

Performance Assessment in Team Sports

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The purpose of this paper is to discuss a procedure to assess individual performance in team sports in contexts of preassessment and formative assessment. An authentic assessment procedure based on the observation of players' actions during matches yielded two performance indices: the efficiency index and the volume of play. A general nomogram is suggested for use with various team sports in order to produce a single performance score combining both indices. Content validity, concurrent validity (.74), and ecological validity are discussed. The interobserver reliability (>.90) of the data and the stability of performance (.88) are also examined. Some conditions are discussed for integrating the assessment procedure to the teaching-learning process with an active participation of the students in the collection and interpretation of the data. The proposed procedure is strictly game oriented and yields information reflecting both motor and tactical skills.

There appears to be growing agreement among researchers in sport pedagogy as to the importance of assessment in the teaching-learning process and as to the character of authenticity that such a procedure should bear. As summarized by Veal (1988), assessment can take the form of preassessment, formative assessment, or summative assessment, depending upon the phase at which it occurs and the reason for which it is implemented. If assessment is to be truly integrated with the teaching-learning process, it must meet at least two requirements. The first requirement is ecological validity (Gardner, 1992), which refers to the relationship of measurement with what is taught and to the fact that the assessment is done in *context* so that it does not disturb the ecology of the classroom (i.e., the classroom's normal functioning). The second requirement is the active participation of students in assessment as it is integrated to the teaching-learning process (Wiggins, 1993; Zessoules & Gardner, 1991). The purpose of this paper is to put forward an authentic assessment procedure that is ecologically valid and that makes students active participants in the assessment process. The proposed assessment procedure also makes it possible to assess each student's performance in various team sports.

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Assessment of Performance in Team Sports

The Nature of Team Sports and Consequences for Assessment

Although team sports each remain unique in their own peculiar way, they offer certain indissociable (closely interwoven) characteristics within a given set of rules, focused towards winning the match (Gréhaigine, 1989, 1992; Gréhaigine & Godbout, 1995):

- 1. *A rapport of strength* (from “group-to-group” to “one-to-one” opposition relationship¹): A group of players confronts another group of players, fighting for (invasion games) or exchanging (net games) an object.
- 2. *A choice of motor skill*: Given the circumstances and the range of motor skills mastered, each player must select a motor response. Sometimes it refers to a more basic skill (running, jumping) and sometimes it refers to a much more specific and elaborate skill (shooting, dribbling).
- 3. *Individual and collective strategies*: Implicit or explicit decisions, taken by the group, on the basis of a common frame of reference, in order to beat the opponents.

To summarize, as illustrated in Figure 1, the fundamental challenge in team sports could be stated as follows: In an opposition relationship (Deleplace, 1979), while insuring the defense of its own camp, the team must coordinate its actions in order to recapture, conserve, and move the ball so as to bring it into the scoring zone and effectively score.

Thus, problems with the assessment of any given player in team sports are those related to the assessment of any complex system; that is, (a) the intervening elements are not only numerous but also interacting, (b) the rapport of strength plays an important role and may vary in different opposition situations or even during one given situation, (c) the members of a given team are interdependent, and (d) a single element (a player) must be assessed within a system (the team) that has its own coherence.

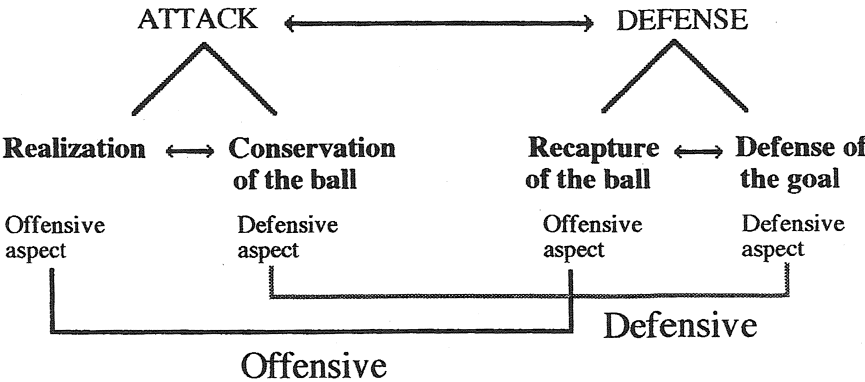


Figure 1 — General principles of team sports.

Facets of Performance Assessment in Team Sports

Authentic assessment of performance in team sports offers a special challenge to physical educators and coaches. Beyond the usual motor fitness components, it is generally agreed that performance in team sports results from the interaction of strategy efficiency, tactical efficiency, and specific perceptual and motor skills (Gréhaigne & Godbout, 1995). In an effort to take into account the various facets likely to be concerned in the assessment of motor performance, Godbout (1990) proposed a two-dimensional model (see Figure 2) that leads to the identification of four general categories of information or objects of measurement. All four categories may be considered of interest in the case of team sports performance assessment. On the one hand, the model recognizes that an assessor may wish to consider the technical or tactical aspect of a player's performance. On the other hand, the assessment may be focused on the end result of the player's actions (the product) or on how those actions are conducted (the process). This distinction between product and process with reference to the assessment of motor skills has been briefly explained by Brown (1982) and in greater details by Veal (1995) and may apply to the tactical aspects of sport performance (Werner, Thorpe, & Bunker, 1996). It may also be respectively associated with the notions of KR (knowledge of results) and KP (knowledge of performance) used by motor learning researchers with reference to augmented or extrinsic feedback (Schmidt, 1991).

Combining both dimensions (technique vs. tactics and product vs. process), one can identify four facets of performance assessment in team sport (Figure 2):

1. Information relative to a *technical product* (e.g., is the player able to reach a partner when passing the ball?)
2. Information relative to a *technical process* (e.g., how does the player proceed to pass the ball?)

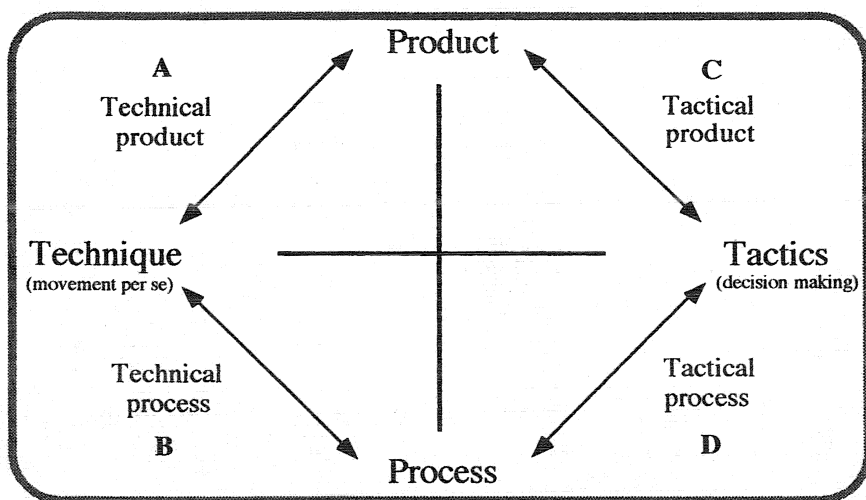


Figure 2 — Facets involved in the assessment of performance in team sports.

3. Information relative to a *tactical product* (e.g., player B was responsible for covering player C; did player C manage to receive a pass anyway or did player B effectively succeed in eliminating player C from the play?)
4. Information relative to a *tactical process* (e.g., how did player B proceed to cover player C and prevent him or her from receiving a pass?)

Current Assessment Practices in Team Sports

To collect information relative to these facets of performance, physical educators and coaches have developed various measurement strategies. In an attempt to summarize these practices, Godbout (1990) proposed the two-dimensional model illustrated in Figure 3. On the one hand, the model recognizes that in some instances the measurements are done in standardized setups whereas in other cases, the information is collected in real-life situations (during regular matches for instance). On the other hand, the measurement procedure may be quantitative (low inference, relying on physical units of measurement) or qualitative (high inference, relying on the use of rating instruments) (see Veal, 1995, for the distinction between quantitative and qualitative assessment). Combining both dimensions of the model, one can identify four general strategies for collecting information with regards to a player's performance in team sports:

1. Standardized tests (e.g., asking a student to shoot a basketball into the basket as many times as possible over 20 trials from a given position)
2. Statistics derived from competition (e.g., computing the average number of controlled rebounds over a certain number of games)
3. Rating of performance in standardized setups (e.g., having every student execute five volleyball tennis serves in an empty court and rating the quality [form] of the serves)

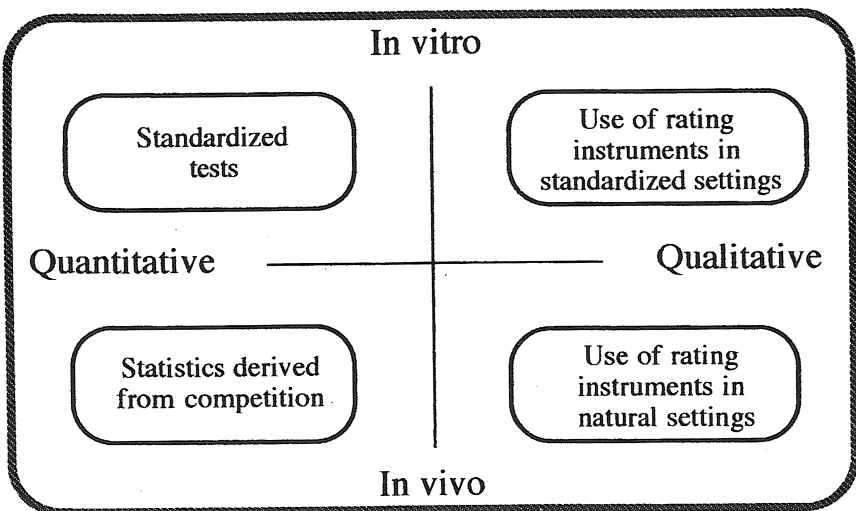


Figure 3 — Measurement strategies for assessing performance in team sports.

4. Rating of performance during the game (e.g., observing a player during a match and rating the way the player proceeds to penetrate into the scoring zone, or observing a defensive player and rating the quality [process] of the player's individual defense)

Whether one consults Barrow, McGee, and Tritschler (1989), Baumgartner and Jackson (1991), Safrit and Wood (1995), or any other measurement and evaluation textbook in physical education, there is little doubt that testing efforts related to team sport performance have been focused on standardized tests. Typically, with reference to the model presented in Figure 2, such tests are focused on the *technical product* aspect of the student's performance. Without necessarily using published standardized tests, teachers do use similar homemade skill tests (Desrosiers, Genet-Volet, & Godbout, 1996; Veal, 1992). Although not widely used by teachers in physical education classes, observational instruments have been devised by coaches in order to register the frequency or number of various events occurring during a match (number of goals, penalties, percentage of successful shots, etc.). Such statistics focus on the *result* of performance. It is impossible, however, to determine whether they reflect the technical aspect of performance, its tactical aspect, or both (which is probably the case most of the time).

Over the last 15 years, there has been a growing interest in assessment procedures that address the process (form) aspect of performance. Pinheiro's (1994) work illustrates the use of rating scales to assess the quality (form) of motor skills; they may be used in standardized setups or in game contexts as well. McGee (1984) has provided examples of rating scales used to assess the tactical performance of children during games. More recently, Mitchell, Oslin, and Griffin (1995) have come up with the GPAI (Game Performance Assessment Instrument), "designed to provide teachers and researchers with a means of observing and coding performance behaviors that demonstrate the ability to solve tactical problems in games by making decisions, moving appropriately, and executing skills" (p. 40). This rating procedure provides information on the *tactical process* aspect of the game and also on the *technical product* aspect of skill execution. Besides this proposal, as far as we know, little has been published with regard to the assessment of strategic and tactical efficiency in team sports.² Observations of secondary physical education teachers' assessment practices nevertheless show that some do consider tactical aspects of game play in teacher-made assessment instruments (Desrosiers et al., 1996). The work presently done by Mitchell and his colleagues (Mitchell, Griffin, & Oslin, 1994; Mitchell et al., 1995), as well as that of the University of South Carolina Group (reported in Werner et al., 1996) are an indication of a growing interest in this area.

Deciding what aspect of a given team sport ought to be assessed depends also upon teachers' views as to what students should learn. As pointed out by some authors (Bailey & Almond, 1983; Gréhaigne & Godbout, 1995; Turner & Martinek, 1995; Werner et al., 1996), it is common in the teaching of team sports for teachers to start by working on a series of technical skills; then, when these skills appear to be reasonably mastered, more emphasis is put on playing the game and on related tactical skills. Such an approach to teaching team sports leads to motor-skill-oriented assessment practices. It has been suggested by various authors (Bouthier, 1988; Bunker & Thorpe, 1986; Turner & Martinek, 1995) that a greater emphasis should be put much sooner on the understanding of the game and on tactical efficiency. Such an approach

would then make it all the more important to consider strategic and tactical efficiency in an assessment procedure.

A Game-Oriented Authentic Assessment Procedure

In an effort to obtain more objective data while avoiding standardized tests that did not provide for a rapport of strength (a central notion in team sports), French sport pedagogy researchers tried out various procedures to assess game play in context. The basic idea was to take into account the players' specific behaviors during the game and to summarize the data collected either under the form of total occurrences or under the form of some performance index. In some cases, the data considered the performance of the whole team (e.g., the number of times the team got possession of the ball, along with the number of shots on goal and the number of actual goals; for a review, see Gréhaigne, 1995). In other cases, the observation focused on single players' performance (e.g., in soccer, the number of times the player got possession of the ball, over the number of contacts made with the ball while dribbling it; Dugrand, 1989).

It is in this field experimentation context that the assessment procedure presented in this paper was developed by 1989. Intended for summative assessment and certification at first, the observation was focused on each player, and there was an effort to consider a series of specific behaviors rather than isolated ones. Over the years, the assessment procedure has been used for formative assessment purposes, but is still used to grade students in team sports. Although the basic observational scheme has remained the same, the rules for computing a performance score have been tried and progressively modified over the last 2 years in order to (a) generalize the procedure to various team sports, and (b) eliminate the norm-referenced connotation that it bore originally.

Description of the Assessment Procedure

A first step of the procedure consists of observing a player during a match and registering various occurrences in order to establish two complementary performance indices: the efficiency index and the volume of play. Figure 4 shows an example of the observational grid used to collect those data. The observational sheet is constructed so that each row should contain two marks: one to indicate how the player gained possession of the ball, and one to indicate how the player disposed of the ball. The player may gain possession of the ball in one of two ways:

1. *Conquering the ball (CB)*: A player is considered having conquered the ball if he or she intercepted it, stole it from an opponent, or recaptured it after an unsuccessful shot on goal or after a near-loss to the other team.
2. *Receiving the ball (RB)*: The player receives the ball from a partner and does not immediately lose control of it.

After having gained possession of the ball, the player may dispose of it in one of four ways:

1. *Playing a neutral ball (NB)*: A routine pass to a partner or any pass which does not truly put the other team in jeopardy is considered a neutral ball.

Observer: _____ Player N°: _____ Match: _____

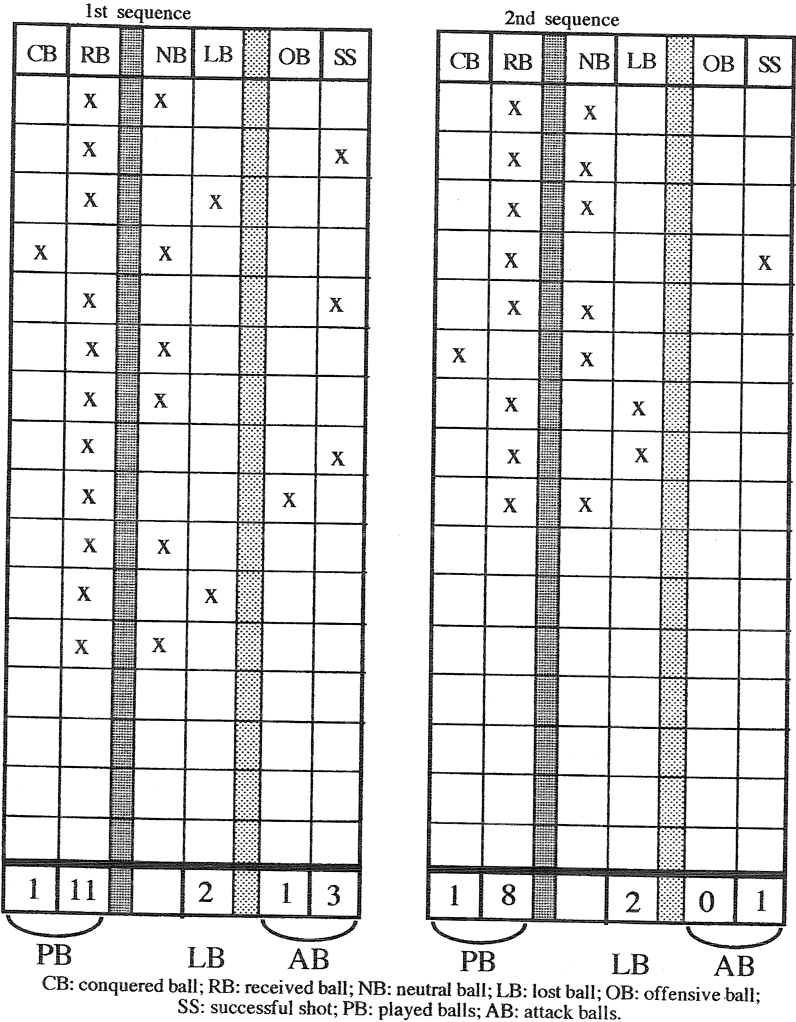


Figure 4 — Observational grid for collecting raw data.

- 2. *Losing the ball (LB)*: A player is considered having lost the ball when he or she loses it to the other team without having scored a goal.
- 3. *Playing an offensive ball (OB)*: An offensive ball is a pass to a partner which puts pressure on the other team and, most often, leads to a shot on goal.
- 4. *Executing a successful shot (SS)*: A shot is considered successful when it scores or possession of the ball is retained by one's team.

Once the match is over, the observer computes the total number for CB, RB, LB,OB, and SS. Some of these totals are also combined to produce two additional pieces of information:

1. *The number of attack balls (AB)*: An attack ball results from an offensive ball (OB) or from a successful shot on goal (SS). Therefore AB is determined by summing the totals for OB and SS.
2. *The volume of play (PB)*: The volume of play represents the number of times the player has gained possession of the ball (PB, for played balls). Therefore PB is determined by summing the totals for CB and RB: volume of play = $PB = CB + RB$.

The performance score is computed on the basis of two indices: an efficiency index and the volume of play. We have just seen how one determines the volume of play; for its part, the efficiency index is computed as follows: efficiency index = $(CB + AB)/(10 + LB)$ or $(CB + OB + SS)/(10 + LB)$.

Of course, the rules under which the game is played (duration of the match, number of players) may influence the range of values for both indices. The idea of adapting the rules of a given game or sport in teaching settings is not new. It has been particularly discussed with reference to elementary physical education to take children's developmental level into consideration (Morris & Stiehl, 1989; Robertson & Halverson, 1984). The assessment procedure discussed here was intended for older students (over 12 or 13 years old) but, as the reader will see later, its integration to the teaching-learning process (with its limits in terms of time and space, and its requirements in terms of learning opportunities [ball exchanges]) and the desire to come up with one single procedure applicable to different sports made it necessary to look for appropriate modifications of each game. It is therefore suggested that the matches be played under the following specific conditions (Gréhaigne & Roche, 1993):

- Basketball: Four players against four players on a regular court; two 7-minute matches are played.
- European handball: Five players (4 + 1) against five players (4 + 1) on a regular court; two 7-minute matches are played.
- Soccer: Five players (4 + 1) against five players (4 + 1) on a 50 m × 30 m surface with 6 m × 2 m goals; regular soccer rules are applied with a few adjustments (e.g., "throw in" is done by foot, corners are done by hand, there is no "off side," for dead balls or "free kicks," opponents are placed at 6 m); two 7-minute matches are played.
- Volleyball: Four players against four players; the serve is considered a played ball; any ball sent to the opponents that produces a point, causes a recapture of the serve, or is recovered only with difficulty by the opponents is considered an attack ball; one nonstop 10-minute match (some 7 minutes of effective play).

Because the efficiency index and volume of play index must be combined to determine the performance score, the problem was to find a way of combining the two indices so that the students obtain a single score, yet avoid giving too great a weight to one of the two indices. Although maximal values for each index may vary somewhat from one sport to the other and from one class group to another, prior field experiments had shown some regularities in the values. After various attempts, we have come up with the following procedure to build a nomogram which can be used with different team sports (Figure 5). The nomogram is made of three different scales:

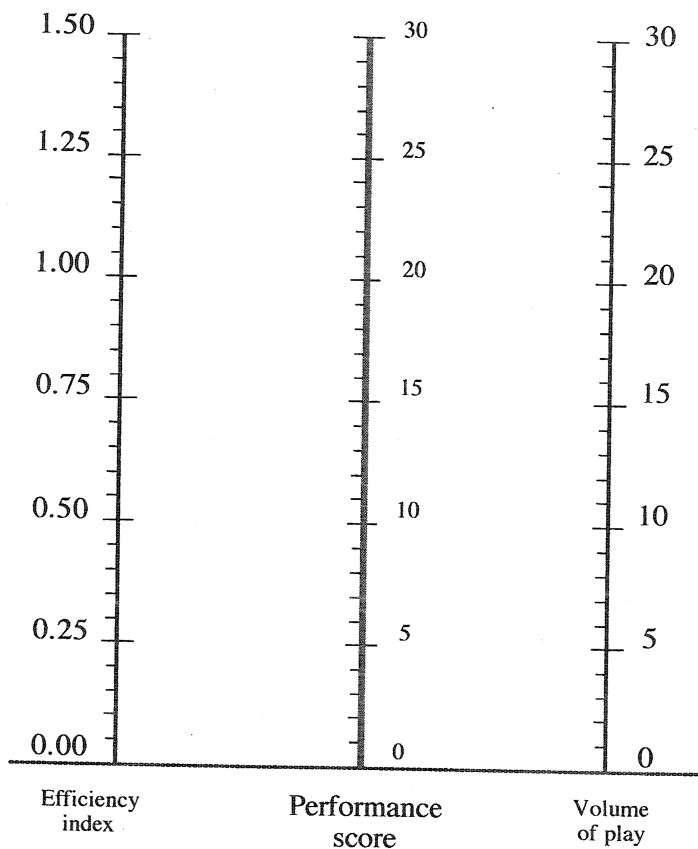


Figure 5 — Nomogram for assessing performance in team sports.

1. *The Efficiency Index scale:* On the left-hand side of the nomogram is the Efficiency Index scale. To build this scale, we used samples totaling 302 senior high school students in different team sports (basketball, European handball, soccer), and we found that the efficiency index rarely exceeded 1.5. We have, therefore, chosen to keep the same scale for different sports (0 to 1.5, with 30 equal intervals). Should one student obtain an efficiency index value higher than 1.5, the 1.5 value is used.
2. *The Volume of Play scale:* The right-hand side of each nomogram presents the Volume of Play scale. Since 90% of students usually had a volume of play of 30 balls or less, we have retained a scale ranging from 0 to 30, with 30 equal intervals.
3. *The Performance Score scale:* The middle scale of the nomogram contains the performance score (or composite score) resulting from the two original indices. This scale has been established on the basis of the following formula, which yields an equal weight to the efficiency index and to the volume of play: $\text{performance score} = (\text{efficiency index} \cdot 10) + (\text{volume of play}/2)$. The scale ranges from 0 to 30, with 30 equal intervals.

To obtain the performance score for a given player, one pinpoints the efficiency index and volume of play for a player, and then draws a straight line joining these two points. The point of intersect on the middle scale represents the performance score attributed to the player. Given the observational data contained in Figure 4, the efficiency index would equal 0.5 [i.e., $(2 + 5)/(10 + 4)$], the volume of play would amount to 21, and thus the performance score would equal 15.5, or 16 if rounded up. Using the mathematical formula described earlier, one would have $(0.5 \cdot 10) + (21/2) = 15.5$; the same result would also be obtained by using the nomogram and drawing a straight line between the 0.5 value on the efficiency index scale and the 21 value on the volume of play scale.

Validity of the Assessment Procedure

Content Validity. While discussing the nature of team sports, we have alluded to the notion that the team must coordinate its action in order to recapture, conserve, and move the ball so as to bring it into the scoring zone and effectively score (Gréhaigne, 1989). The assessment strategy described here relies on quantitative data based on the frequency of various events that occur during game play; such events may be receiving the ball from a partner, stealing the ball from an opponent, shooting on goal, and the like. There are numerous events on which observers could focus their attention. For instance, a very simple and basic approach could be, for a given team, to determine (a) the number of times the team got possession of the ball, (b) the number of shots attempted on the goal (or basket), and (c) the number of goals or points cumulated. In this paper, we put forward an observational scheme that focuses on individual performance. Moreover, in putting together the efficiency index formula, the choice has been made to focus on events or actions related either to the attack or to the offensive aspect of the game (see Figure 1 and Table 1).

In most instances, such events are a combined result of perceptual and motor skills and of strategic and tactical efficiency. Although they may be perceived as macro-indicators of performance, they are undoubtedly related to successful game play. The number of attack balls (AB) reflects the quality of each player's contribution to the attack, as does a small number of lost balls (LB). The number of

Table 1 Relationships Between Observation Items and Types of Information Collected

Observation items	Information collected
Received balls (RB)	Involvement of the player in the team's play
Conquered balls (CB)	Defensive capacities of the player
Offensive balls (OB)	Player's capacity of making significant passes to his or her partners (offensive capacities)
Successful shots (SS)	Player's offensive capacities
Volume of play (PB)	General involvement of the player in the game
Lost balls (LB)	A small number reflects in good adaptation to the game

conquered balls (CB) illustrates the offensive aspect of the defense. In order to avoid an excessive weighting to lost balls when there are only a few ones, we have added a constant value of 10 to the number of lost balls in the denominator. It should be noted that a routine pass to a partner or any pass that does not truly put the other team in jeopardy is considered a neutral ball (NB) and therefore is excluded from the efficiency index formula.

The volume of play, for its part, indicates to what extent the player has gotten involved into the team's attack. Both the efficiency index and the volume of play are valuable indicators of the player's contribution to the team's offensive efficiency. Indeed, a player who safeguards a high efficiency index but plays only four or five balls contributes little to the match. Likewise, a player who gets possession of the ball 25 times but ends up with a low efficiency index impairs the team's attack. Thus the best contribution is offered when both indices have higher values.

Mitchell et al. (1994) point out the importance of observing players when they are not in possession of the ball. As mentioned by Werner et al. (1996), a player, when playing according to a regular team sport format, may spend a good deal of time moving without the ball while trying to position him- or herself to attack space or to receive a pass. The adapted formats described earlier (see description of the assessment procedure) have been chosen so as to make it much more likely for an efficient player to get possession of the ball.

Concurrent Validity. Validity may also be established by comparing results obtained from the new measurement technique with some reference criteria. During a soccer tournament involving high school students, three teams played one time one against the other, thus providing three 14-minute matches (2×7 minutes). Fifteen players were observed by peers and given scores on the basis of the nomogram illustrated in Figure 5. During the same tournament, two soccer experts were asked to observe the players and rank order them by consensus. The performance scores attributed to the players were transformed into ranks and compared with the ranks assigned by the two experts; the rank correlation amounted to .74.

Ecological Validity. A third facet of validity that is seen as an important feature of authentic assessment is ecological validity (Gardner, 1992). The concept of ecological validity goes beyond that of congruency in the sense that the assessment procedure not only focuses on performance in team sports but also provides a way to collect data while the students are actually engaged in some team sport. Therefore, as pointed out by Veal (1992), there is a close link between the instructional task and the assessment. Veal (1992) has stated that one characteristic of authentic assessment "is that the teacher [and the students, we would add] can 'see the skill' that is being evaluated, and there is a connection of skills to real-life situations as learning indicators" (p. 90). In our opinion, the assessment procedure described earlier does just that because it focuses on events and actions that not only reflect performance but can actually be seen during any given match.

Reliability of the Assessment Data

The reliability of the data was examined from two perspectives: the interobserver reliability and the stability of performance over a short time period. During a soccer tournament in which matches were played according to the rules specified in this paper, a group of 4 high school students observed 6 players (each player was observed by all 4 students throughout a given match) using the obser-

vational grid presented in Figure 4; during the same tournament, another group of 4 students observed 6 other players in the same fashion. For each group of observers, the interobserver reliability for a single score (the score provided by any one observer) was computed for the efficiency index and the volume of play using the intraclass correlation technique (Baumgartner & Jackson, 1991; Safrit, 1981). In the first group of observers, the coefficients for the efficiency index and the volume of play were .82 and .94, respectively. In the second group of observers, the coefficients were .90 and .99, respectively. Given the nature of the observational task, these results are not surprising, but are nevertheless reassuring.

A performance stability study was also conducted with a group of 22 junior high school students. Their performance in soccer was assessed after playing a total of 14 minutes (two 7-minute sequences) on two occasions, with a one-week interval. An intraclass correlation reliability of .87 was obtained for the performance score. It should be noted, however, that contrary to what may be the case in a summative assessment situation, reliability of data (in the sense of stability of performance) is not so critical an issue in situations of formative assessment. Being at a learning phase, students can be expected to perform differently from one match to another, experimenting new tactics and testing different hypotheses.

Integration to the Teaching–Learning Process

In order for the teacher to use this assessment procedure, ample class time must be devoted to game situations. It is an assessment procedure that has been developed for a pedagogical context that focused on tactical learning rather than motor skill modeling. This underlying pedagogical approach relies not only on the cognitive nature of tactical learning (as does the games for understanding model presented by Werner et al., 1996) but also on its constructivist dimension (see Gréhaigne and Godbout, 1995, for a discussion of the construction of tactical knowledge by the student; see also Bouthier, 1986, on the pedagogy of tactical decision-making models). The main feature of this pedagogical approach is that the student not only is at the center of the teaching–learning process but also actively participates in that process.

It follows then that such an assessment procedure is of special interest at the preassessment and formative assessment levels. In these situations, the teacher will bring the students to reflect not only on their performance score but also on their efficiency index and their volume of play. For instance, faced with low values for attack balls or volume of play and with high values for lost balls, students must reflect on their team strategy and individual tactics, given each student's motor skill level, in order to find ways to improve their scores. In this sense, learning becomes an individual and collective project, and choices can be made as to which aspect of the game should receive most attention. Figure 6 illustrates assessment results for two students who have played three matches each. One can see that Student A has more or less stabilized his or her performance, whereas Student B is still in a learning phase. For instance, although the second and the third match may yield similar performances scores, the efficiency indices and the volume of play indices differ markedly. This shows also that students can obtain similar performances scores while presenting different performance profiles.

One way to link assessment to instruction (Veal, 1992) is to collect information on students' performances in team sports as the game proceeds. But given the

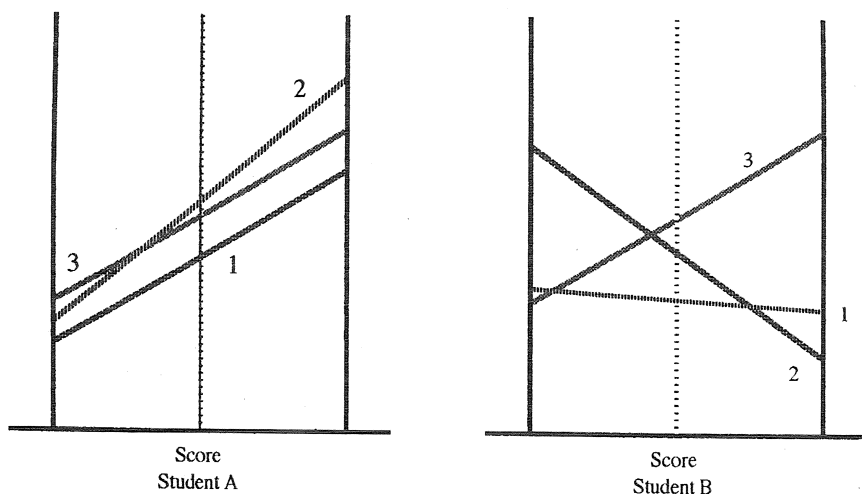


Figure 6 — Illustrations of results obtained by two students in three matches.

observational task of collecting assessment data for each of some 30 students, the teacher clearly cannot take charge of the assessment. Nor is the teacher taking charge alone desirable in preassessment or formative assessment settings. Indeed, some authors see the active participation of students in the assessment process as an important component of the teaching–learning process and involve students in the process (Wiggins, 1993; Zessoules & Gardner, 1991). Such a strategy is particularly significant whenever there is “teaching for understanding” in the classroom, whether based on a cognitive perspective or on a constructivist one (Gardner, 1992; Gréhaigne & Godbout, 1995; Turner & Martinek, 1995; Zessoules & Gardner, 1991). Various studies have also shown that students of various ages are capable of collecting reliable observational data (Boudreau, 1987; Dassé, 1986; Godbout, Desrosiers, & Dadouchi, 1994; Spallanzani, Desrosiers, & Godbout, 1988).

In the case of the assessment procedure discussed in this paper, the simplest way to proceed appears to be to organize four or six balanced teams within the class group and to pair students belonging to different teams so that one will observe and complete the observational grid while the other is playing. So far, this procedure has been successfully applied with secondary school students as young as 13 or 14 years of age. Of course, as one may suspect, students need to learn how to observe properly and continuously. Despite the objectivity of the observational system, they also need to learn to categorize ball play appropriately (for instance, distinguishing between an offensive ball and a neutral ball). Such observational skills, while developed for the sake of the assessment procedure, may be useful to students as they engage themselves effectively in the game. Although the observational data collected rest upon products (end result of different actions), the observers actually see the process (the way the game is played and which choices are made). The way one ball was conquered or lost, although not registered on paper, nevertheless remains in the observer’s mind. As reported by Godbout et al. (1994), students, when observing their peers, see actions and choices to be imitated and mistakes to be avoided. Likewise, determining that a given action leads to a neu-

tral ball or an attack ball requires some interpretation of the choices made by the player given the configuration of play at a given moment. Likely, while recording the judgment, the observer may well reflect on what other decision could have been made.

In order to obtain a valid assessment of the players' performance, the teacher needs to balance opposing teams. In addition, teachers should make sure that matches are played in authentic situations of opposition. One way to do this might be to weight the composite scores obtained by the winners and the losers (respectively 1.1 and .9, for instance). Exchanging the ball between partners for the sake of increasing the volume of play should be discouraged. Also, in order to insure a fair exchange of the ball among all students of a given team, teachers may choose to assign the average score of the team to all its members, thus encouraging them to increase the volume of play of low-skilled students who tend to produce lower efficiency indices (such a strategy would break the cycle of poor players becoming even worse because they never get the ball).

Although many teachers will choose to use the assessment procedure only for preassessment or formative assessment purposes, others may go further and include it in their summative assessment scheme. It has been shown that some physical education teachers do involve students in the summative assessment process (Desrosiers et al., 1996), and the very objective nature of the data may justify such a choice providing that the school policy makes room for some type of peer assessment.

Conclusion

The assessment procedure discussed in this paper appears to produce an objective, reliable, and valid indication of players' overall offensive performance in team sports. Nomograms have been experimented with for various sports (basketball, European handball, rugby, soccer, volleyball) with good results (Gréhaigne & Roche, 1993). The procedure could also be adapted to hockey, ringette, field hockey, Lacrosse, and waterpolo. This paper had a methodological purpose: to describe the rationale behind the proposed performance test and the procedures used to build it, and to discuss its integration to the teaching-learning process in a perspective of authentic formative assessment.

Integrating an assessment procedure to the teaching-learning process has nothing to do with stopping the learning activity in order to conduct the assessment. Because the students actively participate, the assessment becomes a learning activity for the observers, as well as for the players. Furthermore, once the assessment results are communicated, each player and each team is faced with a problem of some sort: how to avoid losing so many balls, how to reduce the number of neutral balls and thus increase the number of attack balls, how to deal with the weaknesses and strong points of each player in order to improve the team's overall performance, and so on. Authentic assessment is an integral part of a never-ending hypothesis-verification-conclusion learning cycle. In a classroom, the teacher sets up and manages learning situations, but the students are the only ones who can achieve learning for themselves. Along with the young observers, the teacher sees things, goods hits and mistakes, and can provide feedback; however, unless students have a chance to reflect on their actions in light of the feedback they receive, and then make other trials in action, true learning may never occur. Students' reflection on their trials, success, and errors feed their tactical thinking. Without that

reflection, there may be some level of modeling (i.e., set up patterns of action that will succeed at times), but reproducing the same tactical patterns over and over should not be associated with tactical knowledge in action (Gréhaigne & Godbout, 1995). In a sense, what is at stake here is the learning and assessment of procedural tactical knowledge in action, with the accompanying effect on skill learning.

Finally, it should be clear that the two essential elements of the proposed assessment procedure are the efficiency index and the volume of play index. We have put forward the use of a nomogram as one way to combine their respective contributions while avoiding an actual computation of the score by the students. Evidently, teachers may elect to work directly with one performance index or the other without bothering to compute a performance score. For instance, at the beginning it may be desirable to focus students' attention on their volume of play and, at a second stage to gradually link the volume of play to the efficiency index. However, when the time comes to truly appreciate the player's performance in the game, both indices should always be taken into consideration.

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Notes

¹An opposition relationship is an antagonist link existing between several players or groups of players confronted by virtue of certain rules of a game that determine a pattern of interaction.

²In team sports (and especially in the invasion type sports) strategy refers to those elements discussed in advance in order for the team to organize itself. Tactics are a punctual adaptation to new configurations of play and to the circulation of the ball; they are therefore an adaptation to opposition (Gréhaigne & Godbout, 1995).

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