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Articles

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The current issue is the fourth of the seventh volume of the *Athens Journal of Sports,* published by the Sport, Exercise, & Kinesiology Unit of the ATINER under the aegis of the Panhellenic Association of Sports Economists and Managers (PASEM).

Gregory T. Papanikos, President, ATINER.

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Athens Journal of Sports - Volume 7, Issue 4, December 2020 – Pages 205-214

The Homeric Charioteer

By Paavo Roos[*]

The persons driving horses in Homer are rather numerous, especially on the battlefield but also on the racecourse and transport. They are usually called by name and although we are seldom informed about their social status, we can see that they often belong to the same class as the warriors. On the battlefield, they live a dangerous life and are often more liable to be killed than the warriors.

Keywords: *Homer, charioteer, chariot, horse-race*

Introduction

Among the innumerable persons mentioned in the Homeric epics there is a great number who with reins in their hands, conduct a chariot or a wagon. The conditions may vary – battle, racing, transport – what is striking is that a considerable part of the persons are named by name. On the other hand, it is not as often we are informed about their social status: who is a prince or his relative, who is his subordinate, who is a poor free man? Who drives his own horses and who drives those of somebody else, and what relation has he in that case with the horse-owner? Part of the question list can also concern Greek and Roman periods – except those concerning battle narratives; here we shall be confined to the situations described by Homer, which will give us sufficient material.

If we start with the racing the material is in fact rather scanty. Of course the main piece is the race at the games held at Patroclus' funeral, referred in the 23th song of the Iliad, and apart from that, one of Nestor's usual reminiscences that he communicates to the audience and thus to the afterworld (*Il.* 23.629-45). The participants in the funeral games are princes and all are listed by names (differently from later periods when we often only are informed about the winner) and their teams are their own. We have Diomedes and his team (which he had conquered from Aeneas), Antilochus and Menelaus, who like Diomedes are famous warriors. Eumelus is much less known, and when he is especially mentioned, it is for his swift horses. The fifth one, Meriones, is a complicated person who also participated in other disciplines, he too was a successful warrior even if he was not a prominent charioteer, nor were his horses swift. Homer makes a great affair of the race with the divine intervention that decided the final outcome between Eumelus and Diomedes, and an internal skirmish between Antilochus and Menelaus.

The chariot race in the funeral games of Patroclus is said to be the motif of one of the most famous Greek vase paintings, that on the François vase from Chiusi from about 570 B.C. One of the many picture strips show a line of partly preserved chariots racing from left to right, and at the right end, thus at the goal, a

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man with a tripod. The tripod is a prize and signifies a competition; other such are visible under the chariots. The motif is not uncommon – the interesting point here is that both the participants and the standing man are listed by name, which has caused considerable trouble. The person in the middle is called Diomedes, who was one of the participants in the games all right. To the right of him are two scarcely preserved figures named Automedon and Olyteus (i.e., Odysseus) who both took part in the war but not in the race in the funeral competitions. By the way, Automedon was sent by Achilleus to fetch an additional prize to give to Eumelus (*Il.* 23.391-7, 532-8)[1] so he could not participate in the race; as for Odysseus he participated in other disciplines like foot-race and wrestling but not in chariot-race (*Od.* 4. 605-8)[2]. To the left of Diomedes we see two quite preserved teams with the names Hippothoon and Damasippos, who not only are lacking in the competition but are not named as participants in the war at all[3].

Now what is it that causes everybody who speaks about this scene to say that it displays the chariot-race at Patroclus' funeral games, when it shows one chariot who took part in the games, two who were present but did not participate in the race, and two whom we do not know at all? It is the single standing figure to the right with the inscription Achileus. Thus it is he who arranges the competition, and as far as we know Patroclus' funeral games were the only competition that Achilleus ever arranged; therefore everybody seems to accept that those are depicted here although the other names do not fit Homer's narrative. We may also put the question why the vase-painter Cleitias has chosen names that do not fit the description – surely Greek painters used to know their Homer well enough to get the names right. In fact, the number of the participants is correct, so that the scene cannot have been painted quite at random[4].

But let us leave the chariot-race that after all was only a small incident in the Trojan War – neither horses nor charioteers had been transported to Troy primarily in order to participate in the chariot-race. It was on the battlefield they were expected to be active. The warriors could drive their own chariots or be driven by a charioteer, but if so, who was this person and what was his relation to the warrior? In fact, the charioteers are rather numerous, and many are named by name, but to be named by name in this connection is nothing to be sighing for; many of them do not live for many seconds after they have been mentioned for the first and only time.

[1]Eumelus crashed with his chariot through Athene's machinations and had to drag it to the goal.

[2]Ithaca, the native island of Odysseus, is not suited for horses, as Telemachus points out to Menelaus.

[3]Their names, "swifthorsed" and "horsetamer" point to skill in dealing with horses.

[4]If we compare with the other motif on the same vase, the hunt of the Calydonian boar, we can notice that also there the participants are named and are no less than 20 persons. About the same number is given by Apollodorus *Bibl.* I 8.2 whereas Ovid. in *Met.* 8.299-318 has twice as many. Many of the names in the picture occur only there, and less than half of the named persons in the picture are found in the authors. A difference from the rendering of the horse-race is of course that the literature that we can compare the boar hunt with is considerably later than the vase and thus cannot be its source like the *Ilias* could be.

Poor charioteers! Life on the battlefield was not at all so easy as to drive the warrior to the battlefield, put him down and move the chariot to a safe place in order to wait for him (see *Il.* 4.226-30, 11.239-42, 17.679)[5]. They had also to encounter the fiery glances and flying lances of the enemies, and although they had like the warriors a helmet and a cuirass as defense they had no shield to catch thrown weapons. Often the charioteers are hit by missiles meant for the warriors, as Hector's charioteer Eniopeus is hit by Diomedes, his charioteer Archeptolemus by Teucer or Meriones' charioteer Coeranus by Hector (who in fact is aiming at Idomeneus). But it happens also that a charioteer is hit on purpose, sometimes when he is going to drive away after letting the warrior leave the chariot, as Pylaemenes' charioteer Mydon was hit by Antilochus or Rhigmus' charioteer Areïthous by Achilleus. And to enhance the iniquities the prospect for survival was worse for the charioteers than for the warriors; whereas a hit or wounded warrior could retire from the mêlée or be carried away by a god or be healed by a summoned doctor it was evidently an irrevocable end for a charioteer to be hit, whether it was with an arrow like Archeptolemus, a stone like Cebriones or a lance like the others.

What did a warrior do when he lost his charioteer in the battle? Since he often fought on foot anyhow it would not be strange if he was forced to do it in such circumstances. But when Hector's charioteer Eniopeus was killed, Hector immediately tried to find a successor; he engaged Archeptolemus, who, however, immediately met with the same misfortune. The next charioteer was Hector's half-brother Cebriones who succeeded in surviving longer, from the 8th song until the 16th, when Patroclus killed him with a stone and a violent struggle was fought about his corpse. In the meantime, he appears a couple of times as warrior or even as leader (*Il.* 12.91-2).

Of course, it happens often that either a warrior or a charioteer remains alone in the chariot and either tries to find a substitute or fights on foot or drives the chariot away. It is difficult to drive and fight at the same time, whether it is with lance, stones or bow and arrow, and with a sword it would hardly be possible to reach an enemy even if you would be able to handle the sword simultaneously with the reins.

An interesting exception is when Automedon after the death of his companion Patroclus takes over his chariot (which in fact belongs to Achilleus) to continue the struggle in his own way, in spite of the impossibility to deal with both chariot and weapons, and the horses are incited by Zeus (*Il.* 17.458-65):

> Ὣς εἰπὼν ἵπποισιν ἐνέπνευεν μένος ἠΰ·
> τὼ δ΄ ἀπὸ χαιτάων κονίην οὐδάσδε βαλόντε
> ῥίμφα φέρον θοὸν ἅρμα μετὰ Τρῶας καὶ Ἀχαιούς.
> τοῖσι δ' ἐπ' Αὐτομέδων μάχετ' ἀχνύμενός περ ἑταίρου,
> ἵπποις ἀΐσσων ὥς τ' αἰγυπιὸς μετὰ χῆνας·
>
> "So saying he breathed great might into the horses. And the twain shook the dust from their manes to the ground, and fleetly bare the swift car amid the

[5]We have examples that this indeed occurred sometimes.

> Trojans and Achaeans. And behind them fought Automedon, albeit he sorrowed for is comrade, swooping with his car as a vulture on a flock of geese, for lightly would he flee from out the battledin of the Trojans, and lightly charge, setting upon them through the great throng. Howbeit no man might he slay as he hasted to pursue them, for in no wise was it possible for him, being alone in the sacred car, to assail them with the spear, and withal to hold the swift horses."

In the end, however, he finds somebody to leave the chariot to, Alcimedon, who is one of the few persons who can handle the horses, and Automedon continues to fight on foot rather than – as we perhaps would have expected – continue in the chariot with Alcimedon as charioteer. By the way he admonishes Alcimedon to keep near him so that Hector or somebody else will not put his hands on the team – they are the immortal horses of Achilleus.

His short and unique incident is enough for Automedon to be remembered for the driving and in later literature be regarded as synonym with charioteer[6].

When Achilleus and Hector meet in the 22nd book their chariots are not on the spot (see below). On the other hand, when Achilleus has killed Hector his chariot is at hand, but then the other Greeks have assembled, so a certain amount of time must have passed. When Achilleus has tied Hector's corpse by the feet in order to drag it after his chariot it is not expressly said that he has no charioteer but drives himself[7]. The illustrators however, both ancient and modern, seem to have supposed that the chariot was driven by a charioteer and that this was Automedon, a supposition that had no support in Homer.

It looks like a curiosity when Nestor in one of his speeches boasts with his skill in whatever he performed and tells that he in the funeral games of Amarynceus at Buprasium won every discipline except the chariot race. In this he was defeated by Actor's sons, twins who collaborated on the chariot, one with the reins and the other with the whip (*Il.* 23.638-42). On the race-course such an arrangement that makes the chariot heavier seems to be unwarranted differently from the battlefield[8]. On the Trojan battlefield we meet several cases of pairs of brothers on the same chariot, not expressly twins and in one case only half-brothers. Beside the pair of brothers Hector and Cebriones mentioned above we meet with six pairs, but only in one case it is expressed that one was a charioteer and the other a warrior, in the other cases only that they stood in the chariot together. But as a curiosity these six cases have another thing in common. They

[6]Both Cicero, Ovid and Juvenal treat his name as synonym with charioteer (skillful or reckless), and evidently Varro has also had his name in mind. On the other hand, he does not seem to be actual for Greek authors. We may also keep in mind how a comment from a watchman concerning the driving by a captain of the host in 2 *Kings* 9.20 has caused that the name Jehu after nearly 3000 years is still a notion: "The driving is like the driving of Jehu the son of Nimshi; for he is driving violently."

[7]According to a commentator to the passage in question there is no room for more than one person on the chariot because Hector's cuirass lies there.

[8]This has evidently confused the ancient commentators so much that the brothers could be regarded as Siamese twins both by authors and artists although Homer does not hint it, see Harris (1972) 172. If Nestor's memory is correct he confronted the same pair of brothers also in a battle (where it is not expressly said that they were standing in a chariot) and would have killed them if Poseidon had not snatched them away from the battlefield, *Il.* 11.750-2.

are mentioned only once and the pairs are always killed together in the same attack, one by Aeneas (expressly twins), one by Achilleus, two pairs by Agamemnon and two by Diomedes. By the way Diomedes had set eyes on a third pair before that, but since they were sons of a priest of Hephaestus the god enfolded one of them in darkness and saved him (Il. 5.9-23)[9].

But battlefields and racecourses are not everything in the world. Even for a battle- or race-chariot there is a life outside these fields. A chariot could of course also be used for travels and transports, and who did then drive it? For transports naturally heavier vehicles were often used, sometimes certainly four-wheelers, but for journeys no doubt lighter vehicles as in the connections mentioned above were used. As far as can be seen from the Homeric source material the travellers did not use a driver but drove themselves. Naturally it was also a question of the number of travellers since there were usually not more than two persons on such a chariot, neither in battle nor on a journey. So, with two travellers on the chariot there would be no room for a charioteer (no luggage is ever mentioned, but anyhow Telemachus has room for a few gifts from Menelaus) (*Od*. 15.131-2). When Telemachus on his journey around Greece to ask for Odysseus visited Pylos and planned to go to Sparta together with Nestor's son Peisistratus it was he who drove the chariot and not a charioteer (*Od.* 3.471-3). Slightly more astonishing is when Paris and Menelaus are going to fight their duel about Helen outside Troy and the Trojan herald Idaeus is sent to the town in order to, among other things, ask king Priam to attend to the event. Priam departs immediately, but it is not Idaeus or somebody else who is his driver – certainly there are many other possible persons at hand – but he takes the reins himself. But Priam takes Antenor with him in the chariot, and then there would anyhow not have been room for a charioteer in the chariot. By the way we can notice that Priam cannot think of standing to regard the duel between Paris and Menelaus but immediately after the sacrifice ceremony he immediately drives back to Troy, also now with Antenor in the chariot (*Il.* 3.249-63, 303-13).

We meet Priam in the act of driving also on another occasion. This time it is the nocturnal expedition when he heads for the camp of the Greeks in order to try to redeem the corpse of Hector from Achilleus. This time he is alone in the chariot, but his friend Idaeus drives a four-wheeler, an *apene*, loaded with gifts and drawn by mules instead of horses. On the way back, it is still Idaeus who drives this, now used to transport Hector's corpse, whereas Hermes, whom they have already met on their way to Achilleus, after having closed the heavy gates takes over the role of the driver on Priam's chariot (*Il.* 24.320-471, 690-1).

In the Odyssey we can also notice that the driver of the heavy wagon drawn by mules, also an *apene*, with the washes of the Phaeacians to the shore is the princess Nausicaa herself, not one of the other girls or a charioteer. She is the only

[9]Moreover also many cases occur of charioteer and warrior being killed together without any relationship being indicated as well as of brothers being killed in the same attack without being fighting from the same chariot.

female driver we meet in Homer, if we not shall count the goddesses who also drive their chariots sometimes[10].

We must not forget the question what happens to the horses (and mules) when the driving is finished. Of course, somebody took care of them, just as somebody harnessed them before the journey[11], and it could not always be expected that the exhausted charioteer would do it himself. Or as an old Turkish proverb puts it, *sen mi ağa, ben mi ağa, atlara kim baχa?* - if you are a lord and I am a lord, who shall look after the horses? But it looks as in Homer the prince or warrior looks after the horses or at least unharnesses them himself, Priam, Achilleus and others. It is only Nausicaa who lets her brothers take care of the animals (and the washes) when she returns from the shore. In the world of the gods we find often that somebody else than the driver unyokes the horses. For example, Zeus' horses are unyoked by Poseidon and Hera's by the Hours (*Il.* 8.433-41)[12].

To return to the position of the charioteer in the Homeric world we can note that we in the relations between the persons have a varying offer which of course could be additionally complicated by the translations. The underlings of a prince may be called *hetairos* and *opaon*, almost always rendered in English with comrade and very seldom with follower or friend, or *therapon*, which is always rendered with squire. *Hetairos* and some of the translations could differently from others be mutual. Some persons have their standing epithets as Meriones, who even has two, "ἀτάλαντος Ἐνυαλίῳ ἀνδρειφόντῃ", "the peer of Enyalius, slayer of men" and "θεράπων ἀγαπήνορος Ἰδομενῆος," "squire of kindly Idomeneus." In the second he is thus linked with Idomeneus, whereas we can observe that other persons in similar connections, like Patroclus to Achilleus or Sthenelus to Diomedes, never have standing epithets. Concerning Meriones we can observe that if he is subordinate to Idomeneus, it is not by much – in the Ships' catalogue it is evident that Meriones rules over the Cretans together with Idomeneus (*Il.* 2.649-50)[13].

These epithets and relations are static and permanent – once a companion, always a companion etc. For the charioteers the situation is slightly different. It is true that the sibling relations mentioned above are permanent, but they would hardly be described that one was the charioteer of the other. And we see from Hector's case how the charioteers change for natural reasons. One interesting case is when Aeneas and the Lycian Pandarus discuss who shall drive and who shall handle the weapons before the imminent fight with Diomedes; Aeneas will be the driver because the horses know him better (*Il*, 5.221-40)[14]. In spite of the fact that

[10]Hera drives with Athene as a passenger, *Il.* 5.745-54, 8.338-92, Iris borrows Ares' chariot to drive the wounded Aphrodite, *Il.* 5.363-9, Eos is supposed to drive her chariot alone, *Od.* 23.244-5. Athene takes Sthenelus' place in order to act as charioteer for Diomedes, *Il.* 5.840-5. The messenger Iris evidently does normally not drive but fulfils her tasks without a chariot, see Wiesner (1968) 24.

[11]Sometimes both gods and human beings harnessed their horses themselves, sometimes there were others who did it for them.

[12]However, both Zeus and Poseidon also unyoked their horses themselves, *Il.* 8.50 and 13.34-5.

[13]He is also called prince in other places and is mentioned together with other princes.

[14]In fact, Pandarus has not brought his own horses although he has eleven chariots with belonging horses, *Il.* 5.192-203. Them he has left in the stable in Lycia and travelled to Troy on

Pandarus happens to hit Diomedes – already the second time that day – the encounter means his death, and Aeneas is not far from sharing his fate.

When we study the terminology, we find that the occasional function of somebody's coach or charioteer, *heniochos* or rarer *heniocheus* is not uncommon. But it is more uncommon than could be expected from the translation – when the charioteer Eurymedon drives Agamemnon's horses far away from the mêlée he is not at all called *heniochos* in Greek but *therapon* (*Il.* 4.224-8). When we will check how it is formulated when you are somebody's permanent charioteer we discover that it in fact is never formulated like that – in the mêlée you can be described as somebody's *therapon* or *heniochos* or sometimes *therapon heniochos*, but in common life nobody is characterized as the charioteer of somebody at all, at least not as *heniochos*, whereas it is common to be characterized as somebody's *therapon*, which has in fact a wide notion (Cf. Krischer 1992, 97f). The only time we find Patroclus mentioned as somebody's charioteer it is not Achilleus but the horses who mourn him when he is dead (*Il.* 17.427, 439; see also 19.401). When we know Automedon as the charioteer of Achilleus it is true that it is from a description in the *Iliad* but hardly from a formulation. If Automedon shall thank anybody for the formulation "charioteer of Achilleus" it is instead Vergil.[15] He formulates it so when he describes Pyrrhus' attack on the palace of Priam in the narrative of Aeneas (Verg. *Aen.* 2.476-7):

> "una ingens Periphas et equorum agitator Achillis, armiger Automedon, una omnis Scyria pubes"
>
> "With him huge Periphas and Automedon his armour bearer, driver of Achilles' horses; with him all the Scyrian youth."

But from where has Vergil got the information that Automedon was regarded as Achilleus' charioteer? Does it never occur that he drives with Achilleus in the chariot? It sure happens, even if it is only one single day Achilleus participates in battle in the *Ilias*, the very day when he kills Hector. The campaign starts with Automedon at the reins. When Achilleus descends we are not informed about, but it is evident on several occasions that he is on foot. But it also looks as if he is driving himself, and what becomes of Automedon that day we are not informed of.[16] Of course Vergil has had access to more source material concerning the Trojan War than we, for example the epic cycle that describes other parts of the

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foot for fear that there would not be enough fodder for them in Troy, see Delebecque (1951) 88.

[15]According to Krischer (1992) 97 it is in fact Patroclus who is the charioteer of Achilleus and Automedon takes over the role only after Patroclus' death. Since the *Ilias* starts with the retirement of Achilleus from the battle we have no narration of him on the battlefield earlier.

[16]It is striking that it is more than once formulated as if it is the warrior himself who drives the chariot in spite of the fact that it is mentioned that he has a charioteer on the chariot. It does not only concern Achilleus but also Hector and Patroclus and others. It can even be so that the term heniochos denotes the warrior when he has a charioteer as Hector in *Il.* 8.89. And who was Thestor, who, crouched on his chariot and frightened was killed by Patroclus in *Il.* 16.401-10 – a warrior or a parked charioteer? If he was a charioteer it is at any rate not expressed whose charioteer he is as it is usually done.

war than those included in the *Ilias*. In *Aethiopis*, which describes events in the war after Hector's death but which is not preserved, there are, for instance, descriptions of how Achilleus kills the Amazon queen Penthesilea and the Aethiopian king Memnon, and the latter episode we see depicted on a Late Corinthian amphora (*LIMC* Automedon 49). In the background we see the chariots and charioteers of both parties. Automedon's name is legible, but of the name of Memnon's charioteer nothing is preserved.

Finally, also a few words concerning the counterpart, the horses. It is not often they obtain speech, but when Achilleus' steed Xanthus starts speaking it is the warfare and the prospects of the warriors he deals with, not the driving and the role of the charioteers (*Il.* 19.404-17). Concerning the use of horses we can notice that two horses were used before the chariot as well in race as in battle, and probably also in transport. Three horses were never used nor one single, even if suggestions of the latter have occurred (see Wiesner 1968: 20, n. 67, Delebecque 1951: 98). Nor do we encounter a four-in-hand, but the battle descriptions give us a problem. Sometimes a *pareoros*, a loose horse or a side-horse beside the team is mentioned[17]. These side-horses are the only ones who are killed in battle, and in Achilleus' team the side-horse Pedasus is the only one who is mortal (*Il.* 16.152-4, 466-71). This means that as a motif for the existence of side-horses it can hardly be the question of acting as a spare horse – a mortal spare horse for an immortal one can hardly be imagined. It is more probable that they had a function as some sort of speed keepers, even if it is difficult to believe that they would be of any use compared with the complications it would mean to have them in the mêlée (Wiesner 1968, 21f).

It seems quite clear that the charioteers in the Homeric epos like the warriors in the chariots are of noble origin, although perhaps not always as noble as the warriors. The same concerns them who drive the chariots in horse-races. Also for other use than in battle and races the chariots may be driven by men of the same class, but we have very few examples of that. How will be the case in centuries to come during Antiquity may be the subject of another study.

References

Delebecque E (1951) *Le cheval dans l'Iliade.* (The horse in the Iliad). Paris: Études et commentaires, IX.

Fairclough HR (ed) (1934–1935) *Virgil: in two volumes.* London/New York: W. Heinemann/Putnam.

Harris HA (1972) *Sport in Greece and Rome.* London & Southampton: Cornell University Press.

Krischer T (1992) Patroklos, der Wagenlenker Achills. (Patroclus, the charioteer of Achilles). *RhM* 135: 97–103.

Murray AT (ed) (1985–1988) *The Iliad*. Cambridge Mass. & London.

Murray AT (ed) (1995) *The Odyssey*. 2nd Edition. Cambridge Mass.

[17]It seems as if two side-horses also may occur, *Il.* 8.185, see Wiesner (1968) 22f.

Wiesner J (1968) Fahren und Reiten (Archaeologia Homerica - Lieferungsausgabe). [Driving and riding (Archaeologia Homerica - Delivery edition)]. Vandenhoeck & Ruprecht.

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Student Understanding and Learning in Team Sports: Understanding through Game-Play Analysis

By Zeineb Zerai[*]*, Jean-Francis Gréhaigne*[±] *& Paul Godbout*[°]

The purpose of this paper is three-fold: (a) to summarily examine the matters of team-sport subject-matter knowledge and student team-sport pedagogical content knowledge learning as they evolved in France since the 1960s, (b) to recall briefly the main constitutive elements of the Tactical-Decision Learning Model (T-DLM) and their ties with student understanding and learning, and (c) to illustrate the use configurations of play and effective play-spaces as tools for enhancing student learning. Through T-DLM, students are challenged to collectively plan action projects, implement them in game play situations, and conclude as to their level of success or failure, going through several iterations of the process until stabilization of their acquired knowledge. This learning process unfolds under the teacher's learned and facilitating guidance.

Keywords: *T-DLM, team-sport understanding, debate-of-ideas, configuration of play, student-centered approach*

Introduction

In 2005, Griffin and Butler stated that in contemporary physical education (PE) research, pedagogical theory had begun shifting from questions about the process/product paradigm to questions about the student's learning process. With regard to the teaching/learning of team sports, there appears to have been, since the late 1960s, two lines of theorization, one concerning the team-sport related content knowledge, and the other concerning students' or players' appropriation of that knowledge. Much has been written in the last three decades about teaching/ learning models. A substantial part of that literature has been published in Physical Education and Sport Pedagogy and in the Journal of Teaching in Physical Education. For various reasons, PE practices and theories developed in non-English speaking countries have not always reached the Anglophone readership. A particular learning theory, constructivism, has significantly influenced the evolution of PE teaching practices in France, leading to the development of a teaching/ learning model in relation with decision making in team sports. In English, the model has been titled Tactical-Decision Learning Model (TDLM).

The use of a tactical approach as framework, along with the contribution of a constructivist and cognitivist perspective and their work on tactical knowledge in team sports has led researchers, in the context of school physical education, to put forward the T-DLM. From a pedagogical point of view, in order to draw student

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attention to prototypic patterns of play, teachers may use data collected during or after game play. For instance, they can gather information from a debate-of-ideas set-up with various game forms and team sports. It may also be hypothesized that by studying these configurations of play, one will help students construct an operational image predictive of the way a given situation of play is likely to evolve. The help of new observation tools makes it possible to describe the dynamics of game-play. It seems that linking five criteria (EP-S field location; ball position and circulation; offensive effective play-space and defensive effective play-space positions; defense in block or in pursuit) provides an immediate representation of the opposition relationship.

Team-Sport Subject-Matter Knowledge and its Appropriation by Students/ Players

Team-Sport Subject-Matter Knowledge

In 1965, Teodorescu, from the University of Bucharest (Romania), published a paper in French discussing principles that ought to be considered in the study of common tactics in team sports and their relationship with teams' and players' tactical training. The paper reproduced a lecture presented at the 1965 Vichy Seminar titled "The planning of team sport teaching". That French publication from Teodorescu being no longer available, editors of the eJRIEPS decided to re-publish it for the benefit of interested readers (Teodorescu 2013). In this paper, Teodorescu's premise was that tactics was the most obvious common factor with regard to team sports. In his book on rugby, Deleplace (1966) developed at length team-sport knowledge that could be applied to invasion team-sport in general, particularly with regard to movements of players and the ball in relation to space and time. Beyond the analysis of sport-related fundamental features, the notion of modelling contributed also to the development of team-sport subject-matter knowledge. Discussing the complexity of situations of play in soccer, Menaut (1982) submitted that resorting to formal thinking seems to constitute a realistic enough model of tools used by players to organize reality and structure their tactical action (p. 38).

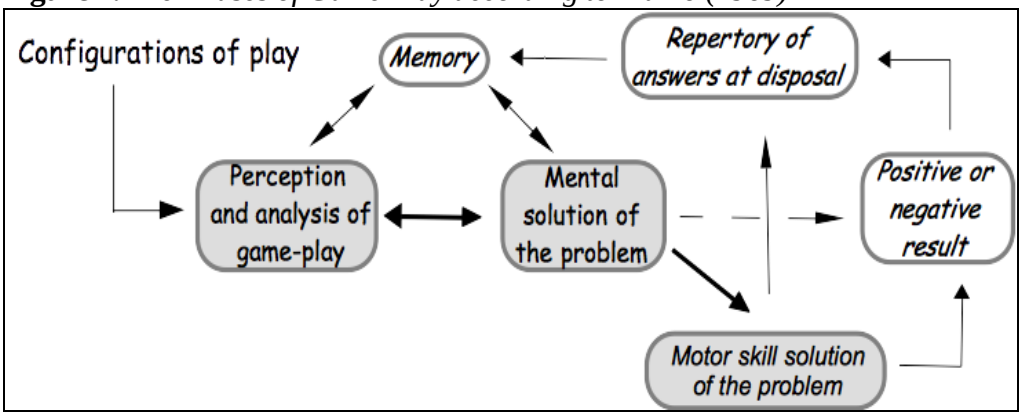
Through didactical transposition (Amade-Escot 2000), this subject-matter knowledge penetrated into PE teaching practices, under the form of Pedagogical Content Knowledge (PCK) (e.g., Gréhaigne et al. 1988, Gréhaigne and Guillon 1991).

Student Knowledge-Learning in Team Sports

Concerning students' learning of team-sport related PCK, the first research known on a game-based approach is, as far as we know, that of Mahlo (1969) (originally published in German in 1965). Malho studied game play phases and showed the complex character of "tactical action in play". He identified the following components of the sport-learning process (see Figure 1):

- perception and analysis of game play (resulting into knowledge of the evolution of the setting);
- mental solution to the problem (involving knowledge of the likely evolution of the setting and the representation of some plan of action);
- motor skill solution to the problem (resulting into the practical solution).

Figure 1. *The Phases of Game Play according to Mahlo (1969)*



Mahlo had put forward the notion of knowledge and advance-organization in game play from cognitive and tactical aspects of the play. To gather information relative to this problem, he studied the answers of players and coaches from various levels of play, confronted to different configurations of play. Mahlo's work was a first step towards a tactical approach in team sport.

In September 1965, a Seminar involving some 140 PE teacher educators was held in Vichy (France). The theme of the Seminar was "the planning of team sport teaching" and put forward a team-sport pedagogy as a tool for school PE (Vandevelde 2007). In the same line of thought and offered from 1964 to the 1980s by the FSGT (Fédération Sportive et Gymnique du Travail) [Sport and Gymnastic Federation for Workers], the Maurice Baquet teacher-training sessions were held in the context of summer camps for 6 to 12-year old children. They were intended for PE teachers' continuing education with regard to the teaching of numerous sport activities. The pedagogical approach was resolutely student-centered and called for teachers' renewal of their practice. "Working in view of the emergence of 'sport for the child' means avoiding a pedagogy of sport-skill learning. … The organization of the training session is the discovery of solutions rather than the appropriation of ready-made solutions" (translated from Mérand 1974, pp. 34, 37). As a follow-up to these training sessions, a series of 12 mementos CPS-FSGT (e.g., Marsenach and Druenne 1974) were published covering numerous team sports and systematically promoting the use small-sided games, a strategy advocated for rugby by Deleplace (1966) and by Frantz several years prior to the publication of his book on soccer (Frantz 1975). The table was set for the emergence of *tactical-decision-models pedagogy*. This approach postulated that the intervention of cognitive processes is decisive for the orientation and motor control of actions. It assumes that the presentation of significant perceptual clues and of rational tactical-choices principles plays a major

role in the enacting of action, including the quality of execution (Bouthier 1984, p. 85).

A *tactical-decision-models pedagogy* offered the management of discussions, interactions and problem solving through debates of ideas (DoI) among students (Deriaz et al. 1998, Gréhaigne and Godbout 1998b), in view of a better understanding of game-play and true learnings.

In 1982, Bunker and Thorpe published their now classic paper on Teaching Game for Understanding. As a result, several game-based approaches (GBA), or game-centered approaches (GCA) (Harvey and Jarret 2014), started emerging in the English literature. Among them, one finds Sport Education (Siedentop 2002), Tactical Games approach (TGA) (Griffin et al. 1997), and Game Sense approach (GSA) (Light 2004). In France, based on the evolution of T-DMP (Bouthier 1988, Deleplace 1979, Gréhaigne 1989), a model for students' construction of tactical knowledge in team sport developed in the 1990s (Gréhaigne and Godbout 1995, Gréhaigne and Godbout 1998b, Gréhaigne et al. 1999, Gréhaigne et al. 2001). The model was eventually formally titled tactical-decision learning model (T-DLM) in the English literature by 2005 (Gréhaigne et al. 2005a, b).

In the student- and player-centered models mentioned above, a common characteristic is the use of student exchanges or discussion during the teaching/ learning process. Also, priority is given to game play in small-sided-game set-ups, along with tactical learning, technical skills being worked on as the need arises (see Stolz and Pill 2014, for an overview). The extent to which student questioning particular to each approach makes use of divergent questions stirring open-ended discussions among students (Pearson and Webb 2008) varies from one approach to another. Questioning from the teacher in relation with T-DLM, remains minimal, teammates' feedback on prior game play acting as implicit divergent questioning (Harvey et al. 2016).

Tactical-Decision Learning Model (T-DLM)

The Model in Short

As mentioned earlier, the use of a tactical approach as framework, along with the contribution of a not only cognitive but also constructivist perspective and their work on tactical knowledge in team sports, has led researchers, in the context of school physical education, to put forward T-DLM. The model focuses on the exploration by students of the various possibilities of game-play and on the construction of adequate responses in small-sided games (Figure 2).

Figure 2. *A Model for Students' Construction of Knowledge in Team Sports (T-DLM)*

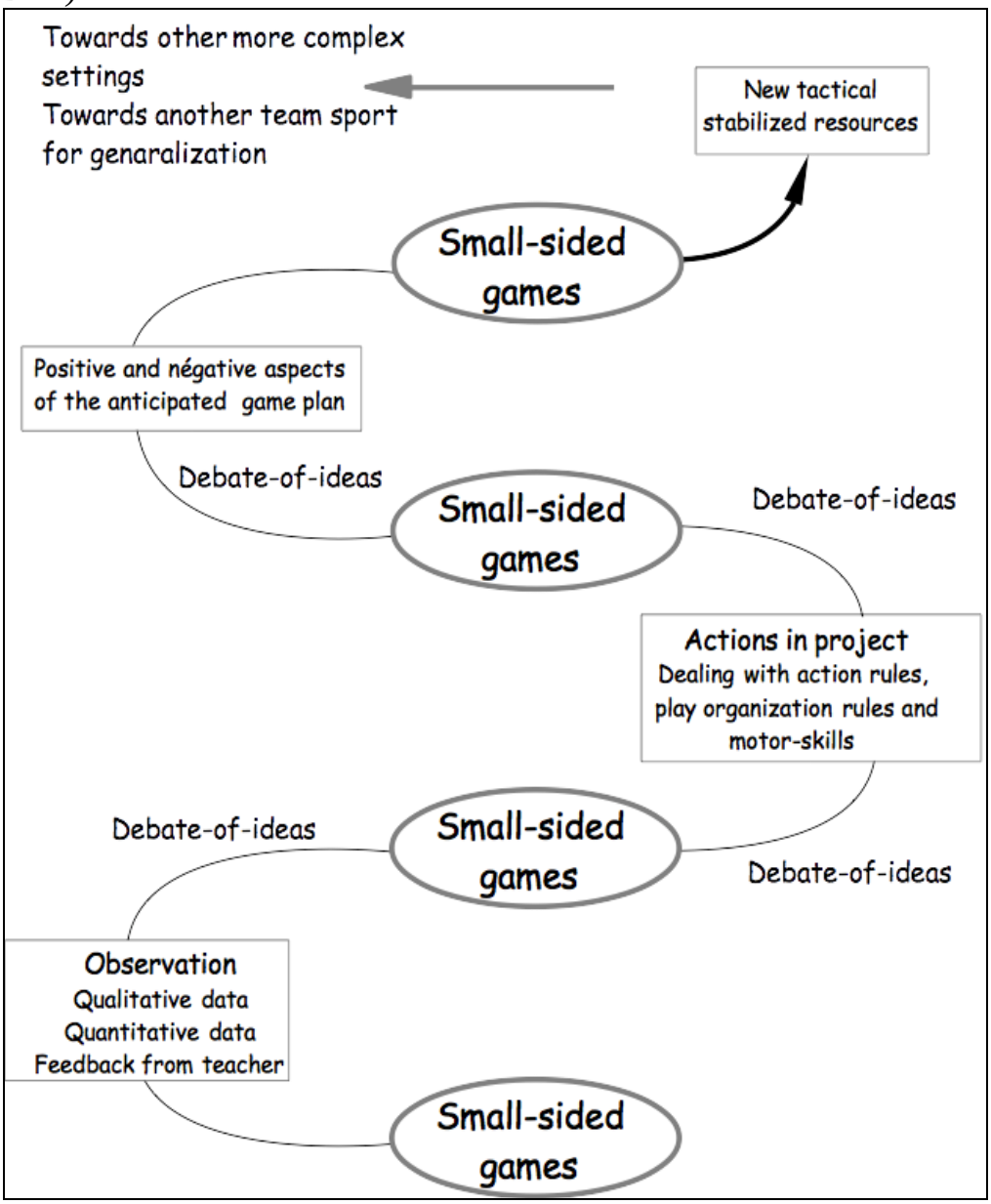


Figure 2 illustrates various steps which should enhance students' construction of tactical knowledge and the development of their decision-making skills. At the very onset of the learning sequence, students are put into action in some form of adaptation of the game, usually small-sided contests. For instance, a lesser number of players should simplify the configurations of play. However, the use of smaller play areas calls for some caution and should be balanced against the number of players involved since this may cause an increase in the time constraints, a limiting factor for decision making (Gréhaigne and Godbout 1998b). After appropriate student observation, feedback from teammate observers, and at times from the teacher, will complement the intrinsic feedback experienced by each player. A

debate of ideas follows in which each team puts together a first action project. This is then tried out in play. From one game-play session to another, students take turns as observers while remaining fully part of the collective discussion and decisions. Following observation, the team's success in implementing the game plan is assessed and proposals for a revision can be made. Should the need for working on technical skill(s) arise, students may elect to include technical pauses in their action project.

After a new exposure to play, students may perceive the emergence of constants for various aspects of the game. This in turn can lead to the development of a new action project with the introduction of connections between action rules, play organization rules (Gréhaigne and Godbout 1995), and required skills on the one hand, and the constants that have just been identified on the other. For instance, in soccer, students may notice that in the last games, their number of shots on goal has increased and stays higher, without a resulting increase in the number of successful shots (points). Given that, they can concentrate either on improving their kicking or shooting accuracy or on getting closer to the goal. After testing its new action project during additional game play (with concurrent student observation), each team may use the results of their teammate's observations to appreciate positive and negative aspects of their anticipated game plan. In doing so, players are progressively putting together tactical knowledge and refining their decision-making skills. However, students often need to acknowledge that their current solutions are not effective, which should bring them to re-conceptualize their answers and willingly engage in an effort to change their conceptual understanding of game and team play. The teacher may also reduce tasks constraints in a number of ways by reducing the number of players on the court (or the pitch), inserting a joker (support player) in game play (Nadeau et al. 2017), or modifying the equipment (e.g., less pressure in the ball). Once stabilization appears to be taking place, more complex learning settings may be introduced and, eventually, players may be exposed to another team sport to initiate a generalization process.

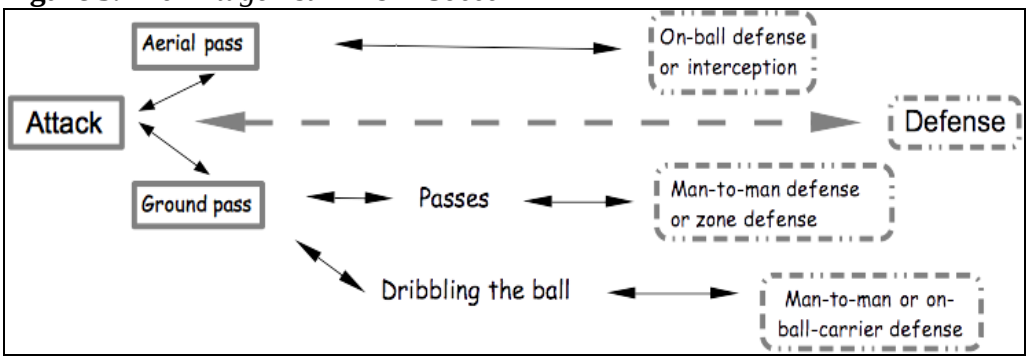
Essential aspects of a cognitive and, moreover, constructivist approach, such as effective problem setting, the integration of students' past knowledge, experience with new learning and a student-centered pedagogy, are central in T-DLM. As illustrated in Figure 2, it evolves from an initial exposure to the pedagogical content to a state of stabilized knowledge of that content but such a process requires time. Students' understanding of tactical game-play accumulates gradually leading to new knowledge that enhances prior cognitive resources (Ennis 2007).

Understanding the Internal Logic of Team Sports

Within team sports, a large part of understanding is based on the fact that players are either defenders or attackers with respect to possession of the ball as well as configurations of play. In invasion games, the logic of the play has its source in this opposition relationship that generates dynamic movements from one target to the other (Deleplace 1966, 1979, Gréhaigne 1989, Gréhaigne et al. 2010a).

The opposition relationship constitutes what is known as the *rapport de forces.* Gréhaigne et al. (1997) refer to "the antagonist links existing between several players or groups of players confronted by virtue of certain rules of a game that determine a pattern of interaction" (p. 516). Figure 3 illustrates the antagonist links in soccer.

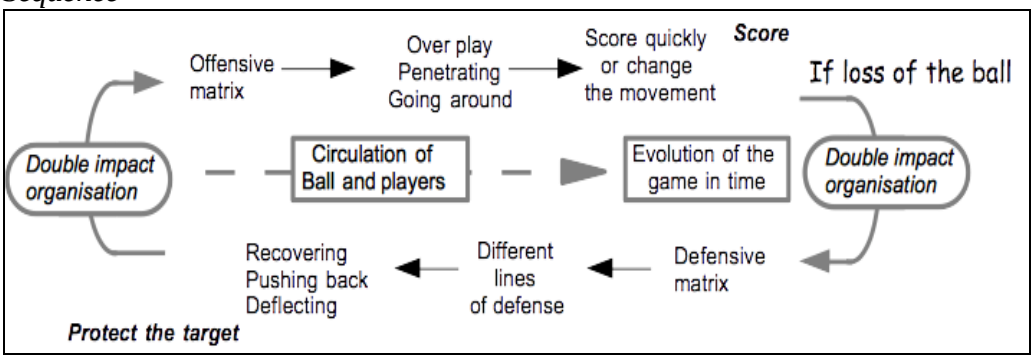
Figure 3. *The Antagonist Links in Soccer*



Gréhaigne et al. (1997, p. 501) wrote "The fundamental challenge in team sports could be stated as follows: in an opposition relationship while ensuring the defense of its own side, 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 score". The knowledge and the motor-skills that students need to learn are deeply connected with this conception of game-play. In this perspective, teachers or coaches should make provision for several-week long teaching sequences if true new resources are to be constructed by students because for many boys and girls who have participated in sport with little thought about the tactical nature of the game, a major restructuring or knowledge transformation is required to conceptualize games as tactical problems (Ennis 2007). Based on the findings of practical experimentation and empirical studies (Chang 2009, Nachon and Chang 2004, Zerai 2011), 10 to12-hour long teaching units appear to be the minimum necessary to see changes in tactical learning. Results from the Avalon project supported these findings and suggest that for tactical learning to occur, students need a minimal 10-hour long exposure to a student-centered approach (Gréhaigne et al. 2005a).

Figure 4 illustrates a model suitable for using with regards to students' challenges in game play (internal logic of team sports referred to above) and the ways students may proceed to solve them.

Figure 4. *Model to Analyze and Anticipate Game Play based on an Analysis of Configurations of Play in Soccer with Defense in Block at the Beginning of the Sequence*



Source: Gréhaigne et al. 2013.

The model illustrates potential attack and defense tactical behaviors with a defense in block (the most common situation in soccer). These represent the contribution of the subject-matter knowledge related to the reference social-practice (the fully developed sport). The notion of double-impact organization becomes very important for it emphasizes the immediacy of switching from attackers to defenders in case of ball loss; for their part, after regaining possession of the ball, defenders become attackers. Consequently, to ensure the continuity of game play there is always a part of defense in the attack and a part of attack in the defense (Gréhaigne et al. 1997). In other words, each player's basic challenge is cooperating with teammates in order to more effectively confront opponents either while attacking (keeping defense in mind) or while defending (keeping ready to counterattack) (Gréhaigne et al. 2001).

At the center of the figure, one finds critical elements of tactical knowledge for players. Awareness of the position and circulation of the ball and that of players (in term of configurations of play), awareness of game play (with regard to its evolution time-wise), and recognition of prototypic configurations of play (with their likely evolution) are key elements for players' understanding of the way game play unfolds. Although not a component of the logic of the sport in itself, students' knowledge of their team's competency network (particular strengths and weaknesses of each teammate) will also play its part in strategic and/or tactical decision making (Gréhaigne et al. 1999, Gréhaigne et al. 2004). Having the teacher draw students' attention on the various elements included in the model illustrated in Figure 4 provides, for the benefit of student-players, both affordances (facilitating information-tactics coupling) and external attentional focus (providing opportunities for successful action) (Chow 2013).

For the students to make it their own implies that the model be discussed and that students make it work. In so doing, they become aware of its areas of application and validity, rectify it or render it more complex through interactions by considering and testing consequences of new game experiments. Offensive and defensive matrices of play may be considered as advance organizers, each a frame of reference that helps players organize perceived information in view of responding more efficiently to problems brought about during game play

(Gréhaigne and Godbout 2014, p. 108). Rather than a series of isolated skills practiced in close-task contexts, matrices of play require cognitive analysis and domain-specific strategic thinking that assist students in considering the evolution of game play as a coherent endeavor. In relation with the notion of matrices of play, Ennis (2007) stated "certainly, implementing Gréhaigne's play configurations and modeling based on defensive and offensive matrices brings a welcome focus on cognitive conceptualization as a prerequisite to tactical success" (p. 21).

Student Content Knowledge in Team Sport

Concerning student learning, it is generally agreed that proper scaffolding of student game-play knowledge can improve its use (Zerai et al. 2013). Depending upon the teacher's approach to leaning, student knowledge may vary significantly. Table 1 gives examples of content knowledge related to a technical approach (on the left-hand side of the Table) as opposed to a tactical approach (on the right-hand side). A technical approach considers the technical requirements of the game as the central focus of what and how things are going to be taught. A typical lesson in this type of approach is made up of three phases: (1) a warm-up; (2) the learning of skills; and (3) a short game at the end the lesson. The overall process involves (a) reproducing predetermined forms of gestures (technique, skill) and strategies, (b) comparing expected models and actual productions, and (c) correcting wrong answers by feedbacks and memorizing through repetition.

Table 1. *Facets of Content Knowledge in a Technical vs a Tactical Approach*

Technical approach **Students repeating** **individual or collective patterns**	**Tactical approach** **Students making** **individual or collective choices**
Reconstructing skills in other situations or team sports	Applying what has been decided by the team
In different sequences of play, increasing the mastery of execution;	Constructing tactics and techniques in a situated context with opposition relationships
Practicing ready-made individual tactics	Reading and interpreting game play with tactics as a frame of reference
Memorizing schemata of play	Anticipating the sequences of events, planning plausible responses

By contrast, in a tactical approach the emphasis is on the tactical aspects of the game in relation to modified game situations (e.g., 3 vs 3, 4 vs 4). At the beginning of a lesson, the teacher sets up different learning situations presenting a tactical problem to the students. In this approach, offensive aspects of the game will be emphasized. The teacher guides the students in this process by helping them to get organized, read game configurations and decide on appropriate responses. The teacher then helps students regulate their learning. The overall process involves, (a) producing actively adapted solutions, (b) exploring action strategies, and (c) developing reflective practices connected with opposition

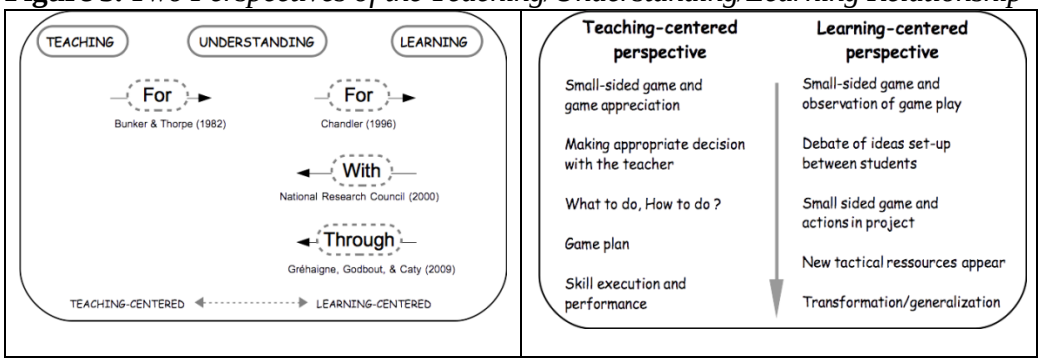
relationships in game plays. Behind the idea of students constructing conscious knowledge is the hypothesis that one can better use it and make better utilization of one's available resources.

The Teaching/Understanding/Learning Triad

Once the notions of student-centered approach and of tactical learning in team sports have been integrated, student understanding becomes an implicit, if not explicit corollary. In a student-centered teaching/learning process, understanding is a necessary cognitive catalyst. For that matter, any teaching approach, whether teacher-centered or student-centered, that aims at making students understand the reason for a given tactical or technical solution is cognitive.

The constructive perspective of tactical learning goes beyond and gives students the opportunity and responsibility to build their knowledge under the facilitating and learned guidance of their teacher. The left-hand side of Figure 5 illustrates the distinctions that have been used in the teaching/learning-related literature in relation with the notion of understanding. Bunker and Thorpe (1982) launched their now famous Teaching for Understanding, possibly taking learning for granted. Chandler (1996) wrote "TGFU is really a misnomer. As an approach it is student- and game-centered rather than teacher- and teaching centered. It would be better described as UFL-*Understanding for Learning*. We have too often seen teaching and learning as being thought of as synonymous or as having a direct cause and effect relationship" (p, 51). Although expressed differently, the US National Research Council (NRC) (2000) shared similar thoughts when using the phrase *learning with understanding* (p. 8). Unaware, at the time, of these viewpoints, Gréhaigne et al. (2009) elected to designate the student constructivist-learning experience as *learning through understanding*. Despite subtle distinctions, viewpoints expressed by Chandler, NRC, and Gréhaigne et al. are the same: far from being an end in itself, understanding is but a step toward learning

Figure 5. *Two Perspectives of the Teaching/Understanding/Learning Relationship*



Also illustrated in Figure 5, in the right-hand side box, are the parts devoted to the teaching-centered perspective (left hand side) and to the learning-centered perspective (right hand side) in a teaching/learning system focused on both understanding and learning. With a teaching-centered perspective, the teacher or

coach carefully assesses each step undertaken before and, if necessary, manipulates tasks constraints (Chow 2013, Tan et al. 2012) to further challenge learners. This is a crucial point for teachers or coaches; they must first identify the most important performance aspect that a student or a team needs to work on at any specific stage of their development and then adapt game rules accordingly. With a learning-centered perspective, at the end of the process with debates-of-ideas and a significant amount of practice, transformations imply not only the appearance of new answers to a given problem (answers in terms of improved motor skills or tactical behaviors) but also a stabilization of these answers for the student.

For new answers to be recognized as stabilized in game-play, they must meet three criteria: (a) regularity (reduction in the range of the answers and a stability of performance over successive trials); (b) durability (retention over an extended period of time), and (c) generalization (recognition of a similarity between several situations and the subsequent utilization and reorganization of previously learned action rules) (Gréhaigne and Godbout 1998b). The students' and teacher's engagement promote knowledge construction and transformation with a deepening understanding that remains essential for student engagement now and for a lifetime.

A Comment about Students' Motor Skills

A recurring comment on T-DLM is the little place it apparently leaves for students' motor-skill development. The model, like many other GBAs, has been developed in a student-centered perspective to enhance tactical learning. This was not developed for motor skills to be ignored. By the time students are exposed to team-sport learning in school, students are no longer novices with regard to motor ability, although their level may vary depending on individual past experiences. Modalities of student grouping for play sessions should help in this regard. One should also keep in mind the constructivist nature of T-DLM, meaning that through play sessions combined with concurrent student observation and following debates, students will become aware that the solution(s) to some observed problems reside(s) in taking technical pauses in their pursuit of tactical improvement. The model illustrated earlier in Figure 2 makes provision for such a possibility (see *Actions in project* box on the right-hand side of the figure). Most of the time, problems related to ball handling (dribbling, throwing, catching or receiving passes) will be reflected in the number of lost balls recorded by student observers (Gréhaigne and Godbout 1998a). Acting as a facilitator, the teacher may at times draw students' attention on the persistence of techniques-related game-play difficulties, suggesting possible remedies.

Analyzing Game Play

Team sports involving several teammates and opponents, they likely represent the most nonlinear subject-matter in the PE curriculum. While performing, each player has to deal with several teammates and take into account several opponents.

Moreover, invasion team sports bring in an additional challenge for players, forcing them to move back and forth across an offensive and a defensive territory, attackers becoming defenders, and defenders becoming attackers. Collaborative and opposition interactions between players, in relation with the position of the ball (or the puck) and the target, create an endless variety of temporary player distributions on the playing area. With regard to the modelling of such distributions, one may consider the notions of effective (occupied) play-space (EP-S) and configuration of play.

Effective Play-Space and Configurations of Play: Reference Tools for Students' Analysis

With respect to invasion games, Mérand (1977) has developed the notion of EP-S, which is defined as the polygonal area that one obtains by drawing a line that links all involved players located at the periphery of the play at a given instant (Gréhaigne et al. 2005a, Gréhaigne et al. 2010b). At a given moment during game play, the EP-S, as a geometric figure, may be located anywhere on the play area with respect to the direction of attack: in the defensive zone, at the center of the play area, in the offensive zone. One may also choose to consider separately the distribution of both teams, thus creating an offensive EP-S and a defensive EP-S. The particular positioning of all players with respect to the ball is called the "configuration of play". Finally, the particular location of the ball inside the EP-S will be designated as being at the rear, in the middle, or at the front of EP-S.

Problems with analysis of performance in team sports in a context of small-sided games 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 opposition relationship plays an important role and it may vary in different opposition situations or even during one given situation and (c) the members of a given team are interdependent. Analyses of game-play may focus on the evolution of game play with respect to players' location, direction of movements and speed of movement, given momentary configurations of play (Gréhaigne and Godbout 2012, Mérand 1977). Consequently, efficiency during game-play has nothing to do with a series of dissociated behaviors. It relies on action rules and play-organization rules (Gréhaigne and Godbout 1995) that regulate strategic and tactical choices. It also relies, as we have seen earlier, on each player's knowledge of the competency network that prevails in his/her team and in the opposing team. The existence of the rules mentioned above appears to be confirmed by the fact that the students can adapt to many configurations of play and, eventually, state the rule or rules on which problem solving was based.

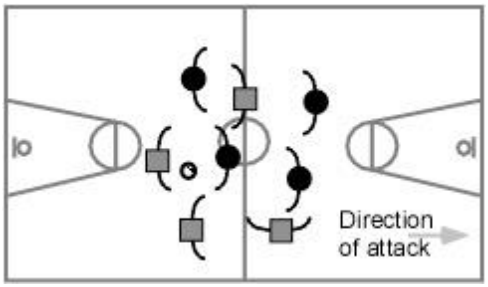
Coming back to play efficiency, one might say that tactical efficiency is the capacity to produce many tactical behaviors in response to infinite new configurations of play. Most of the time during the game, players can foresee only probabilities of evolution for the attack and defense configurations. Nevertheless, in these configurations of play, it is possible to extract configurations of play often used by players. Gréhaigne and his collaborators have called these configurations

prototypical configurations in the sense that they represent an original model, archetype of a model that reproduces itself on a more or less regular basis in different team sports (Gréhaigne et al. 2010b, see also Nadeau et al. 2017, 31, for a discussion on *attractor state* and *attractive configurations of play*).

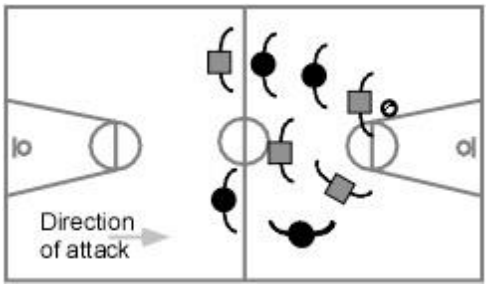
Figure 6 presents a few examples of prototypical configurations of play that allow students to develop the ability to make appropriate decisions and undertake actions accordingly. A game rarely rests upon the simple application of tactical combinations learned previously during training, hence the importance of tactical knowledge at a player's disposal in order to analyze and solve game-play problems more rapidly and efficiently (Gréhaigne 2007). The teacher's and students' challenge is for the latter to (a) come to grasp the notions of configuration of play and prototypical configurations of play, (b) become aware of the recurrence of given prototypical configurations of play, (c) recognize them when they occur during game play, and (d) strategically act according to action rules previously agreed upon or tactically react to an unexpected evolution of the configuration of play.

For the sake of our illustration, player-drawing sizes are enlarged, with respect to the dimension of the play area. In each figure, the drawing of the play area serves the purpose of a background whereas the drawing of the players represents an abstraction of a configuration of play. The same principle will apply in Figures 7 and 8.

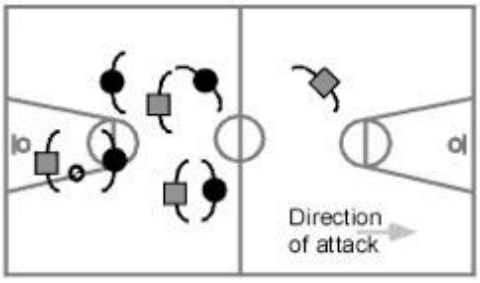
Figure 6. *Six Different Prototypical Configurations of Play for the Students to Learn or to Remember*



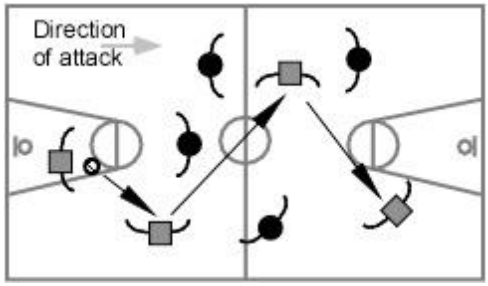
a. Attack with Ball at the Rear of EP-S. Defense is Retreating



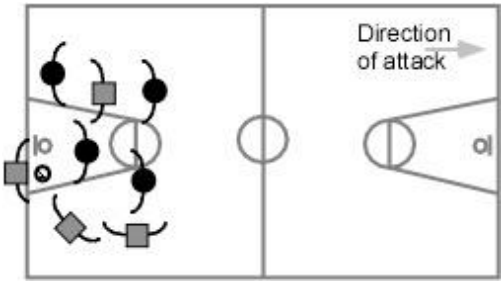
b. Attack with Ball at the Front of EP-S. Defense is in Pursuit



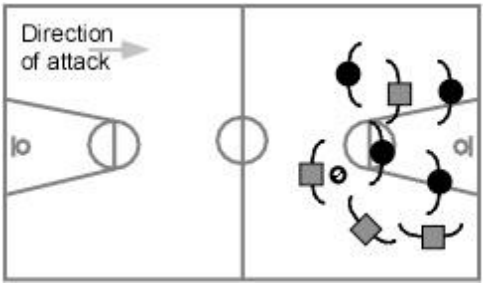
c. Counterattack Configuration



d. Play in Movement: Passes without Dribble (One-Touch Passing)



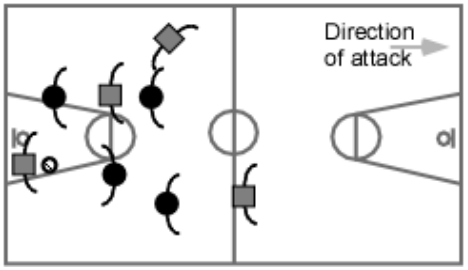
e. Restarting the Game with Beginners and Effective (Occupied) Play-Space



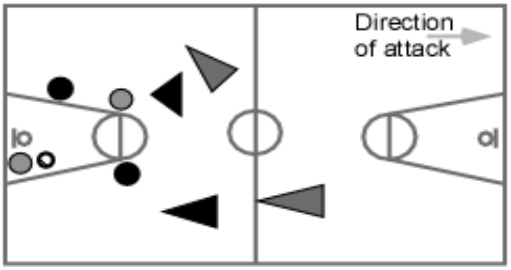
f. Attack of Position (Besieging)

Configurations of play may be interpreted from a dynamic point of view, considering first a temporary static look at a moment T0, as illustrated in Figure 7a below and then its look at moment T+1 when four players have started moving. Besides location of the ball and the players at a given instant, awareness of speed and direction of movements is a powerful assistance for anticipation and decision making.

Figure 7. *Illustration of Dynamic States in Configurations of Play*



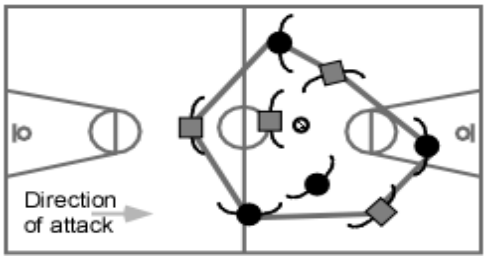
a. Dynamic State at T0



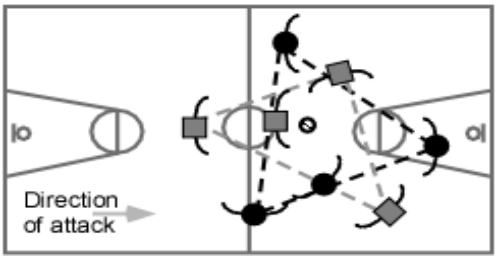
b. Dynamic State at T+1

We have mentioned earlier that EP-S, although considering all players involved in the action, may be viewed as being composed of two distinct geometrical figures, the offensive EP-S and the defensive EP-S, as illustrated in Figure 8a and b. This distinction may help students better appreciate their respective positioning, particularly in a man-to-man defensive strategy.

Figure 8. *Effective (Occupied) Play-Spaces with Respect to Offense and Defense*



a. The Effective (Occupied) Play-Space



b. Offensive Effective Play-Space and Defensive Effective Play-Space

Drawing students' attention on the size of EP-Ss may also enhance understanding of action rules (for instance, moving away from the opponents, in the intervals, or behind the opponents (Gréhaigne and Godbout 1995). Awareness of EP-S expansion (player dispersion) and contraction (player concentration) (Gréhaigne et al. 2010a) will help students understand that the closer team members aggregate, the harder for them it is to create passing opportunities and the easier it gets for opponents to intercept passes. Inversely, the more players disperse, expanding the EP-S, the more chances they have to get passes and move the ball rapidly. Action projects that favor dispersion will often result in having students include, in the project, practice sessions with regard to passing and receiving.

Observation tools illustrated in Figures 6, 7, and 8 make it possible to describe the dynamics of game-play and better understand, at a given moment, how players are moving. Everyone has a position but this position is changing because all players have a different instant speed. Thus, the evolution of the dynamic system can only be modeled by designing a discontinuous evolution in time. It seems that linking five criteria (EP-S field location; ball position and circulation; offensive effective play-space and defensive effective play-space positions; defense in block or in pursuit) provides an immediate representation of the opposition relationship (Gréhaigne et al. 2005a).

Prototypical Configurations of Play and Action Rules

Gréhaigne and Godbout (1995) define action rules as conditions to be enforced and elements to be taken into account if one wants to insure efficient action (p. 496). Such rules are basic to tactical knowledge about the game and their use, whether isolated or in connection with other rules, provides an answer to a given problem. Play organization rules (Gréhaigne and Godbout 1995) cover a certain number of themes related to:

- the logic of the activity (adopting a given system of play, taking into account the opposition relationships);
- the dimensions of the play area;
- the distribution of players on the field (assigning an optimal position on the field for each player);
- a differentiation of roles (assigning particular roles and tasks within the team).

These rules also cover a few simple organization principles which may facilitate the elaboration of a strategy (Gréhaigne et al. 2005a, b). We present below examples of action and play organization rules (see Figures 9 and 10) in connection with the state of the opposition relationship, the location of the ball, and the effective play-space. We shall consider that student, after having been exposed to situations illustrated below, have truly learned if, faced with a problem which is new but compatible with the resources at their disposal, they have

transformed their initial behavior and have identified and verbalized the action and/or play organization rules that made their success possible. When mentioning resources at the students' disposal, we mean tactical, motor and physical inner resources that are inherent and/or previously learned.

Situations illustrated in Figures 9 and 10 represent again abstractions of configurations of play. For the sake of generalization to different invasion team-sport (e.g., soccer, basketball, ice hockey, handball), particular features of play areas have been deleted. Direction of attack is always from left to right in both figures. In both figures, attackers are represented by grey squares and defenders by black circles. A possible adaptation of game play rules might be to have size-reduced goals without a goalkeeper; this would motivate attackers to move closer to take a shot at goal, putting even more focus on the application of appropriate action rules. The ball is always directly in front of the attacker in possession.

Figure 9. *Different Configurations with Locations of the Ball in the Middle of EP-S*

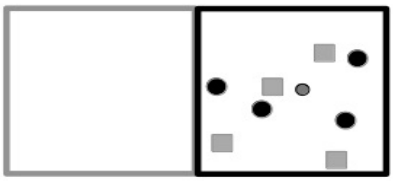
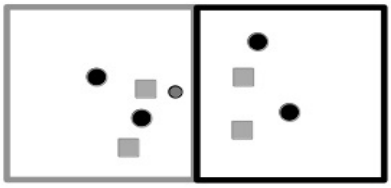
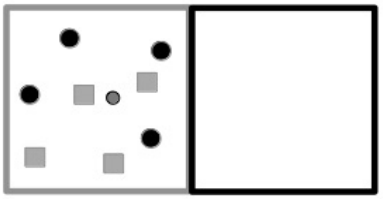
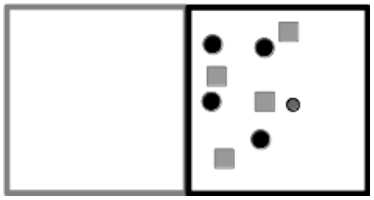
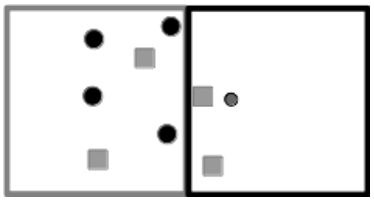
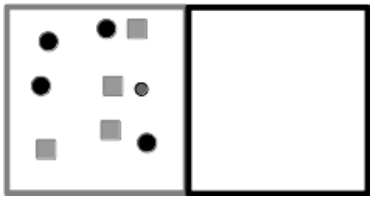
Attack (grey squares) EP-S location …	**Location of the ball in the attack: ball is in the middle of EP-S in balanced confrontation**	**Offensive actions and/or play organization rules to be constructed**
a. a. In the attackers' offensive area		- I pass the ball to a forward partner. - I let the ball move through a one touch play. - I try to shoot at goal.
b. b. In the middle of the field		- I pass the ball to a forward partner. - I try to keep the advance taken. - I dribble the ball in the offensive area.
c. c. In the attackers' defensive area		- I pass the ball to a forward partner. - I let the ball move through a one touch play. - I try to bring the ball ahead of the EP-S.

Figure 10. *Different Configurations with Defense in Pursuit*

Defense (black circles) in pursuit EP-S location …	**Location of the ball in the attack: ball is at the front of EP-S**	**Defensive actions and/or play organization rules to be constructed**
a. a. In the attackers' offensive area		- I try to prevent the shot on goal. - I try to block the attacker in order to force him/her off center. - I delay as long as possible the shot on goal or a decisive pass from one of the two partners.
b. b. In the middle of the field		- I move back swiftly between the ball and the target since there is still room for defense. - I put pressure on the attacker in order to provoke a mistake or a mishandling.
c. c. In the attackers' defensive area		- I move back between the ball and the target since there is a long distance to cover. - I delay the decision and force the attacker to make a wrong choice due to precipitation. - Stepping back /laying.

The configurations of play illustrated above, although momentary, are commonplace in 4 vs 4 games. They represent instant photos of game play, exposing, through their unfolding, the tactical organization agreed upon by the team (Gréhaigne et al. 2007).

Conclusion

Based on the evolution of pedagogical theoretical choices and practices in France over the last 50 years, PE teacher educators, practitioners, and researchers in the didactics of team sports have developed a student-centered teaching approach that favors situated learning and the use of small-sided games. Student understanding of action and play organization rules, through experimentation, student observation, and related student debates of ideas, is viewed as a necessary step toward learning. Throughout the learning process, students are challenged to collectively plan action projects, implement them in game play situations, and conclude as to their level of success or failure, going through several iterations of the process until stabilization of their acquired knowledge. This learning process unfolds under the teacher's learned and facilitating guidance. T-DLM, the underlying model discussed in this paper, enhances tactical learning, provided that the teaching/learning unit lasts a minimal number of 10–12 hours.

References

Amade-Escot C (2000) The contribution of two research programs on teaching content: "Pedagogical Content Knowledge" & "Didactics of Physical Education". *Journal of Teaching Physical Education* 20(1): 78–101.

Bouthier D (1984) *Sports collectifs: contribution à l'analyse de l'activité et éléments pour une formation tactique essentielle. L'exemple du rugby.* (Team sports: contribution to the analysis of activity and elements for an essential tactical education). Unpublished Master's Thesis. Paris, France: INSEP.

Bouthier D (1988) Les conditions cognitives de la formation d'actions sportives collectives. (Cognitive conditions for organizing actions in team sports). Unpublished Doctoral Dissertation. Paris, France: Université Paris V.

Bunker D, Thorpe R (1982) A model for the teaching of games in the secondary schools. *The Bulletin of Physical Education* 18(1): 5–8.

Chandler T (1996) Teaching games for understanding - Reflections and further questions. *Journal of Physical Education, Recreation & Dance* 67(4): 49–51.

Chang C-W (2009) *Langage, pensée et action: approche sémio-constructiviste des apprentissages du jeu en basket-ball chez l'élève de CM2 (5ième grade)*. (Language, thought and action: semio-constructivist approach to basketball game-play learning with 5th grade pupils). Unpublished Doctoral Dissertation. Besançon, France: University of Franche-Comté.

Chow JY (2013) Nonlinear learning underpinning pedagogy: evidence, challenges, and implications. *Quest* 65(4): 469–484.

Deleplace R (1966) *Le rugby.* (Rugby Union). Paris: Colin-Bourrelier.

Deleplace R (1979) *Rugby de mouvement - Rugby total.* (Rugby in movement - Total rugby). Paris, France: Éducation Physique et Sport.

Deriaz D, Poussin B, Gréhaigne J-F (1998) Le débat d'idées. (The debate of ideas). *Éducation Physique et Sport* 273: 80–82.

Ennis CD (2007) Curricular coherence: a key to effective physical activity programs. In P Heikinaro-Johansson, R Telama, E McEvoy (eds.), *AIESEP World Congress 2006 Proceedings: The Role of Physical Education in Promoting Physical Activity and Health*, 10–25. Jyväskylä, Finland: Department of Sport Sciences, University of Jyvaskyla.

Frantz P (1975) *Le football.* (Soccer). Mulhouse, France: L'Alsace.

Gréhaigne J-F (1989) *Football de mouvement. Vers une approche systémique du jeu.* (Soccer in movement. Towards a systemic approach of the game). Unpublished Doctoral Dissertation. Dijon, France: Université de Bourgogne.

Gréhaigne J-F (ed.) (2007) *Configurations du jeu, débat d'idées et apprentissage des sports collectifs.* (Configurations of play, debate-of-ideas and learning of team sports). Besançon, France: Presses de l'Université de Franche-Comté.

Gréhaigne J-F, Guillon R (1991). Du bon usage des règles d'action. (Making good use of action rules). *Échanges et Controverses* 4: 43–66. Paris, France: APECC.

Gréhaigne J-F, Godbout P (1995) Tactical knowledge in team sports from a constructivist and perspective. *Quest* 47(4): 490–505.

Gréghaigne J-F, Godbout P (1998a) Formative assessment in a tactical approach context. *Journal of Physical Education, Recreation & Dance* 69(1): 46–51.

Gréhaigne J-F, Godbout P (1998b) Observation, critical thinking and transformation: three key elements for a constructivist perspective of the learning process in team sports. In R Feingold, R Rees, G Barrette, L Fiorentino, S Virgilio, E Kowalski (eds.), *Education for Life*, 109–118. New-York, USA: Adelphi University.

Gréhaigne J-F, Godbout P (2012) À propos de la dynamique du jeu … en football et autres sports collectifs. (About the dynamics of game play… in soccer and other team sports). *eJournal de la Recherche sur l' Intervention en Éducation Physique et Sport* 26(Apr): 130–156.

Gréhaigne J-F, P Godbout (2014) Dynamic systems theory and team sport coaching. *Quest* 66(1): 96–116.

Gréhaigne J-F, Billard M, Guillon R, Roche J (1988) Vers une autre conception de l'enseignement des sports collectifs. (Towards another view of the teaching of team sports). In G Bui-Xuan (ed.), *Méthodologie et Didactique de l'Éducation Physique et Sportive,* 155–172. Clermont-Ferrand, France: AFRAPS.

Gréhaigne J-F, Godbout P, Bouthier D (1997) Performance assessment in team sport. *Journal of Teaching in Physical Education* 16(4): 500–516.

Gréhaigne J-F, Godbout P, Bouthier D (1999) The foundations of tactics and strategy in team sports. *Journal of Teaching in Physical Education* 18(2): 159–174.

Gréhaigne J-F, Godbout P, Bouthier D (2001) The teaching and learning of decision making in team sports. *Quest* 53(1): 59–76.

Gréhaigne J-F, Caty D, Marle P (2004) L'apport de la notion de configuration du jeu à la didactique des sports collectifs. (The contribution of the notion of configuration of play to the didactics of team sports). In G Carlier (ed.), *Si l'on Parlait du Plaisir d'Enseigner l' Éducation Physique*, 167–179). Montpellier, France: AFRAPS.

Gréhaigne J-F, Richard J-F, Griffin L (2005a) *Teaching and learning team sports and games*. New York, USA: Routledge Falmer.

Gréhaigne J-F, Wallian N, Godbout P (2005b) Tactical-decision learning model and student' practices. *Physical Education & Sport Pedagogy* 10(3): 255–269.

Gréhaigne J-F, Caty D, Marle P (2007) Étude systématique de différentes configurations du jeu dans les jeux réduits. (Systematic study of various configurations of play in small-sided games). In J-F Gréhaigne (ed.), *Configuration du Jeu. Débats d'Idées & Apprentissage du Football et des Sports Collectifs*, 43–60. Besançon, France: Presses de l'Université de Franche-Comté.

Gréhaigne J-F, Godbout P, Caty D (2009) Learning games through understanding: new jobs for students! *International Journal of Physical Education* 46(4): 30–38.

Gréhaigne J-F, Godbout P, Zerai Z (2010a) Using complex system analysis to model team ball sports. *International Journal of Physical Education* 47(4): 28–40.

Gréhaigne J-F, Caty D, Godbout P (2010b) Modelling ball circulation in invasion team sports: a way to promote learning games through understanding. *Physical Education and Sport Pedagogy* 15(3): 257–270.

Griffin L, Butler J (eds.) (2005) *Teaching games for understanding: theory, research and practice*. Champaign, IL: Human Kinetics.

Griffin LL, Mitchell SA, Oslin JL (1997) *Teaching sport concepts and skills: a tactical games approach*. Champaign, IL: Human Kinetics.

Harvey S, Cope E, Jones R (2016) Developing questioning in game-centered approaches. *Journal of Physical Education, Recreation & Dance* 87(3): 28–35.

Harvey S, Jarrett K (2014) A review of the game-centered approaches to teaching and coaching literature since 2006. *Physical Education and Sport Pedagogy* 19(3): 278–300.

Light R (2004) Australian coaches' experiences of Game Sense: opportunities and challenges. *Physical Education and Sport Pedagogy* 9(2): 115–132.

Mahlo F (1965) Theoretische Probleme der taktischen: Ausbildung in den sportspielen. (Theoretical problem of tactics: training in sports games). *Theorie und Praxis der Körperkultur* 14(9): 809–816.

Mahlo F (1969) *Acte tactique en jeu*. (Tactical action in play). Paris, France: Vigot.

Marsenach J, Druenne F (1974) *Volley-ball. Mémento CPS FSGT.* Paris, France: Armand Colin-Bourrelier.

Menaut A (1982) *Contribution à une approche théorique des jeux sportifs collectifs* (Contribution to a theoretical approach for team-sport games). Unpublished Doctoral Dissertation. Bordeaux, France: Université de Bordeaux 2.

Mérand R (1974) Maurice Baquet: rénovation de l'éducation physique et innovation pédagogique. (Maurice Baquet: renovation of physical education and pedagogical innovation). *Revue Éducation Physique et Sports* 127(May–Jun): 33–38.

Mérand R (1977) *L'éducateur face à la haute performance.* (The educator faced with high performance). Paris: Sport et Plein air.

Nachon M, Chang CW (2004) Interactions verbales entre les élèves et projet d'action en basket-ball en classe de troisième. (Student verbal interactions and action projects in basketball with high school students). *eJournal de la Recherche sur l'Intervention en Éducation Physique et Sport* 5: 15–36.

Nadeau L, Gréhaigne J-F, Godbout P (2017) Developing tactical knowledge with the help of support players: an illustration in ice hockey. *International Journal of Physical Education* 54(1): 22–33.

Pearson PJ, Webb P (2008) Developing effective questioning in Teaching Games for Understanding (TGfU). Paper Presented at the *1st Asia Pacific Sport in Education Conference: Ngunyawaiendi Yerthoappendi Play to Educate, Adelaide*.

Siedentop D (2002) Sport education: a retrospective. *Journal of Teaching in Physical Education* 21(4): 409–418.

Stolz S, Pill S (2014) Teaching games and sport for understanding: exploring and reconsidering its relevance in physical education. *European Physical Education Review* 20(1): 36–71.

Tan CWK, Chow J-Y, Davids K (2012) How does TGfU work? Examining the relationship between learning design in TGfU and a nonlinear pedagogy. *Physical Education and Sport Pedagogy* 17(4): 331–348.

Teodorescu L (1965) Principes pour l'étude de la tactique commune aux jeux sportifs collectifs. (Principles for to the study of common tactics in team sports). *Revue de la Société d'Informations et d'Études Pédagogiques de l'Éducation Physique et Sportive* 3: 29–40.

Teodorescu L (2013) Principes pour l' étude de la tactique commune aux jeux sportifs collectifs et leur corrélation avec la préparation tactique des équipes et des joueurs. (Principles for to the study of common tactics in team sports and their correlation with the tactical preparation of teams and players). *eJournal de la Recherche sur l'Intervention en Éducation Physique et Sport,* 28: 99–117.

US National Research Council (2000) *How people learna: brain, mind, experience, and school: expanded edition.* Washington, DC: The National Academies Press.

Vandevelde M (2007) *Repères chronologiques sur le parcours professionnel et militant de Robert Mérand.* (Chronological landmarks on Robert Mérand's professional and liberal career). Paris, France: Éditions Syllepse.

Zerai Z (2011) *Apprentissage du handball chez les jeunes filles Tunisiennes et Françaises; apport de la verbalisation.* (Learning in handball for French and Tunisian young girls: input of verbalization). Unpublished Doctoral Dissertation. Besançon, France: Université de Franche-Comté.

Zerai Z, Gréhaigne J-F, Godbout P (2013) Configurations of play in invasion team sports and learning by analogy. *International Journal of Physical Education* 50(1): 18–28.

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Home Court Advantage in Basketball – A Case Study of Žalgiris Kaunas Basketball Team

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The actual venue where a basketball game is played needs to be considered (Volossovitch 2017) when looking at the effectiveness of a team's performance playing in front of home crowd. Clarke (2005), Gomez and Pollard (2011) and Bray and Widmeyer (2008) explored the home court advantage topic and argued that this exists and is influenced by various factors (such as familiarity with environment, crowd support and loud arena, shooting percentages, absence of travel, etc.). A top division professional basketball team from Lithuania (Žalgiris Kaunas) was selected for this study using a convenience sample method (Veal and Darcy 2014). A case study approach (which incorporated comparisons between and an analysis of certain statistical categories such as: points scored per game; points allowed per game; free throws – made and attempted per game; 3 points shots – made and attempted; assists and turnovers) were used as part of this investigation into Žalgiris Kaunas basketball team and the games they played at home during 2017–2018 and 2018–2019 seasons. From a methodological point of view, a three stage approach was employed. First stage was an exploratory analysis of relevant data available in the public domain for the selected team /club. Second stage comprised of an initial analysis that consisted of statistical calculations (averages per game and per season) and comparisons between Žalgiris Kaunas and their opponents while a discussion and concluding analysis – as a third stage – was drawn by interpretation of data. Similar to findings from literature, playing at home in front of full capacity crowd was beneficial for Žalgiris Kaunas as their performances improved for the statistical categories previously mentioned, alongside with being victorious in 11 out of the 19 home games that were scrutinised for the purpose of the research.

Keywords: *home court advantage, basketball performance indicators, basketball analytics, attendance, Žalgiris Kaunas*

Introduction

"The home advantage in sports is real" (p. 351) argues Smith (2005). However, the causes are not yet fully known (Yi 2017). Since 1977, when one of the first articles discussed the home advantage topic in the context of team sports (see Schwartz and Barsky 1977), the literature in this field has grown substantially and received lots of attention from both the academic world, players, fans and mass media alike. As a well-established phenomenon (Yi 2017, Koning 2011) and "intriguing phenomenon" (Gomez and Pollard 2011, p. 143), home advantage has

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been the topic for numerous researchers who scrutinised and who tried to explain if the team (or the athlete) playing at home benefits of any kind of advantage. Watkins (2013) asserts the acceptance from both players and their fans that in majority of sporting events a "systematic advantage does exist for the home team" (p. 34). Specifically for basketball, the home court advantage is visible for Kozy (2011) as in any other sport and his investigation proposed a model using a mathematical approach. Furthermore, playing at home brings an advantage of 4.68 ± 0.28 points as estimated by Harville and Smith (1994). Basketball as a sport is amongst the few sports that actually allow one team to play more games on own court – this is the case in competitions such as NBA or Euroleague when the teams qualify for the play-off stage (the higher placed team out of the top eight finishers at the end of the regular season has the advantage of playing on home court in the decisive game in best out of 3, out of 5 or best out of 7 series).

This paper intends to contribute to this body of knowledge and, by using a case study approach (by specifically looking at home court attendances of Žalgiris Kaunas basketball team and at statistical data from these particular games played at home in the Euroleague competition) to assess the impact that home crowd support has on the performance of the team (with data collected and interpreted for 2017–2018 and 2018–2019 seasons) in respect of winning and losing games. The specific statistical information relates to game-relevant categories such as: points per game (scored and allowed); free throws (made and attempted); 3 points (made and attempted); number of assists; and number of turnovers; for both the home team (Žalgiris Kaunas) and their opponents.

The paper is structured in an easy to follow manner. The first section will outline relevant literature review; it will start with an overview of research pertaining to the various factors of home court/field advantage in sports. More specific and, in particular, relevant factors to this study, such as the impact of basketball arena to the performance of home team, will be summarized as well. A brief overview of the origins as well as the contemporary status of sports analytics will be presented towards the end of section one, followed by a paragraph designated for the demonstration of the latest research in basketball analytics.

The second section of this article contains the research methods (and generally, the methodological approach which was undertaken), while the third section is devoted to the research findings and a discussion, taking into account the existing opinions expressed by various researchers (in both European and North American basketball context). The final section of this paper provides conclusions. As it will be illustrated, the main findings support the idea of home court advantage in basketball. Analytic analysis of this research showed that the capacity or near capacity crowd led to home team's increased efficiency, which in turn led to more wins (for the particular team that was investigated).

Literature Review

Definition/Various Factors that Impact on and Explanations of Home Court Advantage

Clarke (2005) mentions Pollard's definition (1986) who argued that home advantage can be measured by looking at the number of games won by teams playing on home court and expressing it as a percentage of all the games played. In his study based on Australian rules football, Clarke (2005) found that 80% of matches he investigated "carried a perceived home advantage" (p. 378). Coincidentally, Koning defined the home advantage concept in the same year (2005) and stated that "home advantage is the performance advantage of an athlete, team or country when they compete at a home ground compared to their performance under similar conditions at an away ground" (p. 422).

Several factors and explanations were identified as having an impact on and contributing to teams and players obtaining home advantage: home crowd, familiarity, travel (Courneya and Carron 1992); the style of play (Harris and Roebber 2019, based on their study on NBA teams); crowd support, familiarity with local circumstances, fatigue (or the lack of it) and specific rules that favour either the home or away team (Koning 2011); learning factors, travel and crowd factors including the support from the home crowd and even referee bias (Clarke 2005).

Smith (2005) also identifies the fans as being "partly responsible for producing any success" for the home team (p. 356) and he also adds officials, territoriality and psychological state on the list of contributors to home advantage. Additionally, Yi (2017) argues that teams tend to play in a more aggressive manner when playing at home.

Research in Basketball – Specific Examples

Jones (2018) argues that the advantage in basketball exists in the college game as well as in the NBA. Similar situation was proved for European basketball - the results from a study conducted by Gomez and Pollard (2011) confirmed "the existence of home advantage effect" (p. 143) after investigating seven professional basketball leagues in Europe; and came to reinforce similar findings from their previous study in 2007.

Bray and Widmeyer (2008) investigated Canadian basketball at women's intercollegiate level in an attempt to explore athletes' perceptions of the home advantage. Amongst their findings was that the greatest influences on performance of the team were familiarity of /with the home court and home crowd support, alongside with the athletes' belief that "there was a substantial home advantage in their league of greater than 60%" (p. 7). A very similar home winning percentage (60.9%) was presented by Madrigal and James (1999) after their investigation on women's college basketball in North America. Furthermore, a 64.4% home winning percentage for men and 54.4% for women was the finding of a study in which Moore and Brylinsky (1995) analysed the home advantage in collegiate

basketball in the Mid-American Conference in USA. Additional findings support these figures/percentages with different research showing that home teams win on average more games, ranging from 50% (Courneya and Carron 1992, Nevill and Holder 1999) to 66% (Snyder and Purdy 1985) of games are won by home teams.

Other studies looked at the rest between road games for visiting teams in order to find out if there is any correlation – for example, Entine and Small (2008) discovered that rest (and the impact of fatigue) positively related to both the size of the average margin of victory for home teams and the percentage of games won by home teams. Same authors argue that NBA, as a league, has the largest home advantage of any of the major team sports leagues considering the games they investigated during 2004–2005 and 2005–2006 seasons. The following paragraph will delve into the specifics of home arena and its impact on home team performance.

Loud Arena

The idea of playing in a "loud arena" or in a "difficult place for road teams" (p. 357) was highlighted by Smith in his study in 2005 when he scrutinised fans views in the North American basketball context. Other authors seem to agree by saying that difficult venues and the home crowd "stun the visitors" (Pomeroy, 2012), daunts and disheartens the away players (Jones 2013); while it energises the home team (Pomeroy 2012) and motivates and inspires the home players (Jones 2013). The crowd, as stated by Jones (2013), is the 6th man in basketball (or, using an example from another sport, the 12th man in American football).

McAndrew (1992) adds that the noise created by the home crowd at inopportune moments during the game might disrupt the communication between away team players and it might distract and impair certain aspects of their performance, affecting in this way the overall team performance. On a same note, Garcia et al. (2015) discovered that an increase on game attendance had a direct effect in the number of victories obtained by the home teams (in their study based on NBA teams between 2007–2013 during the regular seasons).

Since moving to a new arena (Žalgirio Arena), Žalgiris Kaunas basketball team' supporters managed to create a supportive atmosphere for their team, determining Eurohoops to consider it the toughest arena to play at after surveying 67 Euroleague players (and getting 40% of the votes) (Žalgiris Kaunas 2019, Eurohoops.net 2019). Real Madrid Head Coach Pablo Lasso agreed when discussing playing in this arena before one of his games: "it is a difficult place to go and play and the atmosphere can be intense, their fans really get behind them" (Real Madrid 2019).

Within this large and the most spacious venue in the Baltic countries (Zalgirioarena.lt 2011), passionate and knowledgeable fans produce an intimidating atmosphere which is "often hailed as one of the top in Europe" (Talkbasket.net 2019). The team moved from Kauno Sporto Halle and started playing their home games at Žalgirio Arena. Since 18th August 2011 when it opened its doors (Talkbasket.net 2019), numerous games were sold out with people from all over Lithuania and beyond filling all the 15415 seats available

(Zalgirioarena.lt 2020). Interestingly, a statistic published by Runrepeat.com (2019) shows that 5% of Kaunas population is going to the Arena for every game to support and follow the team. This level of support leads to another attention-grabbing fact: 95% of the arena is filled with fans every single game and because of this Žalgiris Kaunas basketball club joins Maccabi Tel Aviv as the leaders of the Euroleague basketball competition in this particular category (fans attendance) (Runrepeat.com 2019).

The following sub-section will present an overview of sports analytics. It will first provide an insight into the origins of this field as well as its rather sudden proliferation over the past few decades. Finally, more specific examples of research in the basketball analytics domain and their relevance to the current study will be discussed and presented.

Sports Analytics

Sports analytics is a rapidly growing industry. It refers to the use of data and advanced statistics to measure performance and make informed decisions, in order to gain a competitive sports advantage. The use of sports analytics is designed to improve player and game performance, enhance organization's business performance and analyze player health and injury probability. However, in the future the scope of sports analytics reach will only broaden as "sports analytics can be used in innumerable types, such as social engagement, performance biomechanics analysis, psychological and physical metrics and the aforementioned critical analysis of advanced sports statistics so that technical staff and domain experts can understand more the game and improve the processes and methodologies" (Sarlis and Tjortjis 2020, p. 17).

With an immediate popularity of bestselling book *Moneyball* (Lewis 2003), baseball was the first sport to seriously incorporate the usage of advanced statistics. And such antecedence was to no surprise because baseball is the easiest team sport to model with mathematics. The game can be reasonably partitioned into a series of discrete events and the contributing players in each event can be easily identified and isolated. On the other hand, basketball is fluid. Here each event most often is the result of a series of contributions from all players on the floor. More importantly, a number of contributing factors – such as screens away from ball, hustle plays or help defence for example – go unregistered by the game statistics. Thus, use of analytics and big data paved the way for unprecedented, novel and creative avenues for sports understanding.

Sports Analytics in Basketball

Mostly pioneered by Houston Rockets (National Basketball Association (NBA) team) general manager Daryl Morey, analytics in basketball has been gaining more prominent role over the past two decades. As mentioned earlier, its primary purpose is to assist with decision making in player and team performances. Additionally, the use of analytics has spread into managerial and business operations of basketball teams as well. Harrison and Bukstein (2017) outline in great details how the use of analytics can help with market research analysis,

customer relationship management, social media engagement, and sports sponsorship. Ticket sales, nevertheless, garner the most attention of analytics research in the management side of sport organizations (Mondello and Kamke 2014). More importantly, another research proves that the use of analytics is an effective managerial tool, which indeed provides substantial benefits. As Troilo et al. (2016) conclude the use of analytics lead to 7.2% revenue growth.

Performance analysis is by no means a new phenomenon in sports science studies. However, what is new is an abundance of a more sophisticated and more robust data, as well as tools for data collection. As a result, coaches, managers and even athletes themselves can obtain more detailed performance evaluations, training techniques in order to make better decisions. The NBA has drawn significant amount of scholarly attention regarding the studies of individual player talent evaluation or player performance evaluations as well as team compositions and analysis (Shea and Baker 2013, Glockner 2016). More exclusive examples of analytics capabilities in basketball are presented by Franks et al. (2015) or Bocskocsky et al. (2014). The former attempted to demonstrate how defensive performance (which traditionally lacks statistical information in comparison to offensive performance) could be analyzed and measured. While the latter tackled an even more unconventional topic – the likelihood of a "hot hand", a purported phenomenon that a person who experiences a successful outcome has a greater chance of success in further attempts. On the same topic, Castel et al. (2012) claimed that older adults believed in hot hand by adding some light into this topic which anecdotally received lots of support from players, coaches and even from fans (Ross 2017). Ross (2017) actually looks at both sides of the story and cites authors that argue hot hand is a "massive and widespread cognitive illusion" (Kahneman 2011, cited in Ross 2017, p. 145).

All these authors pointed out that such phenomenon may in fact be true among the NBA and college players. The outlined examples are just a glimpse of inexhaustible opportunities big data and analytics create for sports managers and academics. While, as seen, most of the research has focused exclusively on either side of sport organizations (business or sports performance), this research aims to combine the off-court side (attendance, ticket sales) and the on-court side (scoring, winning) of basketball. Kaplan et al. (2019) provided an example of an attempt to incorporate both sides by estimating that the absence of team superstars had an impact of up to 25% on ticket prices. The research presented in this paper has combined data of business and on-court performance and attempted to find the correlation between home-court and team wins. The methods that were employed during this study will be explained in the next section.

Methodology

A case study design (Jones and Gratton 2015) was considered the best approach in order to understand the dynamics of the team performance in relation to their home crowd (and the impact which the crowd support might have on the outcome of the game). A top division basketball team from Lithuania (Žalgiris

Kaunas) was selected for this study using a convenience sample approach (Veal and Darcy 2014). The team competes in highest ranked European basketball competition - the Euroleague. Data from two seasons (2017–2018 and 2018–2019) was collected, compiled and analyzed. Žalgiris Kaunas team led the Euroleague in home attendance numbers during both of those seasons registering 13,560 and 14,808 average crowds respectively (Basketnews.lt 2020). However, in order to evaluate home court advantage, a decision was made that only home games in which attendance exceeded the average attendance of a given season, were selected for this study. As a result, the present case study is composed of 19 games in total.

From a methodological point of view, a three stage approach was employed. First stage was an exploratory analysis of relevant data available in the public domain for the selected team /club. Using data bases of the official Euroleague website (Euroleague.net), as well as basketball related websites (Basketnews.lt 2020, Overbasket.com 2020), several statistical categories such as points per game scored, points per game allowed, free throws (made and attempted), 3-points (made and attempted), assists, turnovers, and possessions were compiled and analyzed. Second stage comprised of an initial analysis that consisted of statistical calculations (averages per game and per season) and comparisons between Žalgiris Kaunas and their opponents while a discussion and concluding analysis – as a third stage – was drawn by interpretation of data (in the light of existing literature and previous research on the topic). Specific reference was made not only to free throws and 3 points shots percentages but also to assists and turnovers as the literature suggests teams that score consistently good percentages have a chance to win the match and /or the league they are part of (during both regular season and also play-off stages).

Results and Discussion

Žalgiris Kaunas played 19 home games in both 2017–2018 and 2018–2019 seasons – full details are presented as part of Appendix 1 including: name of opposite team; final result; attendance numbers /spectators per game; free throws totals (made and attempted) per game for opponents and for Žalgiris team; and 3 points shots (made and attempted) for opponents and for Žalgiris team. As mentioned previously, the team led the Euroleague in attendance during both of those seasons. Such high attendance numbers could be attributed to the fact that basketball is the most popular sport in Lithuania and Žalgiris being not only the city‘s team but a team that the entire country supports. Also, both seasons produced succesful results on court, as the team made the play-offs and even reached the Euroleague Final Four tournament in 2018 (Euroleague.net, 2020c).

Nineteen home games (10 in 2017–2018 season and 9 in 2018–2019 season) produced attendance which was higher than the average of that respective season. 11 of those games (8 in 2017–2018 season and 3 in 2018–2019 season) were wins (57.9%). Only statistics from those games were used for this study and the findings are presented further down below.

Generally speaking and after careful analysis of the data, the numbers relevant to Žalgiris performance for the seasons being investigated support the idea that teams perform better at home. This study provides ample evidence to support such notion – the main findings will be grouped under the headings of points per game and free throws; 3 points; assists, turnovers and other relevant statistics further down below.

Points per Game (PG) and Free Throws (FT)

Žalgiris Kaunas scored more points per game than both season and home averages, especially during wins (+5.7); additionally, the team allowed fewer points, especially during wins (-5.8).

Free throws would be another part of the spectrum for the most efficient ways to score in basketball. It is the highest percentage shot and most teams average well above 70 percent. It is an uncontested shot, giving the fouled player a chance to earn the points that were potentially taken from him because of the foul. And, most importantly, the game clock is stopped at the time of free throw shooting. Oliver (2004) identified free throw shooting among the top four factors of basketball success (along with field shooting, turnovers and rebounding) and assigned a 15 percent weight towards overall result. Similarly, Sampaio (2003) argued that around 20 percent of a team's total score can come from the free throw line. Glockner (2016, p. 61) convincingly observes that "visits to the "charity stripe" remain the sport's most efficient offensive trip". Further analysis of the statistics on free throw shooting for both 2017–2018 and 2018–2019 Euroleague seasons supported the idea of correlation between free throws and winning. The top four teams that made to the Final Four tournament were among top 5 (in 2017-18 season) and among top 10 (in 2018–2019 season) in the league in free throws attempted. In fact, teams that led the league in free throw attempts ended up winning the championship in respective seasons (Euroleague.net 2020b).

3 Points (3 PTS)

As contemporary basketball is increasingly more reliant on 3-points shot as it brings a valuable contribution to the team success (for 3-points shot as a game performance indicator see, for example, the findings of Garcia et al. 2013), it was important to investigate the effect that home crowd has on long range shooting and the relationship between the two. The research showed that Žalgiris attempted and made more 3-point shots, especially during wins (+1.8 during 2017–2018 season; +1.8 during 2018–2019 season). More importantly, Žalgiris managed to hold its opponents to lower numbers in both made and attempted 3-point shots, fact that increases their chance of winning the game.

Assists (AST)

In terms of better team communication, which could be enabled by home court advantage and familiarity (and which could be easily disturbed by the loud

noise produced by the spectators within the arena), team assists could be an indication of such variable. As a vital statistical indicator, the assist was identified by Gomez et al. (2008) and Melnik (2001) as one of the discriminating factors between teams and between winning or losing a game. A similar point was raised by Dogan et al. (2016) who included assists as an important game-related statistical category that has a great impact on the team's success.

The present analysis showed that Žalgiris Kaunas had a little bit more assists than season average, but less that season home average. However, the team had significantly more assists during wins (+3). Also, the team had fewer turnovers, especially during wins (-2.9).

Turnovers (TO)

It can be argued that the atmosphere created by the fans that spectate the games adds additional pressure on the execution of different plays, technical elements, etc. leading to decision making which both the assists (good decision making) and the turnovers (poor decision making) rely heavily on (as pointed out by Garcia et al. 2013). A small (or limited) number of turnovers for own team clearly increases the chances of winning the game and this should be the main focus of the team in offence (Fylaktakidou et al. 2011); conversely, getting the opposite team into committing errors when handling the ball and running plays is one important aim for any team. Such an important measure of performance (the number of turnovers) increases the chances of defeat – the higher the number of turnovers the higher the chances to lose as Ibanez et al. (2003) argue.

The fact that Zalgiris had more turnovers (-1.4) compared to their opponents (-0.4) can be explained by the level of pressure experienced - playing in front of own fans and trying to match their high expectations leads to additional pressure (on the top of the one provided by the opposite team, on court) and consequently to making mistakes. To support this point, Sampaio and Janeira (2003) claimed that the number of turnovers produced by winning home teams was higher when compared to losing home teams (for both regular season and play-off games). Having said that, this category alone did not lead to Žalgiris losing games as they compensated in all other categories as discussed above.

The following research findings comprise of statistical data from Žalgiris opponents. It will be accompanied by the analytical analysis of Žalgiris efficiency – widely recognised as the most important indicator of winning performance.

Summary of Relevant Statistics for Žalgiris Opponents

The summary (for full details see Table 1) of Žalgiris opponents' statistics provided similarly supportive numbers:

- The opponents scored fewer points than their season averages (-2.8), especially during Žalgiris wins (-7.1).
- The opponents allowed more points than their season average (+3.6), especially during their losses (+6.5).

- The opponents attempted more 3-point shots (+1.6) and made slightly more 3-point shots (+0.2), but made fewer during Žalgiris wins (-0.9).
- The opponents attempted fewer (-2) and made fewer (-1) free-throw shots during Žalgiris wins.
- The opponents had more assists (+0.5), but fewer during Žalgiris wins (-0.2).
- The opponents had fewer turnovers (-0.4).

Table 1. *Key Statistical Categories of Žalgiris Kaunas and its Opponents (2017–2018 and 2018–2019 Seasons)*

Team	Statistical Category	
	PS/G	PA/G
Žalgiris Kaunas statistics	+2.0 (+5.7)	-0.5 (-5.8)
Opponent statistics	-2.8 (-7.1)	+3.6 (+6.5)
	3 PTA/G	3 PTM/G
Žalgiris Kaunas statistics	+0.3 (+1.8)	+0.5 (+1.8)
Opponent statistics	+1.6 (+1.4)	+0.2 (-0.9)
	FTA/G	FTM/G
Žalgiris Kaunas statistics	+1.9 (+1.9)	+1.3 (+1.0)
Opponent statistics	-0.3 (-2.0)	+0.2 (-1.0)
	AST/G	
Žalgiris Kaunas statistics	+0.8 (+3.0)	
Opponent statistics	+0.5 (-0.2)	
	TO/G	
Žalgiris Kaunas statistics	-1.4 (-2.9)	
Opponent statistics	-0.4 (+0.1)	

Key to acronyms:
PS/G and PA/G = points scored per game and points allowed per game.
3 PTA/G and 3 PTM/G = 3 points attempts per game and 3 points made per game.
FTA/G and FTM/G = free throws attempts per game and free throws made per game.
AST/G = assists per game.
TO/G = turnovers per game.
Source: authors' elaboration with data from Basketnews.lt (2020), Euroleague.net (2020a) and (2020b), Overbasket.com (2020).

As it is evident from the above, the basic indicators show that the team being investigated plays better in those environments (with attendances higher than season average) and consequently managed to hold its opposition to much lower standards as well. However, the main question is why is that the case? As it was already stated above and supported by a number of researchers (see, for example, Shea and Baker 2013; amongst others), points per game statistic is not a good predictor of wins; analytics argue that an offensive efficiency calculations could help predict victories more accurately. Authors of the current study strongly agree with the significance of offensive efficiency. That is because offensive efficiency is adjusted for pace and since teams trade possessions back and forth, it does not really matter how quickly they score. What matters is making the most out of every possession and forcing the opposing team to waste their possessions.

As a result, the number of offensive possessions was calculated (using data available at Overbasket.com 2020). The team's total points scored divided by the possessions produces offensive efficiency value; numbers above 1.0 are generally considered an indication of good offence and potential to win.

Calculated offensive possession and offensive efficiency numbers provided some meaningful insights into Žalgiris Kaunas home court advantage. Offensive possessions were lower than team's season average during all 19 games and even 11 home wins. However, the team significantly improved its offensive efficiency (+0.05 in all 19 games and +0.10 in wins), meaning that the home team was indeed making more out of its every offensive possession. So, for example, if Žalgiris has averaged almost 79 possessions, an increased efficiency of 0.10 amounted to almost 8 points – a significant margin in contemporary elite basketball and a meaningful indicator of a win (see additional details in Table 2).

Table 2. *Key Statistical Categories of Žalgiris Kaunas Offensive Efficiency (during 2017–2018 and 2018–2019 Seasons)*

Statistical Category	Žalgiris Kaunas Statistics
Offensive possessions (average)	79.3
Offensive efficiency (average)	1.00
Offensive possessions (19 home games)	77.9
Offensive efficiency (19 home games)	1.05
Offensive possessions (11 home wins)	78.6
Offensive efficiency (11 home wins)	1.10

Source: authors' elaboration with data from Basketnews.lt (2020), Euroleague.net (2020a) and (2020b), Overbasket.com (2020).

Conclusion

Harris and Roebber (2019, p. 1) concluded that home advantage is "unanimously accepted as a key factor" to the success in a game for any team. Basketball is no exception to this – it is widely accepted that playing on one's home-court provides an advantage; players and coaches speak about its importance and teams compete for it in the lead to the playoffs. What is yet to be fully understood is the value of this competitive edge. Presumably factors such as familiarity with the environment and reinforcement from a friendly crowd - facets of the game that are not directly measured - have positive implications. Other underlying factors such as territoriality, culture, history, and playing conditions are either ambiguous or unlikely to have significant influence in a modern, indoor sport such as NBA basketball (Swartz and Arce 2014).

Similar positive implications are applicable to European basketball too as Pollard and Gomez (2013) argue that the average home advantage reaches 60.7 per cent in their study of 35 European national basketball leagues. Adding to these findings, Volossovitch (2017) stresses the need to take into account the actual venue where the basketball game is played when looking at a team's performance – an aspect which current paper attempted to do. Having said that, the home court

advantage cannot, on its own, isolated from other factors, win games – but it is clearly an adjunct to other performance success indices in basketball.

It is evident that home crowd has a positive impact on Žalgiris Kaunas performance (they played in front of a sold-out arena in so many instances during the seasons that were analysed). The performance of Žalgiris Kaunas team improved virtually across every offensive key statistical category: the team was scoring more points, making (and taking /attempting) more 3-points and free throws (most efficient shots in modern basketball). In addition, Žalgiris Kaunas team displayed better teamwork by registering more assists than the opposition and less turnovers.

However, the most important finding of this study was that Žalgiris Kaunas team has displayed increased offensive efficiency numbers – widely recognized as the key determinant of wins. To simply put, in those home games that were attended by more fans than team's regular attendance, Žalgiris Kaunas has managed to achieve a better outcome from the same amount of input. Whether it was because the opponents were competing more poorly or the home team was executing its game plan more accurately, it should be explored in greater detail in future research.

One fact is certain: while Žalgiris Kaunas team's performance has improved when playing at home, compared to the opposite team, as evidenced by certain statistical categories for the seasons investigated (2017–2018 and 2018–2019), there is a need for further research into the effectiveness of home (and away) team performances – it looks like the match results and, generally, the team performance, are influenced by home-field factors related to crowd and familiarity effects, which require more specific attention (Carmichael and Thomas 2005).

References

Basketnews.lt (2020) *Eurolyga – Statistika.* (Euroleague – Statistics). Retrieved from: https://www.basketnews.lt/lygos/25-eurolyga/statistika.html?fgroup=teams&fseason=2017&fmonth=0&stage=0&fpos=att&sort=average&games_type=all. [Accessed 10 June 2020.]

Bocskocsky A, Ezekowitz J, Stein C (2014) The hot hand: a new approach to an old "fallacy". *8th Annual MIT Sloan Sports Analytics Conference*, 1–10.

Bray S, Widmeyer W (2008) Athletes' perceptions of the home advantage: an investigation of perceived causal factors. *Journal of Sport Behaviour* 23(1): 1–10.

Carmichael F, Thomas D (2005) Home-field effect and team performance: evidence from english premiership football. *Journal of Sports Economics* 6(3): 264–281.

Castel A, Rossi A, McGillivray S (2012) Beliefs about the "hot hand" in basketball across the adult life span. *Psychology and Aging* 27(3): 601–605.

Clarke S (2005) Home advantage in the Australian football league. *Journal of Sports Sciences* 23(4): 375–385.

Courneya K, Carron A (1992) The home advantage in sport competitions: a literature review. *Journal of Sport and Exercise Psychology* 14(1): 13–27.

Dogan I, Isik O, Ersoz Y (2016) Examining the Turkish men's professional basketball team's success according to game-related statistics with discriminant analysis. *International Journal of Performance Analysis in Sport* 16(3): 829–836.

Entine O, Small D (2008) The role of rest in the NBA home-court advantage. *Journal of Quantitative Analysis in Sports* 4(2): 1–9.

Eurohoops.net (2019) *The first ever Euroleague players poll*. Retrieved from: https://www.eurohoops.net/en/trademarks/879089/the-first-ever-euroleague-players-poll/9/. [Accessed 5 November 2019].

Euroleague.net (2020a) *Game center*. Retrieved from: https://www.euroleague.net/competition/teams/showteam?clubcode=ZAL&seasoncode=E2017#!games. [Accessed 6 June 2020.]

Euroleague.net (2020b) *Game center/statistics*. Retrieved from: https://www.euroleague.net/main/statistics?mode=Leaders&entity=Clubs&seasonmode=Single&seasoncode=E2017&cat=FreeThrowsAttempted&agg=Accumulated. [Accessed 6 June 2020.]

Euroleague.net (2020c) *Žalgiris Kaunas – did you know that?* Retrieved from: https://www.euroleague.net/final-four/belgrade-2018/news/i/8pfkqbnpy7prpg4t/zalgiris-kaunas-did-you-know-that. [Accessed 7 June 2020.]

Franks A, Miller A, Bornn L, Goldsberry K (2015) Counterpoints: advanced defensive metrics for NBA basketball. 9*th* *Annual MIT Sloan Sports Analytics Conference*, 1–8.

Fylaktakidou A, Tsamourtzis E, Zaggelidis G (2011) The turnovers analysis to the women's National League basketball games. *Sports Science Review* XX(3–4): 69–83.

Garcia J, Ibanez S, Martinez De Santos R, Leite N, Sampaio J (2013) Identifying basketball performance indicators in regular season and playoff games. *Journal of Human Kinetics* 36(1): 161–168.

Garcia RJ, Canadas AM, Antunez MA (2015) Efectos de la asistencia, densidad de la misma y la capacidad del pabellonen las victoriasconseguidasen casa en function de la conferenciaen la NBA. (Effects of attendance, crowd density and capacity of arena in home advantage according to NBA conference). *Cuadernos de Psicologia del Deporte* 15(3): 175–180.

Glockner A (2016) *Chasing perfection: a behind-the-scenes look at the high-stakes game of creating an NBA champion.* Boston, MA: Da Capo.

Gomez M, Pollard R (2011) Reduced home advantage for basketball teams from capital cities in Europe. *European Journal of Sport Science* 11(2): 143–148.

Gomez M, Lorenzo A, Sampaio J, Ibanez S, Ortega E (2008) Game-related statistics that discriminated winning and losing teams from the Spanish men's professional basketball teams. *Collegium Antropologicum* 32(2): 315–319.

Harris A, Roebber P (2019) NBA team home advantage: identifying key factors using an artificial neural network. *PLoSONE* 14(7): 1–9.

Harrison K, Bukstein S (2017) *Sport business analytics: using data to increase revenue and improve operational efficiency*. Boca Raton, FL: CRC Press.

Harville D, Smith M (1994) The home-court advantage: how large is it and does it vary from team to team? *The American Statistician* 48(1): 22–28.

Ibanez S, Sampaio J, Saenz-Lopez P, Gimenez J, Janeira M (2003) Game statistics discriminating the final outcome of junior world basketball championship matches (Portugal 1999). *Journal of Human Movement Studies* 45(1): 1–19.

Jones M (2013) The home advantage in individual sports: an augmented review. *Psychology of Sport and Exercise* 14(3): 397–404.

Jones M (2018) Differences in home advantage between sports. *Psychology of Sport and Exercise* 34(Jan): 61–69.

Jones I, Gratton C (2015) *Research methods for sport studies*. Abingdon: Routledge.

Kaplan S, Ramamoorthy V, Gupte C, Sagar A, Premkumar D, Wilbur J et al. (2019) The economic impact of NBA superstars: evidence from missed games using ticket microdata from a secondary marketplace. *13th* *Annual MIT Sloan Sports Analytics Conference*, 1–30.

Koning R (2005) Home advantage in speed skating: evidence from individual data. *Journal of Sports Sciences* 23(4): 417–427.

Koning R (2011) Home advantage in professional tennis. *Journal of Sports Sciences* 29(1): 19–27.

Kozy J (2011) *A game-theoretic analysis of home court advantage and optimal offensive strategy in basketball*. University of Akron/Ohio LINK Electronic Theses and Dissertations. Retrieved from: https://etd.ohiolink.edu/pg_10?0::NO:10:P10_ACCESSION_NUM:akron1306497821#abstract-files. [Accessed 8 June 2020.]

Lewis M (2003) *Moneyball: the art of winning an unfair game*. New York, NY: W.W. Norton & Company.

Madrigal R, James J (1999) Team quality and home advantage. *Journal of Sport Behaviour* 22(3): 381–398.

McAndrew F (1992) The home advantage in individual sports. *The Journal of Social Psychology* 133(3): 401–403.

Melnick MJ (2001) Relationship between team assists and win-loss record in the National Basketball Association. *Perceptual and Motor Skills* 92(2): 595–602.

Mondello M, Kamke C (2014) The introduction and application of sports analytics in professional sport organizations. *Journal of Applied Sport Management* 6(2): 1–12.

Moore J, Brylinsky J (1995) Facility familiarity and the home advantage. *Journal of Sport Behaviour* 18(4): 302–311.

Nevill A, Holder R (1999) Home advantage in sport: an overview of studies on the advantage of playing at home. *Sports Medicine* 28(4): 221–236.

Oliver D (2004) *Basketball on paper: rules and tools for performance analysis*. Dulles, VA: Potomac Books.

Overbasket.com (2020) *Žalgiris Kaunas Stats by game*. Retrieved from: http://overbasket.com/rsteams.php?tab=30&year=2018&cmp=EL&shteam=ZAL [Accessed 7 June 2020.]

Pollard R, Gomez M (2013) Variations in home advantage in the national basketball leagues of Europe. *Revista de Psicologia del Deporte* 22(1): 263–266.

Pomeroy K (2012) *Myth of home-court advantage*. ESPN Report. Retrieved from: https://www.espn.com/mens-college-basketball/insider/story/_/id/7532021/ken-pome roy-best-home-court-advantage-kansas-kentucky-duke-ncb. [Accessed 16 October 2019.]

Real Madrid (2019) "*We will have to play well and move the ball around to beat Žalgiris", stated Thompkins*. Retrieved from: https://www.realmadrid.com/ en/news/2017/01/laso-%E2%80%9Cwe-will-have-to-play-with-great-intensity-in-kaunas%E2%80%9D. [Accessed 5 November 2019.]

Ross K (2017) Classroom investigations of recent research concerning the hot hand phenomenon. *Journal of Statistics Education* 25(3): 145–157.

Runrepeat.com (2019) *The most popular Euroleague teams*. Retrieved from: https://runrepeat.com/the-most-popular-euroleague-teams. [Accessed 7 June 2020.]

Sampaio J (2003) Importance of free-throw performance in game outcome during the final series of basketball play-offs. *International Journal of Applied Sports Sciences* 15(2): 9–16.

Sampaio J, Janeira M (2003) Statistical analyses of basketball team performance: understanding teams' wins and losses according to a different index of ball possessions. *International Journal of Performance Analysis in Sport* 3(1): 40–49.

Sarlis V, Tjortjis C (2020) Sports analytics — Evaluation of basketball players and team performance. *Information Systems* 93(Nov): 1–19.

Schwartz B, Barsky S (1977) The home advantage. *Social Forces* 55(3): 641–661.

Shea S, Baker C (2013) *Basketball analytics: objective and efficient strategies for understanding how teams win*. Lake St. Louis, MO: Advanced Metrics.

Smith R (2005) Disconnects between popular discourse and home advantage research: what can fans and media tell us about the home advantage phenomenon? *Journal of Sports Sciences* 23(4): 351–364.

Snyder E, Purdy D (1985) The home advantage in collegiate basketball. *Sociology of Sport Journal* 2(4): 352–356.

Swartz T, Arce A (2014) New insights involving home team advantage. *International Journal of Sports Science and Coaching* 9(4): 681–692.

Talkbasket.net (2019) *The survey shows Zalgirio Arena as the leader in the Baltic region*. Retrieved from: https://www.talkbasket.net/59551-the-survey-shows-zalgirio-arena-as-the-leader-in-the-baltic-region. [Accessed 7 June 2020.]

Troilo M, Bouchet A, Urban T, Sutton W (2016) Perception, reality, and the adoption of business analytics: evidence from North American professional sport organizations. *Omega* 59(A): 72–83.

Veal A, Darcy S (2014) *Research methods in sport studies and sport management: a practical guide*. Abingdon: Routledge.

Volossovitch A (2017) Research topics in basketball. In P Passos, D Araujo, A Volossovitch, *Performance analysis in team sports*. Abingdon: Routledge.

Watkins P (2013) Revisiting the home court advantage in college basketball. *International Journal of Sport and Society* 3(1): 33–42.

Yi D (2017) The home court advantage: evidence from Men's College basketball. *Sport Journal* 3(9): 1–1.

Zalgirioarena.lt (2011) *Zalgiris arena plans and preparation for EuroBasket 2011*. Retrieved from: https://zalgirioarena.lt/en/naujienos/2011/09/12/zalgiris-arena-plans-eurobasket-2011/. [Accessed 7 June 2020.]

Zalgirioarena.lt (2020) *About Zalgirio Arena. History*. Retrieved from: https://zalgirioarena.lt/en/zalgirio-arena/apie-arena/. [Accessed 7 June 2020.]

Zalgiris Kaunas (2019) *Zalgirio Arena was voted the toughest arena to play by Euroleague players*. Retrieved from: http://zalgiris.lt/en/news/bc-zalgiris/82995/. [Accessed 5 November 2019.]

Appendix 1. *Overview of Žalgiris Kaunas 19 Home Games, Attendance Figures and Main Statistical Indicators (Free Throws and 3 Points Shots) for 2017–2018 and 2018–2019 Seasons*

Date	Opponent	Result	Attendance	Opponent FT	Žalgiris FT	Opponent 3 PTS	Žalgiris 3 PTS
2017-12-28	Olympiacos Piraeus	74:68	15480	13/16	11/16	9/27	9/19
2018-01-12	Unicaja Malaga	79:77	15392	11/13	12/15	12/28	5/17
2018-02-01	Maccabi Tel Aviv	99:84	14844	21/26	13/21	5/20	14/23
2018-02-09	Khimki Moscow Region	74:84	15172	21/26	24/28	11/29	6/17
2018-03-01	FC Barcelona	90:74	14477	12/16	14/21	6/21	10/24
2018-03-09	Fenerbahce Istanbul	78:85	15238	25/25	19/22	8/18	5/10
2018-03-20	AX Armani Exchange Milan	77:65	13747	12/16	19/31	7/27	2/9
2018-03-30	CSKA Moscow	85:73	15525	10/12	22/26	5/21	5/11
2018-04-24	Olympiacos Piraeus	80:60	14345	20/27	20/25	4/22	4/16
2018-04-26	Olympiacos Piraeus	101:91	14411	31/38	26/31	10/26	13/24
2018-10-12	Baskonia Vitoria	79:87	15107	11/14	17/23	12/28	4/11
2018-11-02	Real Madrid	79:90	15105	15/22	5/10	11/23	4/9
2018-11-16	FC Barcelona	85:88	15126	14/24	18/23	12/23	5/22
2018-12-21	Maccabi Tel Aviv	80:73	15168	7/10	17/20	10/31	11/20
2019-01-04	CSKA Moscow	79:84	15205	20/25	38/43	8/25	5/14
2019-01-18	Panathinaikos Athens	82:69	15140	4/6	19/21	7/23	7/15
2019-03-22	Darussafaka Istanbul	94:67	15178	7/10	16/22	2/17	12/24
2019-04-23	Fenerbahce Istanbul	57:66	15517	14/17	11/16	10/34	6/17
2019-04-25	Fenerbahce Istanbul	82:99	15177	10/11	15/18	15/22	7/19

Source: authors' compilation with data from Euroleague.net (2020a), Euroleague.net (2020b), Basketnews.lt (2020).

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The Participation Legacy at Olympic Games

By Gregory T. Papanikos[*]

The legacy of participating in Olympic Games has not been extensively researched when it is compared with the huge literature of bidding/hosting Olympic Games and the determinants of Olympic success and failures in winning Olympic medals. This paper addresses this issue descriptively by emphasizing the need to do more theoretical and empirical research to explain why so many countries and athletes participate at the Olympic Games even though they have no chance of winning any medal and/or bid and host future Olympic Games. Apart from the personal joy of the participating athlete and the national pride of a participating country, one possible additional explanation might be the human capital generated by participating which can be used to promote youth and grassroot sport participation. The extent that this has been used by national sports policy authorities is suggested to be the subject of future empirical research.

Keywords: *Olympic Games, sports participation, cost-benefit analysis, Olympic legacy, Olympic medals, national sports policy*

Introduction

In the Olympic Games literature, two issues have dominated the relevant field of study. Firstly, the costs and benefits of hosting Olympic Games have been thoroughly examined. Why do countries want to host mega events such as Olympic Games? Numerous explanations have been offered. From an economic point of view, there is a dichotomy of findings. Baade and Matheson (2016) persuasively argue that it is a waste of taxpayers' money. They concluded that "the Olympic Games as currently conducted are not economically viable for most cities. The most important reasons include infrastructure costs relating to the venues hosting the events; the monopoly rents that flow to the International Olympic Committee, poor management, corruption, and the specter of unreasonable and unrealizable economic expectations for the host city and nation. Concerns about costs are nothing new" (pp. 214–215).

Kasimati (2003) has provided a concise review of these studies which included post-Olympic use of sports venues. More recently, Kasimati (2015) examined the post-Olympic use of the Athens-2004 Olympic venues while Ziakas and Boukas (2014) examined the legacy of the 2004 Olympic to develop sports and tourism in a post-Olympic Athens and Greece. On the other hand, Costas (2017) using the 2012 Olympic Games looked at the legacy the games left to youth participation in swimming. Many studies looked at the Olympic legacy itself in terms of culture (community and individual values), social and political pattern of behaviour, development of institutional structures and physical infrastructures

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and in general enhancing the quality of life. Máté (2018) is an example of such an empirical study.

The second strand of this research relates to the medals won by participating countries at the Olympic Games. What are the determinants of success and failure at Olympic Games? Success/failure is measured by the number of absolute or relative medals won qualified to the number of medals expected to win before the games. There is a huge literature which addresses this question. Population size, strength of the economy, political systems, cultures, geography, national sports policy (e.g., government spending on sports) and many other variables have been included in the list of determinants. Allegedly, successes at Olympic Games increase citizens' welfare and therefore taxpayers are willing to pay more for preparing and participating at Olympic Games. Bakkenbüll and Dilger (2020) and Humphreys et al. (2020) are recent examples of such studies. As a corollary, this literature includes studies which aim at increasing the performance of athletes at Olympic Games and therefore increase their chance to become Olympic champions. Ortiz et al. (2020) and Stefani (2017) are examples of such studies. It is not the objective of this paper to examine these determinants of Olympic successes/failures.

Most of participating countries have no chance of either ever hosting Olympic Games or ever winning any Olympic medal in the near future. It is difficult to explain why these countries do participate given that winning no medals might be interpreted as a failure and therefore as a national disgrace. Being there which is the essence of participating at Olympic Games seems not to be a high priority in setting the research agenda of Olympic Games studies. It is really surprising that there is a dearth of research in explaining why do countries participate when the probability of winning even one medal is zero. I was not able to find any single study which examined this non-trivial issue. The literature is dominated by bidding to host the Olympic Games or to analyze the determinants of winning more medals. Of course, this literature relates legacy to participation but only for countries which host the games and/or win medals. The term post-Olympic strictly applies to hosting cities (countries) and not to participating countries. Similarly, the term applies to post-Olympic development of a particular sport but only in cases that a country won medals in this sport. There is a dearth of research for all other cases of countries which neither hosted the games nor won medals.

This descriptive paper aims at pointing out the absence of such research by emphasizing that this issue is of concern of the majority of participating countries at Olympic Games which win no medals. It is even more important for the thousands of athletes who participate without any hope of winning a medal. They exert huge effort and sometimes use scarce personal financial resources to just be there. Why do participate? What is the utility (satisfaction) derived from such a participation? Is it only a consumption good such as going to a party? Being there in the opening and closing ceremonies with their country uniform, label and flag is one possible answer but, still, is this sufficient given the disutility obtained by failing to win a single medal which in the eyes of the participating nation's citizens would be considered as a failure? The issue that participation per se might have its own value seems not to be a main issue. However, in this paper an attempt is made

to bring this issue at the forefront by making a call for more empirical research to discern why countries and athletes participate when all odds are against them in winning medals.

This paper is organized in five sections including this introduction. The second section sketches a theoretical framework which can be tested empirically using a country by country analysis. This section addresses the question of what are the benefits of participating when the chances to win medals are zero. The third section is using data from all previous summer Olympic Games to demonstrate the extent of the number of countries which have participated in all previous Olympic Games without winning any medal. Despite this the number of participating countries increases along with the number of sports included in the games and therefore the number of medals awarded. The fourth section outlines the elements of such empirical research. The last section concludes.

A Theoretical Sketch

Participating at Olympic Games entails costs and benefits. The costs are aggravated when the probability of success is almost zero. On the other hand, non-participation may entail more costs and less benefits. Then the decision to participate may be expressed with the following utility function:

$$\overset{+}{B_p}, \overset{-}{B_{np}}, \overset{-}{C_p}, \overset{+}{C_{np}})$$
$$U_p = (B_p, B_{np}, C_p, C_{np})$$

where U_p: the participating country's utility at the Olympic Games; B_p: the benefits from participating; B_{np}: the benefits of non-participating; C_p: the cost of participating and C_{np}: the cost of non-participating.

If all costs and benefits were monetized, then the decision to participate is a simple one and can be expressed with the following arithmetic expression:

$$B_p - C_p > B_{np} - C_{np}$$

This inequality states that if and only if the net benefits of participating exceed the net benefits of non-participating then the country may decide to participate with a team bearing its flag. If the opposite holds, then the country is better off not to participate. The fact that more and more countries participate shows that the above inequality holds by Paul Samuelson's revealed preference theory: the buddle of commodities of participation is preferred to the buddle of commodities of non-participation at the Olympic Games. This sketch can be further developed into a general theory of participation at Olympic Games.

The above conceptualization is straightforward and can be easily understood if the costs and benefits have a monetary value using either market and/or shadow prices. For example, the money cost of participating is easily calculated. However, the other costs and benefits are non-monetary such as national pride. In such cases,

it might be useful to apply a direct measure of utility using the contingency evaluation method, i.e., citizens are asked how much satisfaction derive from their country's participation at the Olympic Games. Many studies have applied this method in different contexts. Humphreys et al. (2020) is a recent example of applying this method to Olympic Games with reference to Canada. Papanikos (2003) applied it to evaluate the post-Olympic use of the Athens-2004 Olympic venues. This method has been also applied to environment (see for an example the study by Dardanoni and Guerriero 2021), culture (Wiśniewska et al. 2020), health (Himmler et al. 2020), water quality (Keeler 2020), transportation (Hsu 2020), tourism (Lissner and Mayer 2020) and in many other areas.

Nevertheless, one of the original contributors to this method in the 1990s (see Diamond and Hausman 1994) claimed that the contingency evaluation method is hopeless. In his own words, Hausman (2012, p. 43) stated that "I have concluded … that contingent valuation is hopeless. … I find that three long-standing problems continue to exist: 1) hypothetical response bias that leads contingent valuation to overstatements of value; 2) large differences between willingness to pay and willingness to accept; and 3) the embedding problem which encompasses scope problems". In an accompanying paper in the same issue Kling et al. (2012) addressed all these three issues.

I do think that there is hope in evaluating the cost and benefits of bidding/hosting Olympic Games and participating at the Olympic Games. After all there is a direct way of deciding through a referendum. Direct democracy is the best solution in countries with well-developed democratic institutions and long history of making decisions through this mechanism. For example, in countries like the USA, there is no experience of direct democracy through referendums at the federal level albeit such experiences do exist at the state and county level.

But for countries as large as the USA, the benefits and costs of participation are easily measured. The monetary cost can be evaluated since the private sector through sponsoring finances the individual athletes and sports federations participation. Thus, the monetary cost is fully covered. On the other hand, the benefits can be monotonically measured by the number of medals won. Similarly, to the USA, other advanced countries face similar conditions.

Smaller and less developed countries have neither the resources nor the elite athletes to participate and compete at Olympic Games. In this case for reasons not examined in this study the International Olympic Committee (IOC) steps in and finances the participation of such smaller countries or group of athletes (e.g. refugees) because the IOC considers as success the number of participating countries and the number of competing athletes. They simply add countries and popular sports in order to maximize their revenue and other objectives.

Most Countries and Even More Athletes Do Not Win Medals at Olympic Games

The determinants of winning medals have been extensively examined in the relevant literature. It goes beyond the purpose of this paper to refer to them. Athletes and countries compete for medals but most athletes and most countries will return home without any medals in their suitcases. However, most of them are happy that they were there. In the remaining of their lives will remember with joy their participation. They will proudly tell their children, grandchildren and many others that once they competed at Olympic Games. These people make up the human capital of each country who can be used to promote sports participation at the youth and grassroot level.

Table 1 should be seen from this perspective. According to this viewpoint, the number of athletes who have been participating at Olympics has been increasing even though not at a constant rate. Up to the 1960s, distance was an important determining factor. However, given the decrease in the cost of transportation more athletes have been participating but the Games have suffered from boycotts such as the 1980 and the 1984 games. Despite all these, the number of athletes has doubled in the last fifty years. From just over 5,000 athletes in the 1960s to more than 10,000 in the last decades. It seems that the number of athletes has stabilized over 10,000. As reported by IOC, in the last (2016) games a record number of 11,238 athletes participated. This number of athletes is the legacy of the Olympic Games. These are the ones who make up the human capital and returning back to their country, they should use their experience to promote youth and grassroot participation.

The number of athletes has been increasing for three reasons. Firstly, countries have a tendency to send more and more athletes yielding to the tremendous pressure from athletes to be part of their national Olympic team. This is a global phenomenon. Secondly, more and more countries are added to the list of participating nations resulting to an increase in the number of participating athletes. Thirdly, more and more games are added to the list of Olympic sports.

However, the increasing number of countries participating at the Olympic Games cannot increase indefinitely. There is an upper limit given by the existing number of countries. Similarly, the number of medals awarded cannot increase without any bound. Many sports events have been added which have inflated the number of medals from 122 medals in the 1896 Olympic Games to 973 medals in 2016.

After the 1960 Olympic Games, less than half of the participating countries did not return home with even one single medal. Four-fifths of the countries do come home with at least one medal. In the last Olympic Games of 2016, a record number of countries participated (207) and 86 (42% of the total) won at least one medal. Despite the increase in medals, the number of medals per participating athlete has declined. In the 1896 games, the ratio of medals per one hundred participating athletes was 50.6. Since then, this ratio has been declining reaching 8.7 medals per one hundred athletes in the 2016 Olympic Games. If one takes into

consideration that one athlete may win two or more medals, then more than 90% of participating athletes return home without a medal. Based on their pre-Olympic personal records, most athletes had no chance of winning a medal.

A final note on Table 1 relates to the number of cities/countries which have hosted previous Olympic Games. The total number of countries which hosted Olympic Games is only 10% of the total countries which participated at the last Olympic Games of 2016. 20 countries and 23 cities organized all previous 28 Olympic Games from 1896 to 2016. Some cities/countries organized the games two or three times.

Table 1. *Countries, Athletes and Medals in the Olympic Games, 1896–2016*

G	Year	City	Country	TPC	TCWM	TNA	TNMA	TCWM/ TPC	TNMA/ TNA
1	1896	Athens	Greece	14	11	241	122	78.57%	50.6
2	1900	Paris	France	24	21	997	286	87.50%	28.7
3	1904	St. Louis	United States	12	10	651	280	83.33%	43.0
4	1908	London	United Kingdom	22	19	2008	324	86.36%	16.1
5	1912	Stockholm	Sweden	28	18	2407	310	64.29%	12.9
6	1920	Antwerp	Belgium	29	22	2622	439	75.86%	16.7
7	1924	Paris	France	44	27	3088	378	61.36%	12.2
8	1928	Amsterdam	Netherlands	46	33	2883	327	71.74%	11.3
9	1932	Los Angeles	United States	37	27	1334	346	72.97%	25.9
10	1936	Berlin	Germany	49	32	3963	388	65.31%	9.8
11	1948	London	United Kingdom	59	37	4104	411	62.71%	10.0
12	1952	Helsinki	Finland	69	43	4955	459	62.32%	9.3
13	1956	Melbourne	Australia	72	38	3314	469	52.78%	14.2
14	1960	Rome	Italy	83	44	5338	461	53.01%	8.6
15	1964	Tokyo	Japan	93	41	5151	504	44.09%	9.8
16	1968	Mexico City	Mexico	112	44	5516	527	39.29%	9.6
17	1972	Munich	West Germany	121	48	7134	600	39.67%	8.4
18	1976	Montreal	Canada	92	41	6084	613	44.57%	10.1
19	1980	Moscow	Soviet Union	80	36	5179	631	45.00%	12.2
20	1984	Los Angeles	United States	140	47	6829	688	33.57%	10.1
21	1988	Seoul	South Korea	159	52	8397	739	32.70%	8.8
22	1992	Barcelona	Spain	169	64	9356	815	37.87%	8.7
23	1996	Atlanta	United States	197	79	10318	842	40.10%	8.2
24	2000	Sydney	Australia	199	80	10651	927	40.20%	8.7
25	2004	Athens	Greece	201	74	10625	927	36.82%	8.7
26	2008	Beijing	China	204	87	10942	958	42.65%	8.8
27	2012	London	United Kingdom	204	86	10568	959	42.16%	9.1
28	2016	Rio de Janeiro	Brazil	207	86	11238	973	41.55%	8.7

TPC: Total Participating Countries; TCWM: Total Countries Winning Medals; TNA: Total Number of Athletes; TNMA: Total Number of Medals Awarded per 100 participating athletes.

The literature has examined the costs and benefits of both bidding and hosting cities/countries. However, this is a very small issue of what is at stake at the Olympic Games. The number of participating countries and the number of

participating athletes is more important. After all, the tremendous publicity of Olympic Games is not because a specific city hosts the games but because all around the world people want to see their country's flag and athletes proudly parading at the opening and closing ceremonies which by no means can be considered as sport contests. They nevertheless attract huge attendance and media publicity.

The number of athletes participating at the Olympic Games per country is not equally distributed. Tables 2 and 3 report summary statistics of the number of athletes per country who participated at the last 2016 Olympic Games, and 21 categories in terms of the number of participating athletes, respectively.

Table 2. *Measure of Summary Statistics*

Measure	**Total Number**
Total Number of Countries/Groups	207
Total Number of participating athletes*	11238/11249
Average number of athletes per country	54
Median number of athletes per country	10
Maximum (USA)	552
Minimum (Tuvalu)	1
Standard Deviation	95.28
Skewness	2.85
Kurtosis	11.34

*The official figure reported by the IOC is 11238 (see Table 1). However, the IOC does not report participating athletes by country. The unofficial figures found from various sources by country when they add up to 11249; a discrepancy of 11 athletes. The 207 includes the independent and refugee Olympic athletes.

On average, the number of participating athletes per country was 54 athletes and the median was only 10 showing a strong positive skewness (2.85). The distribution is far from normal as this is indicated by the high value of kurtosis (11.34). As shown in Table 3, five countries sent more than 400 athletes. However, 56% of participating countries sent less than 20 athletes. Even though the number of athletes a country sends to the Olympics depends on a number of variables such as a population and the economy, the inequality of representation remains the same if the number of athletes is divided by the population of the country or each country's Gross Domestic Product.

It seems that other variables play a more important role in degerming the number of athletes who are participating at the Olympic Games representing a specific country. One such variable is its tradition or past experiences with participation in such mega sports events. This relates very much to the emphasis of this paper of developing a human sports capital which is made of athletes who have a participating experience. The higher the number of past participants, the higher the number of athletes a country will send to participate at future Olympic Games.

Table 3. *Group of Participating Countries by the Number of Participating Athletes*

Number of Athletes	Countries	Percent	Cumulative Count of Countries	Cumulative Percent
[0, 20)	116	56.04	116	56.04
[20, 40)	26	12.56	142	68.60
[40, 60)	17	8.21	159	76.81
[60, 80)	6	2.90	165	79.71
[80, 100)	8	3.86	173	83.57
[100, 120)	8	3.86	181	87.44
[120, 140)	5	2.42	186	89.86
[140, 160)	3	1.45	189	91.30
[180, 200)	1	0.48	190	91.79
[200, 220)	3	1.45	193	93.24
[220, 240)	1	0.48	194	93.72
[240, 260)	1	0.48	195	94.20
[260, 280)	1	0.48	196	94.69
[280, 300)	1	0.48	197	95.17
[300, 320)	2	0.97	199	96.14
[320, 340)	1	0.48	200	96.62
[360, 380)	1	0.48	201	97.10
[380, 400)	1	0.48	202	97.58
[400, 420)	2	0.97	204	98.55
[420, 440)	1	0.48	205	99.03
[460, 480)	1	0.48	206	99.52
[540, 560)	1	0.48	207	100.00
Total	207	100.00	207	100.00

The conclusion which emerges from this section descriptive analysis is that the majority of the participating countries (60%) and participating athletes (over 90%) did not win a single medal. With very few exceptions, most of participating countries and athletes knew in advance that they had no chance of winning a medal. Thus, the question arises: why did they participate? Of course, the answer is the joy of participation. It is a consumption good. They get satisfaction. But it may be more than that. It may be considered as an investment in human capital which if it is used effectively and efficiently it might promote public policy objectives such as youth and grassroot sport participation. However, this is an empirical question at the country level. An outline of such an empirical analysis is provided in the following section of the paper.

An Outline of an Empirical Approach

The traditional methods used to evaluate the bidding/hosting of Olympic Games and the participation to them when the objective is to win more medals must be adjusted to explain why countries with no hope of winning medals do participate. The cost of participating is (a) the monetary costs of training a national

Olympic team all previous years and the cost of sending the team to compete during the days of the games; and (b) the non-monetary cost of failing to win a medal. The latter non-monetary costs depend very much on the expectations of participation which are shaped by the national sports policy and of course the national media. Raising expectations beyond any logical reason is doomed to bring disappointment after the games. Similarly, overreacting with joy after an unexpected success might raise citizens' expectations of similar and more successes at future Olympic Games. Thus, the second cost relates very much to the strategy of public sports policy. If citizens are well educated starting as early as during their elementary school years along the lines that participating in sports is not only winning but constitutes an end in itself, then the very fact of participation is a measure of success.

Thus, how many athletes participate at Olympic Games under one flag is an important measure of success. This explains then why an increasing number of countries send an ever-increasing number of their athletes to Olympic Games even though they have no chance to win a medal. One possible answer may come from the human capital approach. If we assume that sports amateur and professional participation provides benefits beyond the direct consumption utility of the joy that sports provide to each individual and contributes to health and wellbeing as this has been demonstrated by many studies, then athletes who participated in previous Olympic Games become the human capital in a production function which provides more and better sports services. In addition, previous participants to Olympic Games become a strong marketing tool to promote youth and grassroot participation in the various sports activities. It is not an accident that big multinational companies use athletes to promote their products and services which have no relation to sports. Similarly, as part of national promotion of sport participation at the grassroot level and youth age, participants to previous Olympic Games can be used to promote participation.

This can be empirically tested by examining how participants in previous Olympic Games have been used by national authorities to promote national sports policy objectives. In some cases, it may promote more general policy objectives using sports as an example. Thus, participation alone without medals may bring benefits to national authorities if the experience of these athletes is appropriately used to promote public policy objectives. Thus, the researcher may examine to what extent previous athletes have been used by directly looking at the post-Olympic career of previous participants to Olympic Games. In addition, such studies will reveal the best approach of exploiting the human capital embedded in all athletes who competed in Olympic Games.

These empirical studies can be similar to the study of Cabralis et al. (2018). They examined what happened to graduates of a course-programme offered by the Trinidad & Tobago Olympic Committee (TTOC). This paper here proposes similar empirical studies which will have as their subject of investigation previous participants to Olympic Games. As with the study of Cabralis et al. (2018), the proposed empirical studies should look at (a) the current position of previous athlete participants; (b) their educational and in general knowledge background; (c) the relation of their Olympic experience to their current position; (d) what were

the skills obtained by participating at the Olympic Games that they found useful in their present involvement; (e) what additional educational and knowledge resources would have been useful; (f) the history of their professional career after the athlete career was over; (g) the main obstacles; and (h) their recommendations in maximizing the human capital use of previous athletes for forming a national strategic sports policy.

Conclusions

Research on Olympic Games has been focused on bidding/hosting this mega event and determining the success in winning medals. In this paper an argument has been raised to examine another area which relates to the decision made by countries and athletes to participate despite the fact that the probability of success in winning medals or bidding and hosting one of future Olympic Games is not different from zero. Of course, participation may be explained by the utility derived from the joy of being there but this applies more to the individual athlete and not so much to the participating country. There must be something more which may explain this huge urgency to participate. One possible explanation emphasized in this paper is the development of human capital by participating at Olympic Games. Countries and athletes may use their participation to promote youth and grassroot community participation in sports as well as in other activities. This is a testable hypothesis. Thus, future research may look at how athletes who participating at previous Olympic Games have used this experience to produce benefits for themselves and their countries.

References

Baade RA, Matheson VA (2016) Going for the gold: the economics of the Olympics. *Journal of Economic Perspectives* 30(2): 201–218.

Bakkenbüll L-B, Dilger A (2020) Willingness to pay and accept for hosting Olympic Games in Germany. *Athens Journal of Sports* 7(3): 189–204.

Cabralis S, Foo C, Schaefer G (2018) Where are they now? – A review of the Trinidad & Tobago Olympic committee sports administrator courses. *Athens Journal of Sports* 5(1): 53–68.

Costas BP (2017) Sinking, swimming or just treading water. The Olympic legacy from London 2012 – 4 years on. Has it made any difference? Pupil voice and an analysis of swimming provision. *Athens Journal of Sports* 4(1): 35–52.

Dardanoni V, Guerriero C (2021) Young people's willingness to pay for environmental protection. *Ecological Economics* 179(Jan): 10685.

Diamond PA, Hausman JA (1994) Contingent valuation: is some number better than no number? *Journal of Economic Perspectives* 8(4): 45 – 64.

Hausman J (2012) Contingent valuation: from dubious to hopeless. *Journal of Economic Perspectives* 26(4): 43–56.

Himmler S, van Exel J, Brouwer W (2020) Estimating the monetary value of health and capability well-being applying the well-being valuation approach. *The European Journal of Health Economics* 21(8): 1235–1244.

Hsu K-C (2020) House prices in the peripheries of mass rapid transit stations using the contingent valuation method. *Sustainability* 12(20): 8701.

Humphreys BR, Johnson BK, Whitehead JC (2020) Validity and reliability of contingent valuation and life satisfaction measures of welfare: an application to the value of national Olympic success. *Southern Economic Journal* 87(1): 316–330.

Kasimati E (2003) Economic aspects and the summer Olympics: a review of the related research. *International Journal of Tourism Research* 5(6): 433–444.

Kasimati E (2015) Post-Olympic use of the Olympic venues: the case of Greece. *Athens Journal of Sports* 2(3): 167–184.

Keeler BL (2020) Mainstream and heterodox approaches to water quality valuation: a case for pluralistic water policy analysis. *Annual Review of Resource Economics* 12(1): 235–258.

Kling CL, Phaneuf DJ, Zhao J (2012) From Exxon to BP: has some number become better than no number? *Journal of Economic Perspectives* 26(4): 3–26.

Lissner I, Mayer M (2020) Tourists' willingness to pay for Blue Flag's new ecolabel for sustainable boating: the case of whale-watching in Iceland. *Scandinavian Journal of Hospitality and Tourism* 20(4): 352–375.

Máté T (2018) Social impacts of international sport events – Based on experiences from European youth Olympic festival 2017 Győr. *Athens Journal of Sports* 5(3): 227–242.

Ortiz J, Ando M, Miyazaki T (2020) Numerical simulation of wind drift of arrows on the Olympic venue for Tokyo 2020. *Athens Journal of Sports* 7(1): 1–20.

Papanikos, G.T. (2003) *Αναπτυξιακές επιδράσεις των Ολυμπιακών Αγώνων του 2004: μεταολυμπιακή αξιοποίηση των υποδομών και του εξοπλισμού*. (The development effects of the 2004 Olympic games: post-Olympic use of infrastructure and equipment). Retrieved from: http://www.atiner.gr/gtp/GGOA_Periexomena.pdf. [Accessed 12 November 2020]

Stefani R (2017) Kinesiology analysis of athletics at the ancient Olympics and of performance differences between male and female Olympic champions at the modern games in running, swimming and rowing. *Athens Journal of Sports* 4(2): 123–138.

Wiśniewska A, Budziński W, Czajkowski M (2020) An economic valuation of access to cultural institutions: museums, theatres, and cinemas. *Journal of Cultural Economics* 44(4): 563–587.

Ziakas V, Boukas N (2014) Post-event leverage and Olympic legacy: a strategic framework for the development of sport and cultural tourism in post-Olympic Athens. *Athens Journal of Sports* 1(2): 87–102.