

Using instruments for tactical assessment in physical education and extra-curricular sports

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José Arias-Estero

UCAM Universidad Católica San Antonio, Spain

Francisco Castejón

Universidad Autónoma de Madrid, Spain

Abstract

The aim was to analyse the features concerning the applicational purpose and strategy of the most common instruments used to assess game tactics both in Physical Education (PE) and in extra-curricular sport contexts. The review focused on two instruments: the Game Performance Assessment Instrument (GPAI) and the Team Sport Assessment Procedure (TSAP). The results showed that the two instruments were both mainly applied at the final stage of Junior School and the initial stage of Secondary School. The GPAI was used chiefly in PE (90.91%), through hetero-assessment (90.91%), observation of videos (90.91%), and at the beginning and the end of the teaching and learning process (54.54%). The TSAP was more likely than the GPAI to be used in youth sports (40%), through peer-assessment (60%), live (real time) assessment (60%), and at the end of the teaching–learning process (80%). Despite the possibilities provided by their excellent design, the present review shows that neither instrument has been used very frequently, according to the analysed variables.

Keywords

Teaching games for understanding, assessment, tactics, decision-making

Introduction

According to the model of Bunker and Thorpe (1982), in Physical Education (PE) and extra-curricular sport (sport practised outside PE), the definition of tactics includes two different aspects:

Corresponding author:

José Arias-Estero, Facultad de Ciencias de la Actividad Física y del Deporte, UCAM Universidad Católica San Antonio, Campus de los Jerónimos s/n, Guadalupe, Murcia 30107, Spain.

Email: jlae84@hotmail.com

decision-making and skill execution. Arias and Castejón (2012) recently showed that the most frequently employed instrument for tactical assessment was the Game Performance Assessment Instrument (GPAI), followed by the Team Sport Assessment Procedure (TSAP) and a few others that were used less frequently (nonhabitual instruments). The two instruments were designed for tactical assessment, but they are different, because each instrument defined a set of game components and formulas to quantify the assessment. In spite of notable differences, both these instruments are the most broadly used to assess tactics. More information about the GPAI and the TSAP is needed to know how they have been used, obtain indicators of how they should be used, identify deficiencies, and make proposals for their improvement.

The GPAI was designed to assess tactics following the teaching proposal of the TGfU (Teaching Games for Understanding) model (Mitchell et al., 2006; Oslin et al., 1998). It was created to provide teachers and investigators with an instrument that would allow the assessment of players' skill to resolve tactical problems during their game (see Table 1 and Figure 1 in Appendix 1). It contains a set of components and formulas that are considered essential. The GPAI was designed to be applied in attack and defence of the player, regardless of whether or not he or she possesses the ball. In contrast, the TSAP (Gréhaigne et al., 1997) is a procedure to assess participants' tactical performance in team sports (Table 2, Figure 2 in Appendix 2). It provides information about students' game performance, based on the constructivist approach. The TSAP allows participants to be active in the assessment process. The TSAP was designed to obtain information only about sports that involve playing with a ball (or projectile) and only about gaining possession of the ball and disposing of the ball.

Any assessment process requires, as a minimum, determining the purpose, strategy, and assessment instrument for the process. The purpose can be mainly summative or formative, which, in turn, conditions the moment of assessment, depending on the context in which it will be performed. The assessment strategy is determined by the evaluator, the participants being assessed, and the data-recording process. Lastly, the instrument provides information about the assessment; that is, game category, game component, formulas, game phases and roles. As noted by López-Pastor et al. (2013), it is necessary to use an alternative assessment to help students to improve their learning and teachers to improve their teaching. Studies are needed to corroborate that the use of these instruments achieves these goals. In a prior study (Arias and Castejón, 2012), the characteristics of the instruments were addressed, but not the variables determined by their applicational purpose and strategy.

MacPhail et al. (2008) admitted that the GPAI was used in primary schools more frequently by researchers than by PE teachers. Furthermore, these authors emphasized that the instrument can be implemented by students and teachers using different strategies. However, their statements were not supported by any prior work, but instead were suggestions. In addition, there seem to be no studies indicating the relationship between factors that determine the applicational purpose and strategy of the instruments most frequently employed to assess tactics (the most appropriate setting for the instrument, to which subjects can it be applied and who can use it, for which kinds of assessment can it be used depending on the moment and the data-recording process). The aim of the present review was to analyse the variables related to the applicational purpose and strategy of the most common instruments used to assess game tactics: assessment context, assessment time, age of the participants being assessed, evaluators, and data recording.

Method

Using descriptive analysis, we analysed the studies of tactical assessment following the TGfU or a similar approach (Bunker and Thorpe, 1982; Hastie et al., 2009; Mitchell et al., 2006; Pritchard

et al., 2008), from the year 1996 until January 2010. The selection included all the works that presented empirical studies, excluding works that made proposals but did not provide data. The process of teaching–learning and assessment from a tactical approach and the instrument employed for tactical assessment had to appear in the article.

To prevent the results of the real assessment of participants' tactical skill from being confounded with the assessment of the verbalization of their tactical skill or with other types of assessment, we excluded studies that: (a) only used instruments designed for self-assessment by the students/players (questionnaires, video-tests, image recognition, etc.); (b) only applied questionnaires to assess declarative and/or procedural knowledge; and (c) only performed interviews or similar techniques (reflection or discussion groups, etc.). Moreover, the authors rejected the inclusion of assessment instruments that were used infrequently in the studies reviewed because their use was not generalized, they had only been designed for research or to study a specific game, or their authors were the only users. Therefore, the results focus on two instruments, which can be considered common in tactical assessment: the GPAI and the TSAP.

The review was carried out in the Science Citation Index database, specifically in journals that used a blind peer review process to guarantee the robustness of the results. The search was done using different combinations of terms: physical education, teaching, TGfU, assessment, instrument, tactics, decision-making, sport pedagogy, game performance. The bibliographic search provided 70 articles. The researchers who carried out this review read all the documents and reached a consensus about their inclusion in the study based on previously established criteria (16 articles marked with an asterisk in the reference list).

The authors reached a consensus about the series of variables that should be analysed according to the aim of the present review (see other variables of assessment in Arias and Castejón, 2012): assessment context (PE or extra-curricular sport); assessment time (initial, final, middle or continuous); age of the participants being assessed; evaluators (hetero-assessment or peer-assessment); and data recording (observation during the game or after the game by means of videos). The results of the review (see Table 3 in Appendix 3) are presented by means of counts and percentages of occurrence of the categories of each variable across the total number of manuscripts concerning each instrument.

Results and discussion

Assessment context

As can be observed in Table 3, the GPAI was mostly used in a PE context, with the exception of one case. The exception was the study of Harvey et al. (2010) in soccer. According to Harvey et al., the use of the GPAI seems to be limited to PE and not typically extended to extra-curricular activities. This result seems logical because the GPAI was created to be mainly applied in PE, although its designers noted that it can also be used in extra-curricular sports (Oslin et al., 1998).

The TSAP was used in PE in 60% of the cases and in extra-curricular sports in 40% (Nadeau et al., 2008a, 2008b). As with the GPAI, the TSAP was chiefly designed for use in PE in order to carry out formative assessments (Nadeau et al., 2008b). Nevertheless, the authors and/or collaborators have shown a strong tendency to apply the instrument to extra-curricular sports, because they assumed it would be accepted in PE. Hence, in almost one half of the works referring to the TSAP, it was used in organized sports (specifically, in ice hockey – Nadeau et al., 2008a, 2008b).

In general, PE was the assessment context in which tactics were assessed with the instruments analysed in the present study. This result appears to reflect two aspects. First, it may be an indication that the TGfU approach has not penetrated as strongly in the extra-curricular context as in the curricular context and, although coaches work with tactics in organized sports, they do not follow the guidelines of TGfU (Light, 2006). Second, coaches are habitually more concerned with assessing tactics drawn from game statistics and their subjective perception (Turner and Martinek, 1999). This does not mean that the instruments cannot be used outside of PE, but the main current of TGfU has conducted studies in PE (Mitchell et al., 2006). Future research should be performed with the GPAI and the TSAP to verify their validity in extra-curricular contexts.

Assessment time

The most generalized assessment time for the GPAI was at the beginning and the end of the teaching–learning process (54.54%; Chatzopoulos et al., 2006a, 2006b; Mesquita et al., 2005; Mitchell and Oslin, 1998), although it was also used in the middle in some cases (27.28%; Harvey et al., 2010; Pritchard et al., 2008; Tallir et al., 2007), for final assessment in a single study (Oslin et al., 1998), and for continuous assessment in one study (Casey and Dyson, 2009; see Table 3). In the studies that used the instrument in the middle, the authors had used it during one or more sessions across the teaching–learning process to carry out a follow-up (Harvey et al., 2010; Pritchard et al., 2008). These results are reasonable, taking into account that the GPAI was predominantly used in PE. In this context, initial assessment helps to identify students/players' strengths and limitations on which to base teaching contents and strategies. During the process, it allows the identification of whether the students/players make the expected progress. It also detects problems, and ultimately serves to verify what the students/players learned and to obtain useful information to plan future interventions.

The TSAP was used in most of the works (80%) for final assessment and, in only one study, as a continuous assessment instrument (Richard et al., 1999). This finding of just one continuous assessment with the TSAP is contradictory, as it was created with the premise of permitting a more integrated assessment, as it can be used for pre-assessment, formative assessment, and summative assessment (Richard et al., 1999, 2000). The reason for this result is that, in 80% of all the reviewed studies using the TSAP, the authors' goal was to verify the reliability and validity of the instrument with different students/players and in different games. This type of research implies that the authors decided to use the instrument at the end of a training process.

To achieve formative assessment, the instruments should allow the coaches to verify what the students learned and show them how to improve their learning. In general, the reviewed instruments were only used once for continuous assessment. Nevertheless, as part of the pedagogic action, assessment should take place across the entire process (Desrosiers et al., 1997). The difficulty of applying continuous assessment that provides sufficient feedback to the students/players may reside in many factors (e.g. from the number of students to the type of instrument and the teacher/coach's conception). Although the traditional tests used for assessment were mainly applied at the end of the teaching–learning unit (Desrosiers et al., 1997), a positive aspect of the instruments analysed in this review is that they can be used for continuous assessment. Although continuous assessment does not exclude final assessment, it is the teacher/coach who decides what to do with the information obtained by the instrument. In spite of this, both instruments can be used without having to design specific assessment sessions (Oslin et al., 1998; Richard et al., 2000). Studies are needed to appraise the utility of both instruments for continuous assessment in order to ensure that they do not disturb the ecology of the classroom/training.

Age of the participants being assessed

In most of the studies, the participants' age ranged between 10 and 14 years, independently of the type of instrument used (GPAI: 63.63% and TSAP: 60%). This indicates that instruments were employed predominantly in Key Stages 2 and 3; that is, during the final stage of Junior School and the initial stage of Secondary School (according to the British educational system). The instruments were used less frequently in Key Stages 4 and 5 (Table 3). This is coherent with the fact that the authors of both instruments designed them – or at least validated them – with participants aged between 11 and 12 years in the case of the GPAI (Oslin et al., 1998) and between 12 and 13 years in the case of the TSAP (Gréhaigne et al., 1997). The initial validation of both instruments with participants of these ages and their use and validation with participants aged between 15 and 18 years shows a predisposition to extend the use of the instruments to other ages.

The lack of more studies of participants of other ages seems to be justified by the following arguments. First, teachers/coaches do not usually grant much importance to aspects related to tactics until the learners have mastered skill execution (Desrosiers et al., 1997; Díaz-Cueto et al., 2010). Second, the TGfU approach emerged for application in early youth training stages. This does not mean that this type of instrument cannot be applied to adults. Moreover, both the GPAI and the TSAP are modifiable tools, in the sense that they offer the possibility of choosing which variables to assess (game components), and this allows their adaptation to the participants being assessed. Hence, new studies are needed to verify whether these instruments are useful to assess tactics with younger and older individuals.

Evaluators

The GPAI was used in all cases to perform hetero-assessment and, in one case, also peer-assessment (Casey and Dyson, 2009; see Table 3). According to Oslin et al. (1998), teachers/coaches, researchers and even students/players can use the GPAI. The present review corroborates the fact that teachers/coaches and researchers use it most frequently and that its use for peer-assessment was limited. However, Oslin et al. (1998) noted that the simplified version of the GPAI is particularly useful when applied by students/players for peer-assessment (for more information on the simplified version, see Mitchell et al., 2006).

In 60% of the manuscripts referring to the TSAP, the students/players were the evaluators (Nadeau et al., 2008b; Richard et al., 2000), although in 20% of the cases, peer-assessment was accompanied by hetero-assessment (Gréhaigne et al., 1997). The greater use of the TSAP for peer-assessment in comparison with the GPAI seems reasonable because the TSAP was especially developed for peer-assessment in order to make the process more active and formative (Gréhaigne et al., 1997; Richard et al., 1999). Various studies showed that the TSAP was valid for use by PE students between 14 and 17 years of age (Nadeau et al., 2008b) and from 11 to 14 years (Richard et al., 2000). As with the GPAI, Richard et al. (2000) noted that when the TSAP is used by the students/players, it is not necessary to use all the component criteria, but instead, only the criteria that are more suitable to the students' capacity.

Although both instruments can be adapted to students/players, the TSAP has led to greater participation of students/players in the studies reviewed. This could be due to the suggestions of Richard et al. (2000) aimed at helping students/players use the TSAP correctly: (a) introduce the variables to be assessed gradually; (b) select the variables that can be understood by the students/players without needing to use the rest of the variables; (c) establish a training period with the

instrument of three to four 44-minute sessions; (d) dedicate more time to the less skilled students/players; and (e) carry out a systematic verification of students'/players' records. According to Richard et al. (1999, 2000), the students'/players' problems when using the TSAP were the habitual ones when applying peer-assessment with any other type of instrument (e.g. greater assessment capacity of some students/players compared with others, time needed to learn the procedure, etc.).

In general, hetero-assessment was found in a large number of studies, independently of the instrument used. This result was similar to that obtained by Desrosiers et al. (1997) after analysing 62 assessment instruments. An explanation of the predominance of hetero-assessment is that it seeks to achieve maximum reliability and to avoid students'/players' prior training period in the use of the instrument. Although peer-assessment was higher with the TSAP, this does not mean that the TSAP leads to a greater loss of time and a less rigorous assessment. In contrast, studies carried out with the TSAP did not consider that the participation of external agents ensured maximum reliability, and they believed that the students'/players' training period was an important aspect of their learning process.

Assessment is not only the teacher's/coach's competence. It should also include the students/players because they are in charge of their own learning, while acknowledging that their involvement implies alternative assessment. From the TGfU perspective – especially the interpretative process – peer-assessment is possible, as it allows students/players to improve their autonomy because they learn from the experience of action and reflection on the action. Furthermore, the assessments of the diverse evaluators who participated in the teaching–learning process may be complementary – hetero-assessment and peer-assessment at the same time – as shown by Desrosiers et al. (1997). New works should demonstrate how the instruments should be used for peer-assessment and to determine recommendable adaptations, taking into account the variables related to their applicational purpose and strategy. This is particularly necessary in the case of the GPAI.

Data recording

In all the studies reviewed except for one (Casey and Dyson, 2009; see Table 3), the GPAI was used to record the data by means of video observation after filming the game. In the case of the TSAP, using videos for subsequent assessment was not predominant (Table 3). There was a higher percentage of studies that used the TSAP during the game (60%; Gréhaigne et al., 1997; Nadeau et al., 2008b; Richard et al., 1999), although 20% of the cases recorded the data both during and after the game (Gréhaigne et al., 1997). This suggests that the variables on which the TSAP is based may be less complex to comprehend and record, which would facilitate its use during the game. Nevertheless, both the GPAI (Oslin et al., 1998) and the TSAP (Gréhaigne et al., 1997; Richard et al., 2000) were designed for live assessment during the game as well as for subsequent video assessment.

Tactical assessment involves a series of demands that involve making decisions about the instrument to be used and about its use in real time or through video observation. The predominance of the use of video assessment is due to the implicit complexity of the game and the tactics themselves, because of the multiple aspects that must be attended to when recording the data (Harvey et al., 2010; Pritchard et al., 2008; Tallir et al., 2007). It seems that the video is an essential resource in order to improve the process of data collection. However, the ease of using the video to analyse a concrete game component in more detail and even by more than one evaluator is an obstacle for its use in PE and in extra-curricular sports. Faced with the counterposed demands involved in live game analysis and the difficulty of using videos in both contexts, the two

instruments (GPAI and TSAP) can be adapted to be applied in their simplified versions. Further research should address the minimal characteristics (e.g. game components, formulas) that the instruments should include to allow them to assess tactics as designed.

Conclusion

This review shows that GPAI has been used chiefly: (a) in PE; (b) with students from Key Stages 2 and 3; (c) for initial and final or middle hetero-assessment; and (d) for data recording after the game. On the other hand, the TSAP was used to a greater extent: (a) in extra-curricular sport; (b) with students from Key Stages 2 and 3; (c) for peer final assessment; and (d) during the game. These differences are mainly because the TSAP was designed to assess only the player in possession of the ball, through the two ways that players may gain ball possession (conquered ball, received ball) and the four ways that players may dispose of the ball (lost ball, neutral ball, offensive ball, successful shot on goal). In contrast, the GPAI allows the assessment of the attacking players (with and without the ball) and defenders (from an attacker with and without the ball), through seven game components (base, adjust, decision making, skill execution, support, cover, guard/mark) that should be defined and appropriate for each game. The differences between the GPAI and the TSAP are, in turn, an indication for researchers to know how to use both instruments. In spite of these differences, both instruments were designed for use in different contexts (PE or extra-curricular sport) and assessment times (initial, final, punctual, or continuous), by different evaluators (hetero-assessment or peer-assessment), independently of the age of the subjects being assessed, for assessment during and after the game (videos). In contrast, because of the definition of tactics, the employment strategy of the instruments is somewhat limited; for example, the instruments should ask the participants being assessed about their decisions. New studies are needed to show that the instruments can be used while taking into account the variables of the present work. However, the results obtained in this review should be ratified in future research through direct data obtained from teachers and coaches.

Researchers should make a greater effort to bring the GPAI and the TSAP closer to teachers/coaches. According to the conclusion of this review, the measures should transmit the possibilities of adaptation and simplification of the GPAI and the TSAP to teachers/coaches, so they will use them in extra-curricular sports, with subjects of different ages, for peer-assessment, and without disturbing the ecology of the classroom/training. Future research should analyse the minimum number of components and formulas included in the instruments to facilitate their use and allow them to assess tactics. Moreover, we recommend limiting the number of assessment criteria without neglecting the essence of tactical assessment. The data-recording process could also be optimized through the implementation of software to make it easier to use and more attractive to teachers/coaches and students/players. It should not be forgotten that designing and applying adequate instruments facilitates good tactical assessment, which benefits the teaching-learning process of games.

Appendix I

Table I. Game Performance Assessment Instrument (GPAI) components and formulas (adapted from Oslin et al., 1998).

Components of game performance	
Base (B)	Appropriately returning to a recovery (base) position skill attempts (iB= inappropriate)
Decision-making (DM)	Appropriately deciding what to do with the ball (or projectile) during a game (iDM=inappropriate)
Skill execution (SE)	Efficiently executing selected skills (iSE=Inefficient)
Support (S)	Appropriately supporting teammate with ball (or projectile) by being in position to receive a pass (iS=inappropriate)
Guard or mark (GM)	Appropriately guarding or marking an opponent who may or may not have the ball (or projectile) (iGM=inappropriate)
Cover (C)	Appropriately providing defensive cover, help, or backup for a player making a challenge for the ball (or projectile) (iC=inappropriate)
Adjust (A)	Moving either offensively or defensively as necessitated by the flow of the game (iA=inappropriate)
Game performance formulas	
BI=B/iB	Base index
DMI=DM/iDM	Decision-making index
SEI=SE/iSE	Skill-execution index
SI=S/iS	Support index
GMI=GM/iGM	Guard or mark index
CI=C/iC	Cover index
AI=A/iA	Adjust index
GI=B+iB+DM+DM+SE+iSE+S+iS+GM+iGM+C+iC+A+iA	Game involvement
GP=(BI+DMI+SEI+SI+GMI+CI+AI)/7	Game performance

	Decision-making		Skill execution		Support	
Name	DM	iDM	SE	iSE	S	iS
Player 1	XXX=3	XX=2	XXX=3	X=1	XXXXX=5	XX=2
Player 2	X=1	XXX=3	XXXXX=5	XX=2	XXXX=4	X=1
Player 3	XXXXX=5	X=1	XXXX=4	XXX=3	XXX=3	XXXXX=5
Player 4	XX=2	XXXXXX=6	XXX=3	XXXX=4	XXXX=4	X=1
Player 5	XXXX=4	X=1	XX=2	XXXXX=5	X=1	XXX=3

Figure I. Example of observation of soccer performance with Game Performance Assessment Instrument (GPAI) (adapted from Oslin et al., 1998).

DM: decision-making; iDM: inappropriate decision-making; SE: skill execution; iSE: inefficient skill execution; S: support; iS: inappropriate support.

Appendix 2

Table 2. Team Sport Assessment Procedure (TSAP) variables and formulas (adapted from Gréhaigne et al., 1997).

Observational variables	Operational definition
Gaining possession of the ball	
Conquered ball (CB)	A player is considered to have 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.
Received ball (RB)	The player receives the ball from a partner and does not immediately lose control of it.
Disposing of the ball	
Lost ball (LB)	The player is considered having lost the ball when he or she loses control of it without having scored a goal.
Neutral ball (NB)	A routine pass to a partner who does not truly put pressure on the other team.
Offensive ball (OB)	An offensive ball is a pass to a partner who contributes to the displacement of the ball towards the opposing team's goal.
Successful shot or goal (SS)	A shot is considered successful when it scores or when one's team retains possession of the ball.
Formulas	
$AB = OB + SS$	Number of attack balls
$VP = CB + RB$	Volume of play index
$El = (CB + OB + SS) / (10 + LB)$	Efficiency index
$PS = (VP/2) + (El \times 10)$	Performance score

Note: Nadeau et al. (2008b) added two new variables (received puck and successful icing), and Nadeau et al. (2008a) added another two new variables (hindering progression and blocked shot) and a new formula (volume per minute) to use the TSAP in ice hockey.

Observer: Sequence n.:	Player n.:	Match:					
CB	RB		NB	LB		OB	SS
	X		X				
	X						X
	X			X			
X			X				
	X						X
	X		X				
	X		X				
I	6		4	I		0	2

Figure 2. Observational grid for collecting data on Team Sport Assessment Procedure (TSAP) (adapted from Gréhaigne et al., 1997).

CB: conquered ball; RB: received ball; NB: neutral ball; LB: lost ball; OB: offensive ball; SS: successful shot.

Appendix 3

Table 3. Count and percentages of the variables concerning the applicational purpose and strategy of the instruments.

Variables	GPAI		TSAP	
	<i>n</i>	%	<i>n</i>	%
Assessment context				
PE	10	90.91	3	60
Extra-curricular sport	1	9.09	2	40
Assessment time				
Initial and final	6	54.54	—	—
Middle	3	27.28	—	—
Final	1	9.09	4	80
Continuous	1	9.09	1	20
Age of participants being assessed				
Between 10 and 14 (Key Stage 2 and 3)	7	63.63	3	60
Between 15 and 18 (Key Stage 4 and 5)	4	36.37	1	20
Not mentioned	—	—	1	20
Evaluators				
Hetero-assessment	10	90.91	2	40
Peer-assessment	—	—	2	40
Peer-assessment and hetero-assessment	1	9.09	1	20
Data recording				
During the game (live)	1	9.09	2	40
After the game (videos)	10	90.91	2	40
During and after the game	—	—	1	20

GPAI: Game Performance Assessment Instrument; TSAP: Team Sport Assessment Procedure.

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Author biographies

José Arias-Estero is a Senior Lecturer and Head of Department of Physical Activity and Sport Science at UCAM Universidad Católica San Antonio, Spain.

Francisco Castejón is a Professor in the Department of Physical Education, Sport and Human Movement at Universidad Autónoma de Madrid, Spain.