SECTION IV

Other issues in sports performance analysis
TECHNICAL EFFECTIVENESS

José M. Palao¹ and Juan Carlos Morante²

¹UNIVERSITY OF MURCIA, SPAIN
²UNIVERSITY OF LEÓN, SPAIN

Summary

The objective of this chapter is to describe the concepts, criteria, and ways to express effectiveness, as well as to provide examples of technical effectiveness in the different types of sports. The evaluation of technique effectiveness is influenced by the purpose of the evaluation, the characteristics of the technique, and the sport (e.g., purpose and structural aspects). From this conceptual basis, the criteria and ways to express effectiveness (i.e., types of calculations) are reviewed. After determining these aspects, examples of the ways that technical effectiveness is monitored in the different types of sport are presented.

Concepts and definitions of efficacy and technique

Technique is the ability to use certain movements or actions. In sport, the concept of technique involves the movements executed by athletes in their sport practice (training or competition). In the specialized literature, there are many definitions or concepts of technique, as well as misconceptions about this term (see Lees, 2002). However, most of these definitions were influenced by the perspective or the context of the author(s) that wrote the definitions (e.g., mechanical perspective, applied perspective, specific sport, etc.). The way in which technique is defined influences the way sport and performance evaluation are understood. The definition of technique that we are going to use as a reference will be the following: technique is the ‘proper pattern of movements to do a specific sport skill’ (adapted from Antón, 1998). With regard to effectiveness, it is defined as the power to produce an effect (decided, decisive, or desired effect). In other words, a movement is effective if the execution achieves the objective(s) of the movement (e.g., accuracy, scoring, power, projecting the body as far or as high as possible, etc.).

In certain sports, the idea of a proper pattern of movements involves only movement execution (e.g., athletics) but in other sports it involves perception, decision making, and movement execution (e.g., basketball). Regardless of its application, it is important to re-emphasize that the concept of technique involves perception, decision making, execution, and evaluation. The application of technique by an athlete involves intention, which is a tactic, because the technique is adapted to accomplish a purpose. Therefore, a proper analysis of the technique efficacy involves the integration of the different perspectives of analysis (e.g., biomechanical and notational analysis) (Bartlett, 2001).
In order to properly establish the efficacy of the sport technique, the aspects that characterize and define it must be considered (adapted from Morante and Izquierdo, 2008): a) it is conditioned by sport rules; b) it seeks efficiency; c) it seeks economy; d) it follows a model; and e) it requires adaptation.

The execution of a sport technique is influenced by sport rules. The regulations state the conditions of the sport and the purpose for implementing the technique (e.g. time, distance, points, goals, etc.). In order to properly understand how these aspects affect technique and its efficacy, it is necessary to know the purpose and goals of the sport, the sport’s structural aspects, and the repertoire of technical skills in the given sport. According to these criteria, the different sports can be grouped according to their purposes and goals (see Table 17.1). Therefore, the set of movements executed in a sport technique in order to achieve performance in that technique is unique to each sport (Bompa, 1990).

Sport techniques attempt to take advantage of athletes’ functional and motor abilities to resolve the situations that sport competition create. The concept of efficiency can vary even within a sport. For example, the same concepts cannot be applied to establish the efficiency of running in a sprint race as in a fast-break in basketball (Brechue, 2011). The economy of the application of the technique refers to how to manage resources in the best possible way to be effective (i.e. energy cost, time, concentration, etc.). Therefore, this concept refers to the relationship between technical efficiency and the cost involved in its execution. For example, the same concept cannot be applied to establish the economy of running for a marathoner as for a football player (Brechue, 2011; Kyröläinen et al., 2001).

### Table 17.1 Type of sport according to its purposes and goals (adapted from Thorpe et al., 1984)

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision and accuracy</td>
<td>Sports where the athlete tries to put the projectile or object close to a designated area.</td>
<td>Archery, shooting (pistol, rifle, etc.), golf, bowling, billiards, curling, etc.</td>
</tr>
<tr>
<td>Batting and field sports</td>
<td>Sports where the athlete tries to hit the ball and score runs by advancing through the field.</td>
<td>Baseball, softball, cricket, etc.</td>
</tr>
<tr>
<td>Net and/or wall sports</td>
<td>Sports where the athlete tries to put the ball or shuttlecock in the opponent’s court, making it difficult or impossible for the opponent to return it over the net or by playing on one or more walls.</td>
<td>Tennis, table tennis, badminton, volleyball, beach volleyball, squash, paddle, etc.</td>
</tr>
<tr>
<td>Invasion sports</td>
<td>Sports where athletes try to put the ball or object in the opposing team’s goal.</td>
<td>Football, basketball, team handball, rugby, ice hockey, water polo, etc.</td>
</tr>
<tr>
<td>Combat sports</td>
<td>Sports where the athlete attempts to throw and/or contact parts of the opponent, etc.</td>
<td>Judo, fencing, boxing, etc.</td>
</tr>
<tr>
<td>Aesthetic or evaluation</td>
<td>Sports where the athlete is evaluated for the way that he/she performs his/her movements (e.g. timing, form, execution, expression, etc.).</td>
<td>Gymnastics, rhythmic gymnastics, diving, synchronized swimming, figure skating, etc.</td>
</tr>
<tr>
<td>Results or position sports</td>
<td>Sports where the athlete tries to go as fast, far, or high as possible.</td>
<td>Athletics, swimming, cycling, triathlon, sailing, etc.</td>
</tr>
<tr>
<td>Mixed sports</td>
<td>Sports where the athlete performs a combination of disciplines that involve different purposes</td>
<td>Nordic combined, modern pentathlon, equestrian events, etc.</td>
</tr>
</tbody>
</table>
Technical effectiveness

Further, the structural characteristics of the human body establish the possible movements that can be made by the athlete. From the application of mechanical principles, sport characteristics, and the context of the movement execution, the ideal pattern or model of movement execution can be determined. Sport technique involves an integrated intervention of the processes of perception, decision making, execution, and evaluation. Through this process, the athlete attempts to respond optimally to the situation that he or she faces. The success of the technique involves the proper execution of the different stages of this process (perceiving the situation, making a decision about the movement execution, carrying out the movements, and analysing the execution). The analysis of the efficacy of the athlete’s technique involves understanding the aspects of this process and the aspects that affect technique efficacy (Bartlett, 2001).

Criteria to establish technique effectiveness

Technique effectiveness can be established in relation to reference criteria. Any evaluation of efficiency is based on the comparison of the performance with an ideal technical model or concept. This ideal model establishes how an athlete’s technical execution or outcome should be carried out for all the parameters of the movement (adapted from Morante, 2004). This ideal model is established in relation to aspects that characterize each sport technique: efficiency, economy, models of execution, need for adaptation, and outcome. These aspects are not given the same importance in all types of sport.

To establish the technical reference or model with regard to efficiency, the mechanical parameters of the execution must be considered. Using biomechanical principles, the way the movement should be done to be effective can be established. Parameters such as speed of movement, angle, body position, movements executed, times, etc. are used to establish the level of technique effectiveness. An example of parameters used to establish efficacy is the study of the trajectory of the centre of mass in a long jump from the speed components and jump angle (McGinnis, 2005). To establish the effectiveness of the technique from the perspective of economy, the physiological parameters of movement execution are generally considered to establish the energy efficiency and mechanical efficacy. Examples of parameters that are used for this include heart rate, thresholds, muscle tension, oxygen consumption, etc. A specific example would be establishing which running technique is most effective from the oxygen consumption that each one requires (Fletcher et al., 2009).

The efficacy of the technique can be also established in relation to a specific model. This is common in aesthetic sports, where the sport’s rules establish the movements according to standardized aesthetic criteria. Examples of parameters that are used to establish the efficacy include amplitude, rhythm, flow, body alignment, posture, position, etc. A specific example would involve establishing the judge’s scoring of a back handspring in relation to the alignment of a gymnast’s legs during a floor exercise routine (e.g. according to the rules of the Federation Internationale de Gymnastique). This way of establishing the efficacy of the execution is commonly used by coaches when they analyse their athlete in training and competition and compare the athlete’s technique executions with the theoretical model of execution that they have in their minds.

In sports where the success of the technique execution is related to the variability and uncertainty in the athlete’s actions (to reduce the opponent’s chances of anticipating the athlete’s movements), the psycho-tactical criteria of the technique execution must be considered to establish its efficacy. Examples of parameters that are used here include cues, feints, speed of the movements, etc. A specific example would be establishing efficacy by using the number
of cues that the position adopted by the setter when getting ready to set in volleyball gives the opponent (Hernández et al., 2004).

The outcome of the movement execution provides a reference for the way the movement is done. This has traditionally been the criteria for establishing efficacy in sport. It involves establishing the performance level that is achieved by an athlete that changes in relation to the sport and the technique (e.g. distance jumped in the long jump, points scored, or free throws percentage). Examples of parameters that are used for this include winner–error ratios, success percentages, attempts, etc. A specific example would be to establish the efficacy using the number of turnovers, steals, field goal percentage, etc. of a basketball player in a game (Gómez et al., 2009).

The ideal model can be absolute (a theoretical model or movement execution of reference, e.g. the movement execution used to achieve the world record) or relative (e.g. comparison of an athlete’s accomplishment with his/her motor potential). When an absolute model is used, the evaluation is carried out by assessing whether the critical aspects of movement are executed properly, or by comparing a referent outcome from the same level of competition (e.g. average free-throw percentage). When a relative model is used, the evaluation is based on the optimal technique that allows the athlete to take advantage of all his/her capacities (Morante, 2004). An example would be to compare the athlete’s running speed with the athlete’s dribbling speed in a fast-break.

It must be kept in mind that, in some sports, some patterns should not be given consideration or should not be given the same importance as the rest because they evaluate an aspect that is not the aim of these sports (see Table 17.2). Additionally, some of these patterns are more appropriate for the analysis of the athlete’s technical efficacy for coaching purposes, such as, for example, the degree of technique efficacy regarding an athlete’s motor potential.

### Ways to express technique effectiveness

The study of parameters to evaluate a technique’s efficacy can be done from two perspectives: quantitatively and qualitatively. Quantitative analysis involves description through quantifiable data. An example would indicate the number of points scored, the angle and speed of release in a free throw, or the outcome of a long jump. Qualitative perspective refers to the efficiency with which a movement has been done according to the objectives set out (Carr, 2004; Hall,

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**Table 17.2 Type of sport and criteria to evaluate effectiveness**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Precision and accuracy</th>
<th>Batting and field accuracy</th>
<th>Net and/or wall</th>
<th>Invasion sport</th>
<th>Combat sport</th>
<th>Aesthetic or evaluation</th>
<th>Results or position</th>
<th>Mixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomechanical</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Physiological</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Psycho-tactical</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Outcome</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Technical effectiveness

(2003; Knudson and Morrison, 2002). Qualitative analysis involves the description of how the movement was done (e.g. outcome of the serve or reception in volleyball) or whether or not key aspects of the movement were carried out (e.g. correct or incorrect execution). Both perspectives are important in the description and analysis of sport technique.

Quantitative analysis involves the numerical description of motion using an interval scale (e.g. temperature) and/or ratio measurements (e.g. time). Qualitative analysis involves the description of motion using category systems, field formats, or rating scales (Anguera, 2003; Baumgartner et al., 2003) that can be expressed using nominal (e.g. type of technique used) and ordinal scales (e.g. poor, medium, and good). The different types of scales permit different types of data analysis. With certain limitations, it is also possible to treat the qualitative data as quantitative data but it requires a transformation of the data (i.e. percentages or coefficients).

The most common ways to monitor efficacy are: occurrence, average, balance, totals, attempts, relative attempts, ratio, percentages, and coefficients:

- **Occurrence (count):** the number of times that a certain type of movement, action, or combination of actions occurred. For example, the total number of points or shots made by a player in a game.
- **Average:** the sum of the scores or measurements divided by the number of scores or measurements. For example, the average points per match are the sum of the points scored in all matches divided by the number of matches (e.g. 58.7 points).
- **Balance:** the difference between the number of occurrences of different actions or a combination of actions. For example, the difference between the points won and lost by a beach volleyball player.
- **Total:** the sum of the occurrences and/or balances. For example, the total number of positive actions and negative actions done by a player on offence and on defence.
- **Attempts:** the number of times a movement, action, or combination of actions is tried, regardless of whether the result is positive or negative. In some cases, this value will be the same as the occurrences. For example, the total number of free throws taken by a player.
- **Relative attempts:** the fraction relating the number of actions taken and the number of actions that have achieved the desired result. This value can be expressed in absolute values (e.g. four attempts to get three points) or in an equivalently reduced fraction (e.g. 1.30 attempts to get 1 point). This value can be calculated by game phase, match, competition, etc.
- **Ratio:** the relationship between two values. It is the fraction between the number of actions that have achieved the desired result and the number of attempts made. This value can be expressed in absolute values (e.g. three points out of four attempts, 3:4) or in an equivalently reduced fraction (e.g. 1 point in side-out from 1.30 tries, 1:1.30). This value can be calculated by game phase, match, competition, etc.
- **Percentages:** the measurement expressed in terms of values of 100. It is the result of multiplying the number of actions that have achieved the desired result by 100 and then dividing by the number of attempts made. For example, the success percentage of a player’s free-throw attempts.
- **Coefficients:** the sum of attempts by category multiplied by the value of the category and divided by total attempts. This value expresses efficacy in values between 0 and the highest value of the category. For example, in volleyball, a spike coefficient of 2.35, where error has a value of zero, allowing maximum opponent attack options has a value of 1, limiting the opponent’s attack options has a value of 2, not allowing the opponent any attack options has a value of 3, and a point has a value of 4.
Once the technical effectiveness is measured, it is necessary to normalize the data and have reference values to interpret the data (Bartlett, 2001). Data normalization involves expressing the data in values relative to reference values, and it is necessary to properly analyse technical efficacy. After that, it is necessary to have norms or profiles to compare the measurements done in relation to a reference, a group, or a population. The most common way to monitor efficacy is by using percentiles and/or percentile ranks. This type of value serves as a reference point for analysing the data (standard score):

- Percentiles: the value below which a certain percentage of observations fall. The twenty-fifth percentile is the value (or score) below which 25 per cent of the measurements may be found. The percentile is used to report scores from norm-referenced tests or reference values. The twenty-fifth percentile is also known as the first quartile (Q1), the fiftieth percentile as the median or second quartile (Q2), and the seventy-fifth percentile as the third quartile (Q3). For example, these values allow us to have a reference of the athlete’s performances. If in a competition an athlete scores at the seventy-fifth percentile, he/she scores greater than 75 per cent of the scores in this competition.

- Percentile ranks: the relative position of the athlete’s performance in a group or database that scored below a given value. These values allow us to rank the performances of the athlete. For example, if an athlete scores 58 points in a competition, he/she ranks in the eighteenth percentile of this competition.

Examples of technical effectiveness by type of sport

The goals, purposes, and rules of the different sports establish the technique repertory and what is considered correct regarding technical effectiveness. However, it must be taken into consideration that not all the actions produced in a sport pursue the same goals. For example, in an invasion sport such as football, the actions executed by the goalkeeper are different from a field player and, for both of these players, the actions and goals change if they are on offence or on defence. Therefore, it must be kept in mind that the following examples are general and attempt to provide a global perspective of the criteria used to measure technical efficacy in the different type of sport, and its use must be put into context.

An overview of the different ways of calculating technical effectiveness in different sports types is given in Table 17.3.

Precision and accuracy sports

In precision and accuracy sports (e.g. archery, shooting, golf, etc.), efficacy is measured as the ability of the athlete to put the projectile or object close to a designated area. The usual outcome measure is the shooting accuracy relative to the target or the shot taken to reach the target. In archery or shooting sports, the different parts of the target give different points to the athlete. The final score is the number of points attained by the athlete. In golf, the outcome is measured by the number of shots used to put the ball in the hole in relation to a standard (par). From a mechanical perspective, the efficacy of the skills is related to the way the projectile or object is thrown, the angle of the release, the speed of the release, etc. (McGinnis, 2005). However, research has shown that the aspect that differentiates bad shots from good shots in performance athletes is the range of variability in the mechanical execution (Edelmann-Nusser et al., 2006; Horsak and Heller, 2011) as well as the moment of execution (relationship between trigger time and cardiac cycle) (Konttinen et al., 2003).
Technical effectiveness

Batting and fielding games

In batting and field sports (e.g. baseball, softball, cricket, etc.), efficacy is measured as the ability of the athlete to hit the ball and score runs by advancing through the field or by preventing this (offence or defence, respectively). This type of sport, especially baseball, has a long tradition of evaluating players’ efficacy. Monitoring players, with regard to batting, running, pitching, and playing in the field, is part of the game (e.g. batting average, at bats per home run, walks allowed per nine innings, etc.). The efficacy evaluation is done in relation to the outcome. Performance sport analysts have developed methods to study the players’ and teams’ actions. An example of these methods is the Data Envelopment Analysis (DEA), popularized by Charnes et al. (1978), which evaluates the relative performance by peer comparison. Using these methods, one can study players’ performance (Bradbury, 2009; Chen and Johnson, 2010), the economic impact on a team (Dennis et al., 2009; Jane et al., 2010), or the recovery after an injury (Namdari et al., 2011).

Net/wall sports

In net and/or wall sports (e.g. tennis, table tennis, badminton, volleyball, beach volleyball, etc.), efficacy is measured as the ability of the athlete to put the ball or shuttlecock in the opponent’s court, making it difficult or impossible for the opponent to return it over the net, or by playing on one or more walls. This type of sport traditionally collects information about the efficacy of

Table 17.3 Different ways of calculating technical effectiveness by type of sport (according to their purposes and goals)

<table>
<thead>
<tr>
<th>Type of sport</th>
<th>Sport</th>
<th>Examples of types of efficacy measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision and accuracy</td>
<td>Archery, shooting, golf, etc.</td>
<td>Accuracy, points, distance to target, number of shots to reach the target in relation to a standard (par for the hole), percent age of variability between movement executions, etc.</td>
</tr>
<tr>
<td>Batting and field</td>
<td>Baseball, softball, etc.</td>
<td>Batters: batting average, walks per plate appearance, doubles plus triples per at bat, home runs per at bat, on-base percentage, on-base plus slugging, slugging average, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pitchers: walks allowed per nine innings, earned-run average, home runs allowed per nine innings, strikeouts per nine innings, earned run average, etc.</td>
</tr>
<tr>
<td>Net and/or wall</td>
<td>Tennis, table tennis, volleyball, etc.</td>
<td>Percentage of shots won or errors, effect of the shot (point, error, or continuity), efficacy coefficient (point, error, or continuity), etc.</td>
</tr>
<tr>
<td>Invasion</td>
<td>Soccer, basketball, rugby, etc.</td>
<td>Number of ball contacts, percentage of duels won, successful passes, shot attempts and successful shots, balance, etc.</td>
</tr>
<tr>
<td>Combat</td>
<td>Judo, fencing, boxing, etc.</td>
<td>Points, number of techniques (e.g. punching, kicking) or manoeuvres executed, the way that they are done, penalties, etc.</td>
</tr>
<tr>
<td>Aesthetic or evaluation</td>
<td>Gymnastics, diving, figure skating, etc.</td>
<td>Technical-merit score, the ability of the athlete to use both dominant and non-dominant sides of the body, etc.</td>
</tr>
<tr>
<td>Results or position</td>
<td>Athletics, swimming, cycling, triathlon, sailing, etc.</td>
<td>Time, distance, points, index, etc.</td>
</tr>
</tbody>
</table>
a player’s execution from the perspective of outcome (point, error, or continuity). In this type of sport, it is common for the competition’s organizing committee to put together a report of the players’ actions (e.g. number of points, errors, and actions of continuity, etc.). Performance sport analysts use percentages, coefficients, indexes, etc. to study the performance of players and teams (Marcelino et al., 2008; Palao, 2008; Pfeiffer et al., 2010; Reid et al., 2010; Sindik and Kondri, 2011). The characteristics of the sport influence the aspects that are important and that determine efficacy. For example, in tennis, where the net is low, the serve is the critical action affecting the final outcome (O’Donoghue, 2001; Reid et al., 2010). However, in volleyball or beach volleyball, where the net is higher, actions close to the net (i.e. the spike and block) are the ones that are critical to the final outcome (Eom and Schutz, 1992; Giatsis and Panagiotis, 2008; Marcelino et al., 2008; Palao et al., 2004).

Invasion games

In invasion sports (e.g. football, basketball, team handball, rugby, ice hockey, water polo, etc.), efficacy is measured as the ability of the athlete to put the ball or object in the opposing team’s goal, or the actions that allow or prevent that (offence or defence, respectively). The study of technical performance has been carried out on ball actions (e.g. heading, ground duels, passing, ball touches) (Dellal et al., 2010, 2011; Rampinini et al., 2009). Evaluation of the efficacy has been measured by collecting the number of ball contacts, the percentage of duels won, successful passes, shot attempts, and successful shots, etc. (Carling et al., 2009; Lago-Ballesteros and Lago-Peñas, 2010; Olsen and Larsen, 1997; Ortega et al., 2009). Due to the characteristics of this type of sport, efficacy has been measured in relation to goals/points scored, offence, and defence (Hughes and Franks, 2005; Lago-Ballesteros and Lago-Peñas, 2010; Wright et al., 2011), playing positions (Sampaio et al., 2008), set plays (penalty, corner, etc.) (López-Botella and Palao, 2007), home advantage (Pollard, 2008), and fatigue (Carling et al., 2008; Carling and Dupont, 2011).

Combat sports

In combat sports (e.g. judo, fencing, boxing, etc.), efficacy is measured as an athlete’s ability to throw and/or contact parts of the opponent, etc. The outcome is measured by the number of times the goals are achieved (e.g. contacting the opponent’s body or properly executing a technique). The outcome is measured in relation to the points, number of different types of techniques (e.g. punching, kicking) or manoeuvres executed, the way that they are done, penalties incurred, etc. (Ashker, 2011; Franchini and Sterkowicz, 2003). Studies about athletes’ technique efficacy have measured the ability of the athlete to use both dominant and non-dominant sides of the body (Čular et al., 2010), the variability in the techniques (Adam, 2007), and the number of different techniques used (Fatma and Özden, 2009; Kajmović et al., 2011; Kapo et al., 2008; Sterkowicz-Przybycień, 2010).

Aesthetic evaluation sports

In aesthetic or evaluation sports (e.g. gymnastics, rhythmic gymnastics, diving, synchronized swimming, figure skating, etc.), efficacy is measured as the ability of the athlete to perform standardized movements (e.g. timing, form, positioning, expression, etc.). Technical efficacy is established using the technical merit score and the judging criteria established by the sport rules (Alentejano et al., 2008). In the bibliography review carried out, few studies have been found
Technical effectiveness

that assess technique efficacy in this type of sport. Most of the information found is related to the mechanical study of the movements executed in these sports. Studies about gymnastics skills and skill level demonstrated the importance of the ability of the athlete to use both dominant and non-dominant sides of the body (Bozanica and Miletica, 2011; Jastrjembskaia and Titov, 1999).

Timed/position sports

In results-dependent or position sports (e.g. athletics, swimming, cycling, triathlon, sailing, etc.), efficacy is measured as the ability to go as fast, far, or high as possible. Studying efficacy in this type of sport usually uses the outcome (e.g. time, distance, position, etc.); technical effectiveness can also be studied by assessing the efficacy or economy of the execution from a mechanical and physiological perspective. An example of efficacy in cycling is the pedalling effectiveness index (Mornieux et al., 2008). Regarding the study of economy, examples include bike fit or skiing position (Bini et al., 2011; García-López et al., 2009) or the manner of technical execution (Leskinen et al., 2009; Støren et al., 2011).

Concluding remarks

To establish technique efficacy, the first step is to know the purpose, context, and characteristics of the movement, etc. The second step is to determine how the efficacy of the technique is going to be established (i.e. in relation to which aspects [efficiency, economy, models of movement execution, need for adaptation, and outcome]). The outcome criteria is the most common criterion used, although the aspects to be considered vary in relation to the type of sport, the skills used, the purpose of the analysis. The third step is to determine the ways in which technique effectiveness is going to be expressed (occurrence, average, balance, totals, attempts, relative attempts, ratios, percentages, efficacy, or coefficients). Once the technical effectiveness is measured (fourth step), it is necessary to normalize the data and have reference values to interpret the data.

The different types of sport have different purposes, and even the different actions that the athletes have to do within a sport can have different purposes. The last part of this chapter reviewed examples of how technical effectiveness is measured in the different types of sport, from a general perspective. There are significant differences in the standardization, normalization, and information that is available about the efficacy evaluation in the different types of sport. There is a need to standardize measurement protocols as well as normalized reference values for technical effectiveness (Bartlett, 2001). Normative profiles are needed for males and females at different levels of competition, different age groups, etc. This criterion is necessary in order to contextualize and properly interpret technique efficacy (O’Donoghue, 2005).

References


Technical effectiveness