physical fitness parameters, but today, ever more data is being generated on technical-tactical performance. The objective of this study was to review the studies on technical-tactical variables based on the information offered by data providers from every country’s regular elite league championship. The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards. A total of 31 studies were selected. LaLiga (27.91%) and the Premier League (18.60%) were the most studied competitions. Amisco was the company with the largest number of studies (54.84%). Descriptive studies (58.06%) predominated over comparative (22.58%) and predictive analyses (19.05%). “Style of play”, “contextual variables” (descriptive analysis), and “demarcation” (comparative analysis) were the most used objectives in the 28 studies reviewed.

Keywords: match analysis; soccer; eventing; notational analysis; computerised system

1. Introduction

The precursors of football game analysis date back to the work of Charles Reep (1968) on the predictive models of successful passes in the English league [1,2]. However, as opposed to the observation methodology (where the data undergo a quality control) [3] and to the data providers object of this research, notational analyses similar to those used in the Charles Reep (1968) studies recorded technical-tactical actions manually, offering no guarantee of a minimal data collection reliability [4–6]. The advent of automated tracking systems made it possible to overcome many problems related to manual tracking. These systems enabled the recording of other parameters that were difficult to quantify manually: distances travelled, positions in the field, speeds, etc. [7,8]. Although Van Gool [9] can be considered as the forerunner of these systems, these automated systems in elite football were probably first used in the competitions leading up to the 1998 World Cup, with the French team and in the Spanish League during the 2002–2003 season through AMISCO [10].

Regarding the information given by football data provider companies, two major types of information should be differentiated. On the one hand, “tracking” data offers information about the exact position of players on the pitch. This information allows generating, in turn, a wide range of physical variables (not technical-tactical) such as positional synchronisation between players, which provide a significant amount of data about the game [11,12]. Data for physical fitness variables are more accurate than recorded data for technical-tactical variables. However, the performance keys of soccer, as a team sport, are predominantly technical-tactical. For this reason, the second type of information offered by data providers is called “eventing”. It essentially covers the technical-tactical actions related to the ball: assists, counterattacks, or set piece actions [13,14].

Football represents an open and complex system, and this complexity must be addressed during the analysis [15]. This complexity means that behaviours are not explained...
only by manifestations of psychological or physical variables but by the interaction of these variables in changing contexts, which are characteristic of team sports [16]. The difficulty to measure or quantify such a reality has led to the fragmentation into more operable physical phenomena to try to explain football performance. In the case of football, regular leagues are the most researched competition format, and this has resulted in a tendency to extract from data providers variables such as distance, positioning, or player speed [10,17]. Despite the usefulness of these data, given the complexity of a sport such as football, it seems necessary to adopt the complexity paradigm and analyse technical-tactical variables considering the specificity of the paradigm and the greater explanatory nature. Therefore, the objective of this work was to review the studies on technical-tactical variables based on the information offered by the data providers in each country’s regular elite league championships.

2. Materials and Methods

2.1. Search Criteria

The search focused on three criteria: (a) football studies, (b) words related to “match analysis” and (c) data providers. Search terms were included in the “Title/Abstract/Keyword” fields. The AND command was used to join the “football” criterion with the “data providers” criteria and words related to the match analysis. The OR command was used to separate search terms within each criterion. The complete list of search instructions was as follows: TITLE-ABS-KEY ((mediacoach OR instat OR wyscout OR statbombs OR prozone OR amisco OR (second AND spectrum) OR chyronhego OR opta OR (video AND tracking) OR (computerised AND match AND analysis AND system) OR (multiple-camera AND match AND analysis AND system) OR semiautomated OR (multi-camera AND image AND recognition AND system) OR (task AND analysis) OR (notational AND systems) OR (analysis AND systems) OR (multiple-camera AND system)) AND (football OR soccer)). Only articles (no systematic reviews) written in English were included in the search.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed [18]. The PRISMA statement standards consist of a 27-item checklist spread across the title, abstract, introduction, method, results, and discussion sections. The PRISMA statement items were checked for each article, one by one. Item numbers 4 and 6 that refer to the PICO format were of particular interest: “Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).”

In the present study, the “participants” were the “competition” (Premier League, Laliga, Serie A, Bundesliga, Ligue1, and league tournaments in other countries). The “intervention” referred to the “method”, which in our case was the “data provider”. It also included “purposes” and “outcomes”.

2.2. Exclusion Criteria

A total of 6 exclusion criteria were defined:
1. The article was not included in the Web of Science or Scopus databases.
2. The study focused on qualifying competitions rather than regular leagues.
3. The study did not use some of the data providers included in the search.
4. Articles that do not analyse each country’s top competition: training/second division.
5. Study of a sport other than football.
6. They analyse variables related to physical conditions only.

Studies were included regardless of whether the players were male or female and regardless of the country, provided the competitions were of regular leagues.

2.3. Procedure

Three researchers performed a search in two databases: SCOPUS and Web of Science. The search terms listed above were included. The researchers eliminated the duplicate articles that were found after applying the inclusion and exclusion criteria and later agreed
on the non-coincidences. Finally, the PRISMA standards were verified, considering that the object of study mainly focused on educational sciences. From 2 January to 2 May 2021, the review in the databases was conducted. The search ultimately produced a total result of 28 articles across the two databases (Figure 1).

Figure 1. Flowchart describing the phases of the review process.

2.4. Quality of the Studies

To evaluate the quality of the studies, a risk-of-bias quality form was used for the specific research context. Evaluation was performed from work developed by Law et al. [19]. The systematic review conducted by Sarmento et al. [20] was also taken as a reference. Sixteen quality criteria (QC) were considered: purpose stated clearly (QC 1), relevant
background literature reviewed (QC 2), appropriate design for the research question (QC 3), sample described in detail (QC 4), sample size justified (QC 5), informed consent (QC 6), reliable outcome measures (QC 7), valid outcome measures (QC 8), method described in detail (QC 9), results reported in terms of statistical significance (QC 10), appropriate analysis methods (QC 11), importance for the practice reported (QC 12), any drop-outs reported (QC 13), conclusions appropriate (QC 14), implications for practice (QC 15), and limitations of the study (QC 16).

The quality criteria were applied by three experts in soccer match analysis studies. The quality of indicators for the included articles was as follows: (1) the mean methodological quality score for the 28 selected articles was 87.05%; (2) 9 articles scored between 90 and 100% (excellent methodological quality); (3) 17 articles scored between 80 and 90% (good methodological quality); and (4) none of the articles scored below 75% (see Electronic Supplementary Table S1). The score registered (percentage and completed items) by each article is shown in Tables 1–3.

3. Results
3.1. General Analysis

A first descriptive analysis was obtained based on three variables: competitions, providers, and study objectives. In the case of competitions, a total of 10 regular competitions from different countries were studied according to the inclusion criteria. The championship of the Spanish LaLiga (27.91%) and the English Premier League (18.60%) were the most widespread across the 28 studies (Figure 2). Analyses of technical-tactical variables in regular tournaments were distributed over five data providers: Amisco, Prozone, Mediacoach, Opta, and Instat. Half of the studies (54.8%) were drawn up by Amisco. Finally, within this first analysis, the studies were organised into three groups according to the type of analysis: descriptive (54.84%), comparative (22.58%), and predictive (28.51%) (Figure 3).

Figure 2. Percentage of studies according to the competition studied (%).
The literature included a number of reviews of football match analyses [17,20]. The present systematic review found 28 works published between 2011 and 2020 on technical-tactical variables in elite regular leagues of different countries. The latest update that included research on the topic under study dates back to 2014 [10,21]. Moreover, the present study makes several contributions compared to previous reviews, besides providing a necessary update. First, we addressed the limitation of works that focused mainly on technical-tactical variables. In addition, further data providers other than Amisco and Prozone have emerged (Mediacoach, Instat, Wyscout, and Opta) since the previous reviews. Regarding the competition model, elimination and selection tournaments obviously have a different competitive idiosyncrasy than regular tournaments. Therefore, a differentiated analysis of the “league” format competitions was necessary.

3.2. Type of Analysis Conducted

Following the same methodology as Sarmento [21], the studies were first classified according to the type of analysis carried out: descriptive analysis (contingency tables or other descriptive parameters); comparative analysis of different groups (positions in the field, competition levels, sex, etc.); and predictive analysis (different types of regression or algorithms). Subsequently, we analysed the following variables in each of the three groups of studies: “data provider”, “competition”, “objective” and “outcomes.”

3.2.1. Descriptive Analyses

A total of 17 studies that described technical-tactical variables were found (Table 1). Although all data providers were represented in these descriptive studies, Amisco was the most widely used (9). Of the eight leagues from different countries under study, the Premier League (7) and LaLiga (6) were the most analysed. These 17 works were grouped into four categories: game model, spatial, situational, and methodological. The technical-tactical variables (forward passes, passes from defensive third to attacking third, crosses, etc.) aimed at explaining the “style of play” of the teams included the largest number of studies. Within this category, some studies focused on the network of contacts resulting from the collective [22,23], the team’s defensive behaviour [24], the most frequent cooperative interactions [25], the head pass game [14], or longitudinal studies of technical-tactical parameters such as the five-year study by Zhou et al. [26] on the China League. Notable among these studies was the work of Fernández-Navarro et al. [27], who performed a
factor analysis in order to categorise different styles of play based on 19 technical-tactical indicators. A second category of descriptive studies focused on spatial aspects such as playing area, breadth, or depth [28,29]. A third group of studies focused on the influence of independent contextual variables such as a player expulsion [30], the scoreboard [31], the weather [32], or return to competition after injury [33]. Finally, within these descriptive studies, we singled out the so-called “methodological” category of studies that measured technical-tactical variables, aiming at the application of a scientific method including reliability [34] or content validity [35].

**Table 1.** Descriptive studies of regular tournaments using information obtained from the data providers (the studies are listed alphabetically within each category).

| Authors and Year | Provider | League | Purpose | Outcomes | Quality Score |
|------------------|----------|--------|---------|----------|---------------|
| **Fernández-Navarro et al. [27]** | Amisco | Premier League and LaLiga | To categorise different styles of play in elite soccer and associated performance indicators by using factor analysis factorial. | Direct and possession styles of play, defined by factor 1, were the most apparent styles. | 93.5 |
| **Fernández-Navarro et al. [24]** | Amisco | LaLiga | (1) To examine the defensive behaviours of soccer teams when gaining the ball in advanced zones of the pitch (2) To evaluate the effect of contextual variables on these defensive behaviours. | Winning teams gained more balls in the zone close to their own goal. The greater the quality of the opponent, the lesser the chance of gaining the ball in advanced zones of the pitch. | 87.5 |
| **Gama et al. [23]** | Amisco | Primeira Liga Portuguese | To verify the network of contacts resulting from the collective behaviour of professional football teams through the centroid method and networks. | The interactions of the professional football teams tended to occur preferentially in the game’s offensive phase, and the network of contacts was controlled, during ball possession, through passes performed in the central and lateral areas of the field. | 81.25 |
| **Gama et al. [22]** | Amisco | Primeira Liga Portuguese | (1) To verify whether network analyses could be used to identify key players in attacking phases of professional football. (2) To establish the main interactions and preferential linkages between attacking teammates during competitive performance. | Results indicated how key individual players are instrumental in orchestrating team performance, exerting a powerful influence on the creation of attacking patterns of play. | 75 |
| **Ramos et al. [25]** | Prozone | Premier League | To operationalize a method addressing different levels of hypernetworks on soccer matches. | The results showed that, at a micro-level, the most frequent simplicial configuration is 1 vs. 1. | 87.5 |
| **Sarajarvi et al. [14]** | Instat | Premier League | (1) To gather detailed information about game situations where headers were performed. (2) To characterise how headers were executed in different game situations. | Significant associations between the following variables were found: header purpose and player position, movement and jump type, game state and player movement, game state and jump type, space occupation and opponent players as well as header type. | 93.75 |
Table 1. Cont.

| Authors and Year      | Provider | League                  | Purpose                                                                                                                                                                                                 | Outcomes                                                                                                                                                                                                 | Quality Score (%) | Completed Items |
|-----------------------|----------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| Zhou et al. [26]      | Amisco   | China Super League      | To examine the evolution in physical and technical performance parameters in the CSL (China Super League) from the 2012 season to the 2017 season.                                                        | Physical performance, especially high-intensity running distances, together with technical performance parameters, such as crosses, shots on target, and opponent penalty area entries, increased over six seasons in the CSL.                       | 81.25             | 13/16           |
| Duarte et al. [28]    | Prozone  | Premier League          | (1) To analyse qualitatively whether changes in the emergent patterns of behaviours of sport teams could be related with key events such as goals scored. (2) To investigate the complexity of team collective behaviours, in terms of their magnitudes and structures of variability. | Key events such as goals scored and games seemed to influence the collective patterns of performance. Teams seemed to become more regular and predictable but with increased magnitudes of variation in their organisational shape over the natural course of a match. | 81.25             | 13/16           |
| Zubillaga et al. [29] | Amisco   | 1st female Spanish Division | To examine the playing area according to the position of the ball.                                                                                                                                     | The player distribution was significantly wider and shallower when the ball was in the central areas of the field than when the ball was in a built-up play zone and the finishing and scoring zone. The spaces were significantly different depending on the ball’s position. | 93.75             | 15/16           |
| Konefa et al. [36]    | Opta     | Bundesliga              | To assess the frequency with which football players engaged in the technical activity of different types, in relation to seven phases of a game associated with changes in match status. | A team attempting to change the match score will need to raise the frequency and accuracy of passes, the percentage of ball possession, and the percentage of tackles ending in success. The maintenance of a winning match status requires a high frequency of occurrence of shots and shots on target. | 93.75             | 15/16           |
| Lago-Peñas et al. [37]| Opta     | Premier League, LaLiga, Bundesliga, Serie A, and LaLiga | To evaluate the soccer teams’ technical competitive match performance following the effect of a player dismissal.                                                                                       | The advantaged teams exhibited better team performance after a player dismissal, and teams modified their tactics and style of play in response to this new match scenario.                                      | 87.5              | 14/16           |
| Portillo et al. [33]  | Mediacoach | LaLiga                  | To determine the effects of muscular injuries in the lower limbs on the technical and physical performance when they returned to the league competition.                                                         | After a moderate or severe muscular injury (causing >8 days lay-off), player performance was significantly lower as well as technical skills such as sprints and successful passes.                                      | 87.5              | 14/16           |
| Zhou et al. [32]      | Amisco   | China Super League      | To investigate the effects of situational and environmental factors on the technical and physical match performance.                                                                                   | In the CSL, situational variables had major effects on technical performance but trivial effects on physical performance. Environmental factors affected technical performance.                                      | 81.25             | 13/16           |
Table 1. Cont.

| Authors and Year     | Provider | League | Purpose                                                                                                                                                                                                                                                                                                                                 | Outcomes                                                                                                                                                                                                                                                                                                                                 | Quality Score (%) | Completed Items |
|----------------------|----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| Liu et al. [34]      | Opta     | LaLiga | To evaluate the inter-operator reliability of the OPTA client system, which is used to collect live football match statistics by OPTA Sportsdata Company.                                                                                                                                                                                                                                                             | Results showed that team events coded by independent operators presented a very high degree of agreement (kappa values were 0.92 and 0.94), and the average difference of event time was 0.06 ± 0.04 s.                                                                                                                                  | 81.25             | 13/16           |
| Santos et al. [35]   | Amisco   | LaLiga | To demonstrate the impact of three distinct operational definitions over two performance indicators related to the ball recovery.                                                                                                                                                                                                                                                | The results showed that the frequency and location of ball recoveries differ depending on the operational definition used. These data support the selection of a ball recovery definition for use in empirical research.                                                                                                                                      | 87.5              | 14/16           |

(*) Evaluation was performed from developed by Law et al. [19] and Sarmento et al. [38].

3.2.2. Comparative Analyses

A total of seven studies were found that compared the technical-tactical variables of different groups (Table 2). The most frequent comparison was one that sought to determine the technical-tactical performance differences based on the specific demarcation [11,39,40]. “Ball possession”, “percentage of duels won”, or “dribbles” were some of the technical-tactical variables used to determine the differences between the demarcations. Another group of studies compared decision-making based on the competitors’ levels (strong or weak; first or second division), such as in the studies by Castellano et al. [41,42]. Finally, it is worth highlighting the study by Tenga et al. [43] on the differences between male and female football.

Table 2. Comparative studies of regular tournaments using the information obtained from the data providers.

| Authors and Year     | Provider | League | Purpose                                                                                                                                                                                                                                                                                                                                 | Outcomes                                                                                                                                                                                                                                                                                                                                 | Quality Score (%) | Completed Items |
|----------------------|----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| Castellano et al. [42]| Amisco   | LaLiga | To identify collective tactical decisions from a high-level football team, by analysing team length, width, and surface area in offensive and defensive phases, when playing against stronger and weaker level opponents.                                                                                                                                                                                                                   | Higher offensive lengths, widths, and surface frequencies were found against weak teams. In the defensive phase, higher frequencies of the studied variables were found against strong teams.                                                                                                   | 75                | 12/16           |
| Castellano et al. [41]| Opta     | LaLiga | The aim of this study was to analyse the strategic component of teams in the first and second division of the Spanish football league according to their position in the table at the end of the season.                                                                                                                                                                                                                     | The main finding was that the most successful teams in the first division of the Spanish football league in 2013–14 performed differently compared to other teams analysed with respect to most of the variables studied.                                                                                                           | 87.5              | 14/16           |
| Authors and Year | Provider | League | Purpose | Outcomes | Quality Score (%) | Completed Items * |
|------------------|----------|--------|---------|----------|-------------------|-----------------|
| Dellal et al. [39] | Amisco | LaLiga | To examine both the technical and physical activities of a large sample of players from the French First League, with special reference to their playing positions. | Midfielders performed successful passes ranging from 75% to 78%, whereas lower values were found for the forwards (71%) and central defenders (63%), respectively. | 87.5 | 14/16 |
| Folgado et al. [11] | Prozone | Premier League | To explore whether the outcome of professional football matches is affected by changes in intra-team movement synchronisation. | When losing, the analysed teams tended to exhibit a lower value of movement synchronisation. Defensive dyads presented a more synchronised behaviour during the match than the offensive dyads. | 93.75 | 15/16 |
| Gai et al. [40] | Amisco | China Super League | To identify the technical and physical differences between domestic and foreign soccer players according to playing-positions in the China Super League (CSL). | Notably, non-Chinese players performed more passes, shots, and aerial and ground challenges when compared with Chinese players. | 87.5 | 14/16 |
| Gai et al. [44] | Opta | China Super League | The aim of this study was to identify the key performance indicators related to technical and tactical aspects according to playing position and nationality in the CSL. | There were significant technical-tactical performance differences between domestic (Chinese) and foreign (non-Chinese) players according to playing positions in the CSL. There were also small differences between domestic and foreign players. | 93.75 | 15/16 |
| Tenga et al. [43] | Amisco | LaLiga | The aim of this study was to explore emergent patterns of game structure in male and female matches from elite soccer by using playing distances measured according to the ball location. | The results suggest that female matches produced less favourable game structure patterns with fewer penetration opportunities than male matches. | 93.75 | 15/16 |

(*) Evaluation was performed from work developed by Law et al. [19] and Sarmento et al. [38].

3.2.3. Predictive Analyses

This third group of studies focused on predicting individual or collective patterns and behaviours and, in some cases, according to situational variables (Table 3). A number of works centred on an individual/group (not team) technical-tactical means of passing, such as the study by Gama et al. [45], which suggested the existence of a pattern between an increase in the homogeneity of passing distributions and goal-scoring attempts in the sample of competitive matches studied. Another predictive study on an individual technical-tactical situation was that of Szczepański et al. [46], who designed a predictive model of successful passes. The model, however, was not only based on technical variables, but it also considered the defensive pressure. Predictive works on technical-tactical variables based on “situational” factors include the studies of Kubayi [47] and Santos et al. [48]. These latter authors built regression models based on the match’s momentary result or the opponent’s strength, the dependent variables being ball possession or ball recovery. Finally, the “system” predictive models are especially worthy of note given their complexity. Examples include the study by Lago-Ballesteros [49] and Barron [49], which predicted more global aspects of game systems such as the type of attack (direct or elaborate) or multiple technical-tactical variables.
Table 3. Predictive studies in regular tournaments based on information obtained from data providers.

| Authors and Year | Provider | League | Purpose | Outcomes | Quality Score (%) | Completed Items * |
|------------------|----------|--------|---------|----------|-------------------|------------------|
|                  |          |        |         |          |                   |                  |
| Individual/group technical-tactical skills | | | | | |
| Gama et al. [45] | Amisco   | Portuguesa | To establish a relationship between the homogeneity of passing distribution between players of a team and goal attempts in the team sport of association football. | Results suggested the existence of a pattern regarding an increase in the homogeneity of passing distributions and the goal-scoring attempts in the sample of competitive matches studied. A homogeneous distribution of passes can moderately predict when a goal attempt will occur within the minute following an entropy assessment. | 81.25 | 13/16 |
| Szczepański et al. [46] | Amisco | Premier League | To build a statistical model in which the success of a pass depends on the factors as the origin and destination of the pass, the skill of his teammates and the opponents, and proxies for the defensive pressure. | A combination of various factors influences the probability that a pass is successful in a statistical model and that it evaluates inherent player skills. | 81.25 | 13/16 |
| Situational variables | | | | | |
| Kubayi et al. [50] | Instat | South African Premier Soccer League (PSL) | To assess the impact of situational variables on ball possession in the PSL. | The results showed that losing teams had the highest ball possession compared to winning and drawing teams. Playing away significantly decreased ball possession by 5.21% compared to playing at home. Playing against weak opposition was associated with increased ball possession by 4.09%. | 87.5 | 14/16 |
| Santos et al. [48] | Amisco | LaLiga | The aim of this study was to examine the effects of match conditions on the defensive positioning in professional soccer. | Playing against a strong opponent decreased the “ball recovery location” position of the defensive line compared to playing against similar opponents. A combination of these variables can be used to develop a model to predict future performances. | 93.75 | 15/16 |
Table 3. Cont.

| Authors and Year | Provider | League | Purpose | Outcomes | Quality Score (%) | Completed Items * |
|------------------|----------|--------|---------|----------|-------------------|------------------|
| Barron et al. [12] | Prozone | Premier League | The aim was to objectively identify key performance indicators in professional soccer that influence outfield players' league status using an artificial neural network. | The findings of this study showed that it is possible to identify performance indicators using an artificial neural network that influences players' league status and that accurately predicts their career trajectory. | 87.5 | 14/16 |
| Lago-Ballesteros et al. [49] | Amisco | LaLiga | The aim of this study was to analyse the influence of playing tactics, opponent interaction, and situational variables on achieving score-box possessions in professional soccer. | The direct attacks and counterattacks were more effective than elaborate attacks for achieving score-box possession. Team possession originating from the offensive zone and playing against imbalanced defence produced greater success than those initiated in the defensive zone with a balanced defence. | 93.75 | 15/16 |

(*) Evaluation was performed from work developed by Law et al. [19] and Sarmento et al. [38].

4. Discussion

The aim of this work was to review the studies on technical-tactical variables based on the information offered by the data providers in each country's regular elite league championships. The technical-tactical variables of the studies (forwards' passes, passes from defensive third to attacking third, crosses, etc.) in this review were directed, mainly, towards objectives that explain the “style of play” of the teams, the influence of the “contextual variables,” and the technical-tactical differences depending on the “demarcation.”

We believe the study makes several significant contributions regarding its initial objective. First, a selection was made of the study results of major football data providers within “match analysis” studies. Second, the technical-tactical variables were analysed in a differentiated way from those relating to physical conditions or the match environment. Third, regular leagues were selected as the competitions under study since regular league technical-tactical variables can be regarded as more stable than those of qualifying competitions. Finally, each country’s top Regular Leagues are of greater repute and scientific interest than lower category competitions.

If we compare the results of this present study with that of previous match analysis reviews [10,38,48], the number of studies on technical-tactical variables has increased. Most of the previous studies focused on variables relating to physical conditions, probably because they are easier to measure. This review found almost three times more descriptive studies compared to predictive and comparative studies, thus illustrating the difficulty of analysing the game from a systemic perspective [15,16]. Sarmento et al. [21] had already observed this predominance of descriptive designs. Ever more efforts have been undertaken, however, by data providers to elaborate more qualitatively complex and predictive metrics more closely linked to the game’s functional logic. Metrics such as expected goals or assists are an example of this [48]. In any event, some of these metrics continue to establish predictive models based on isolated technical-tactical skills. Yet, passes or goal assist
cannot be decontextualised from the corresponding game’s cycle or phase. Therefore, it seems necessary that data providers advance towards adequate predictive models based on the game’s globality and, above all, that they be contextualised within each team’s game model [49]. In this line of data personalisation, the teams’ tactical analysts emphasise how important it is that the generated reports be understandable for coaches [50].

Worthy of note is the latest revision by Sarmento et al. [38]. This work sheds light on the question of what performance analysts need to know about research trends in association football. Regarding the technical-tactical variables in the present study, the systematic review by Sarmento et al. [38] categorises studies according to significant aspects such as “Team Center,” “Team Dispersion,” or “sequential patterns.” Although the study by Sarmento et al.’s work is not limited to data providers only, we must remember that some aspects of the game are important to analysts and have not yet been automated by data providers, such as the distances covered by players. That is, much concurrent data is generated, but football requires obtaining temporal patterns that are more difficult to achieve automatically.

In the same way, given the complexity of the data’s management [51] if we understand that the data is meant to help football teams to increase their performance, it would be necessary to obtain real-time data and thus enhance its usefulness for analysts and coaches. Most of the technical-tactical data in the previous works, however, are obtained after the matches. This lack of immediacy is nevertheless beginning to be overcome as ever more data is being provided in real time. The increase in the number of football data providers has contributed to this improvement. At the end of the twentieth century, Prozone and Amisco were virtually the only companies to offer football tracking data. In recent years, the increase in the number of data providers has contributed to improving the quality of data. It is worth highlighting the British company OPTA, Mediacoco in LaLiga, or Instat and Wyscout.

5. Conclusions

To conclude, studies on technical-tactical variables were reviewed based on the information provided by the data providers in the elite league competition formats of each country. The present work was the first systematic review that has been carried out with the above characteristics. The studies were first classified according to the type of analysis carried out: descriptive, comparative, and predictive analysis (different types of regression or algorithms). Most studies used a descriptive analysis of the game (58.06%). Studies with comparative (22.58%) and predictive (19.35%) analysis were limited in the use of the data providers. A summary of the studies according to research objectives showed that “style of play,” “contextual variables,” (descriptive analysis) and “demarcation” (comparative analysis) were the most used objectives in the 28 studies reviewed.

Future work should analyse the state of the art of the new metrics that data providers are starting to introduce. One of the limitations of the present study is that it focused only on regular elite leagues in different countries. Thus, several studies potentially use relevant data providers but do not take top-level competitions as a reference [4,51].

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/su131810167/s1, Table S1: Methodological quality.

Author Contributions: Conceptualization, F.M.O.-S., V.M.T.-M., J.A.G.-J. and R.D.A.-M.; methodology, F.M.O.-S. and V.M.T.-M.; software, V.M.T.-M.; validation, F.M.O.-S. and J.A.G.-J.; formal analysis, F.M.O.-S.; investigation, J.A.G.-J. and V.M.T.-M.; resources, J.A.G.-J.; data curation, R.D.A.-M.; writing—original draft preparation, F.M.O.-S., V.M.T.-M., J.A.G.-J. and R.D.A.-M.; writing—review and editing, F.M.O.-S., V.M.T.-M., J.A.G.-J. and R.D.A.-M.; visualization, R.D.A.-M.; supervision, F.M.O.-S.; project administration, J.A.G.-J.; funding acquisition, not applicable. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.
Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: All data are fully available without restriction in the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Reep, C.; Benjamin, B. Skill and Chance in Association Football. J. R. Stat. Soc. Ser. A Stat. Soc. 1968, 131, 581–585. [CrossRef]
2. Reep, C.; Pollard, R.; Benjamin, B. Skill and Chance in Ball Games. J. Source Stat. R Ser. Soc. 1970, 134, 623–629. [CrossRef]
3. Anguera, M.; Blanco, A.; Hernández, A.; Losada, J. Diseños observacionales: Ajuste y aplicación en psicología del deporte. Cuad. Psicol. Deport 2011, 11, 63–76.
4. Pons, E.; García-Calvo, T.; Resta, R.; Blanco, H.; Del Campo, R.L.; García, J.D.; Pulido, J.J. A comparison of a GPS device and a multi-camera video technology during official soccer matches: Agreement between systems. PLoS ONE 2019, 14, e0220729. [CrossRef] [PubMed]
5. Di Salvo, V.; Collins, A.; McNeill, B. Validation of prozone: A new video-based performance analysis system. Int. J. Perf. Anal. Sport 2006, 6, 108–119.
6. Redwood-Brown, A.; Cranton, W.; Sunderland, C. Validation of a Real-Time Video Analysis System for Soccer. Int. J. Sports Med. 2012, 33, 635–640. [CrossRef] [PubMed]
7. Anderson, L.; Orme, P.; Di Michele, R.; Close, G.; Miles, J.; Morten, J.P. Quantification of Seasonal-Long Physical Load in Soccer Players with Different Starting Status from the English Premier League: Implications for Maintaining Squad Physical Fitness. Int. J. Sports Physiol. Perform. 2016, 11, 1038–1046. [CrossRef]
8. Lago-Peñas, C.; Kalén, A.; Lorenzo-Martínez, M.; Campo, R.-L.-D.; Resta, R.; Rey, E. Do elite soccer players cover longer distance when losing? Differences between attackers and defenders. Int. J. Sports Sci. Coach. 2021, 16, 840–847. [CrossRef]
9. Van Gool, D.; Van Gerven, D.; Boutmans, J. The physiological load imposed on soccer players during real match-play. In Science and Football; Reilly, T., Leeds, A., David, K., Murphy, J., Eds.; E. & F.N. Spon: London, UK, 1998; pp. 51–59.
10. Castellano, J.; Alvarez-Pastor, D.; Bradley, P.S. Evaluation of Research Using Computerised Tracking Systems (Amisco® and Prozone®) to Analyse Physical Performance in Elite Soccer: A Systematic Review. Sports Med. 2014, 44, 701–712. [CrossRef]
11. Folgado, H.; Duarte, R.; Marques, P.; Gonçalves, B.; Sampaio, J. Exploring how movement synchronization is related to match outcome in elite professional football. Sci. Med. Footh. 2017, 2, 101–107. [CrossRef]
12. Barron, D.; Ball, G.; Robins, M.; Sunderland, C. Artificial neural networks and player recruitment in professional soccer. PLoS ONE 2018, 13, e0205818. [CrossRef] [PubMed]
13. Kubayi, A.; Larkin, P. Analysis of teams’ corner kicks defensive strategies at the FIFA World Cup 2018. Int. J. Perform. Anal. Sport 2019, 19, 809–819. [CrossRef]
14. Sarajärvi, J.; Volossovitch, A.; Almeida, C.H. Analysis of headers in higher-performance football: Evidence from the English Premier League. Int. J. Perform. Anal. Sport 2020, 20, 189–205. [CrossRef]
15. Castelo, J.F.F. Estructura y Dinámica del juego; INDE Publicaciones: Madrid, Spain, 1999.
16. Passos, P.; Araújo, D.; Davids, K.; Gouveia, L.; Serpa, S.; Milho, J.; Fonseca, S. Interpersonal Pattern Dynamics and Adaptive Behavior in Multidisciplinary Neurobiological Systems: Conceptual Model and Data. J. Mot. Behav. 2009, 41, 445–459. [CrossRef]
17. Carling, C.; Bloomfield, J.; Nelsen, L.; Reilly, T. The Role of Motion Analysis in Elite Soccer Work Rate Data. Sport Med. 2008, 38, 839–862. [CrossRef]
18. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G.; The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med. 2009, 6, e1000097. [CrossRef]
19. Law, M.; Stewart, D.; Pollock, N.; Letts, L.; Bosch, J.; Westmorland, M. Critical Review Form—Quantitative Studies; McMaster University: Burlington, ON, Canada, 1998.
20. Sarmento, H.; Clemente, F.M.; Araújo, D.; Davids, K.; McRobert, A.; Figueiredo, A. What Performance Analysts Need to Know About Research Trends in Association Football (2012–2016): A Systematic Review. Sports Med. 2018, 48, 799–836. [CrossRef]
21. Sarmento, H.; Marcelino, R.; Anguera, M.T.; Campaniço, J.; Matos, N.; Leitão, J. Match analysis in football: A systematic review. J. Sports Sci. 2014, 32, 1831–1843. [CrossRef]
22. Gama, J.; Passos, P.; Davids, K.; Relvas, H.; Ribeiro, J.; Vaz, V.; Dias, G. Network analysis and intra-team activity in attacking phases of professional football. Int. J. Perform. Anal. Sport 2014, 14, 692–708. [CrossRef]
23. Gama, J.; Dias, G.; Couceiro, M.; Belli, R.; Vaz, V.; Ribeiro, J. Networks and centroid metrics for understanding football. S. Afr. J. Res. Sport Phys. Educ. Recreat. 2016, 38, 75–90. [CrossRef]
24. Fernandez-Navarro, J.; Ruiz-Ruiz, C.; Zubillaga, A.; Fradua, L. Tactical Variables Related to Gaining the Ball in Advanced Zones of the Soccer Pitch: Analysis of Differences among Elite Teams and the Effect of Contextual Variables. Front. Psychol. 2020, 10, 3040. [CrossRef]
25. Ramos, J.; Lopes, R.J.; Marques, P.; Araújo, D. Hypernetworks Reveal Compound Variables That Capture Cooperative and Competitive Interactions in a Soccer Match. Front. Psychol. 2017, 8, 1379. [CrossRef] [PubMed]
26. Zhou, C.; Gómez, M.-A.; Lorenzo, A. The evolution of physical and technical performance parameters in the Chinese Soccer Super League. Biol. Sport 2020, 37, 139–145. [CrossRef] [PubMed]
27. Fernández-Navarro, J.; Fradua, L.; Zubillaga, A.; Ford, P.; McRobert, A. Attacking and defensive styles of play in soccer: Analysis of Spanish and English elite teams. J. Sports Sci. 2016, 34, 2195–2204. [CrossRef] [PubMed]

28. Duarte, R.; Araújo, D.; Folgado, H.; Esteves, P.F.; Marques, P.; Davids, K. Capturing complex, non-linear team behaviours during competitive football performance. J. Syst. Sci. Complex. 2015, 26, 62–72. [CrossRef]

29. Zubillaga, A.; Gabbett, T.J.; Fradua, L.; Ruiz-Ruiz, C.; Caro, Ó.; Ervilia, R. Influence of Ball Position on Playing Space in Spanish Elite Women’s Football Match-Play. Int. J. Sports Sci. Coach. 2013, 8, 713–722. [CrossRef]

30. Lago-Peñas, C.; Ruano, M.; Angel, G.; Owen, A.L.; Sampaio, J. The effects of a player dismissal on competitive technical match performance. Int. J. Perform. Anal. Sport 2016, 16, 792–800. [CrossRef]

31. Zhou, C.; Hopkins, W.G.; Mao, W.; Calvo, A.L.; Liu, H. Match Performance of Soccer Teams in the Chinese Super League—Effects of Situational and Environmental Factors. Int. J. Environ. Res. Public Health 2019, 16, 4238. [CrossRef]

32. Portillo, J.; Abián, P.; Calvo, B.; Paredes, V.; Abián-Vicén, J. Effects of muscular injuries on the technical and physical performance of professional soccer players. Physician Sportsmed. 2020, 48, 437–441. [CrossRef]

33. Liu, H.; Hopkins, W.; Gómez, A.M.; Molinuevo, S.J. Inter-operator reliability of live football match statistics from OPTA Sportsdata. Int. J. Perform. Anal. Sport 2013, 13, 803–821. [CrossRef]

34. Santos, P.; Silva, P.M.; Lago-Peñas, C. The ball recovery as an action related performance indicator in Football—An example using distinct operational definitions. J. Hum. Sport Exerc. 2017, 12, 96–105. [CrossRef]

35. Konefał, M.; Chmura, P.; Rybka, K.; Chmura, J.; Huzarski, M.; Andrzejewski, M. What Frequency of Technical Activity Is Needed to Improve Results? New Approach to Analysis of Match Status in Professional Soccer. Int. J. Environ. Res. Public Health 2019, 16, 2233. [CrossRef]

36. Dellal, A.; Wong, D.P.; Moalla, W.; Chamari, K. Physical and technical activity of soccer players in the French first league—with special reference to their playing position. Int. Sport J. 2010, 11, 278–290.

37. Gai, Y.; Volossovitch, A.; Lago, C.; Gómez, M.-A. Technical and tactical performance differences according to player’s nationality and playing position in the Chinese Football Super League. Int. J. Perform. Anal. Sport 2019, 19, 632–645. [CrossRef]

38. Castellano, J.; Casamichana, D. What are the differences between first and second divisions of Spanish football teams? Int. J. Perform. Anal. Sport 2015, 15, 135–146. [CrossRef]

39. Castellano, J.A.D.; Figueira, B.; Coutinho, D.; Sampaio, J. Identifying the effects from the quality of opposition in a Football team positioning strategy. Int. J. Perform. Anal. Sport 2013, 13, 822–832. [CrossRef]

40. Tenga, A.; Zubillaga, A.; Caro, O.; Fradua, L. Explorative Study on Patterns of Game Structure in Male and Female Matches from Elite Spanish Soccer. Int. J. Perform. Anal. Sport 2015, 15, 411–423. [CrossRef]

41. Gai, Y.; Leicht, A.S.; Lago, C.; Gómez, M.A. Physical and technical differences between domestic and foreign soccer players according to playing positions in the China Super League. Res. Sports Med. 2018, 27, 314–325. [CrossRef] [PubMed]

42. Gama, J.; Dias, G.; Passos, P.; Couceiro, M.; Davids, K. Homogeneous distribution of passing between players of a team predicts attempts to shoot at goal in association football: A case study with 10 matches. Nonlinear Dyn. Psychol. Life Sci. 2020, 24, 353–365.

43. Szczepański, Ł.; McHale, I. Beyond completion rate: Evaluating the passing ability of footballers. J. R. Stat. Soc. Ser. A Stat. Soc. 2015, 179, 513–533. [CrossRef]

44. Kubayi, A.; Toriola, A.; Paul, Y. The effects of ball-possession status on technical and physical indicators at the 2016 European Football Championship | Gli effetti del possesso palla sugli indicatori tecnici e fisici ai Campionati Europei di Calcio 2016. Med. Dello Sport 2018, 71, 533–539. [CrossRef]

45. Santos, P.; Lago-Peñas, C.; García-García, O. The influence of situational variables on defensive positioning in professional soccer. Int. J. Perform. Anal. Sport 2017, 17, 212–219. [CrossRef]

46. Lago-Ballesteros, J.; Lago-Peñas, C.; Rey, E. The effect of playing tactics and situational variables on achieving score-box possessions in a professional soccer team. J. Sports Sci. 2012, 30, 1455–1461. [CrossRef]

47. Kubayi, A.; Toriola, A. The Influence of Situational Variables on Ball Possession in the South African Premier Soccer League. J. Hum. Kinet. 2019, 66, 175–181. [CrossRef]

48. Brechot, M.; Flepp, R. Dealing With Randomness in Match Outcomes: How to Rethink Performance Evaluation in European Club Football Using Expected Goals. J. Sports Econ. 2020, 21, 335–362. [CrossRef]

49. Agudo-Méndez, R.D.; González-Jurado, J.A.; Callejas-Jerónimo, J.E.; Otero-Saborido, F.M. Analysis of the goal-scoring opportunities conceded in football: A study case in the Spanish La Liga. Qual. Quant. 2021, 55, 1477–1496. [CrossRef]

50. Agudo-Méndez, R.D.; González-Jurado, J.A.; Reina-Gómez, A.; Otero-Saborido, F.M. Perceptions of Football Analysts Goal-Scoring Opportunity Predictions: A Qualitative Case Study. Front. Psychol. 2021, 12, 3714. [CrossRef]

51. Fedushko, S.; Mastykash, O.; Syerov, Y.; Peracek, T. Model of User Data Analysis Complex for the Management of Diverse Web Projects during Crises. Appl. Sci. 2020, 10, 9122. [CrossRef]