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The Usefulness of "Hybrid Unit" Goal-based Learning on Physical Education

Focusing on the practice of tag rugby, handball, and basketball in junior high schools

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Abstract: The purpose of this study was to address a motor learning program consisting of "hybrid units" and to clarify the usefulness of the learning sequence and arrangement by analyzing the common movement patterns among various athletic activities . Then, we conducted empirical lessons of two units: tag rugby-handball and handball-basketball. Results showed that "forming a line in a defense" and "passing effectively in an attack" are common ways of moving. In addition, it was found that both defensive and offensive movements became progressively more complex and could be studied in a developmental sequence.

1. Introduction

When conducting a unit on ball games and goal-type activities in physical education classes in junior high school, which events should be selected? Additionally, how will they set up the events as the school year progresses? The annual number of required class hours depends on the content of the unit, but generally speaking only approximately 12 hours are available for one unit. Therefore, physical education teachers are expected to promote effective learning within a limited time period. In addition to improving students' motor skills and physical fitness, physical education classes are expected to nurture the qualities and abilities needed to realize a lifelong, rich sports life. To achieve this goal, what kind of class improvements are necessary? Using these questions as a starting point, I decided to conduct an actual class practice.

The Courses of Study for Junior High School were revised in March 2017 and will be fully implemented in 2021. The revision includes a review of the content of instruction based on a systematic approach over the 12-year period from elementary school to high school (Ministry of Education, Culture, Sports, Science, and Technology, 2017). Ball games are classified into three types: goal-type, net-type, and base-ball-type. In terms of content, while the athletic activities to be covered in each type are indicated, the order and sequence in which they are to be studied are not clearly indicated. Regarding the learning of ball games, Shimizu (2016) stated that even though three types are typical, the relationship between the scope and sequence of each type needs to be studied and clarified in order to provide effective instruction. In addition, Hirose (2002), posited

that learning transfer between basketball, handball, soccer, and rugby in junior high school and high school is possible and should be required for the study of ball movement. In light of the above, it is important to examine the usefulness of the sequence and arrangement of lessons in order to improve lessons for effective learning and use of the limited time available in a unit. However, there are very few practical examples of organized learning of ball games, particularly goal-type events, and there are no reports of effective learning sequences and arrangements. In this study, the first step was to create a learning program that combines two disciplines into a single lesson unit in the goal-type domain. In this study, we decided to conduct an empirical lesson by defining this as "hybrid unit" learning. By analyzing the "form of movement" that is common among the sports, we decided to proceed with the research with the aim of clarifying the usefulness of the sequence and arrangement of goal-based learning.

2. Research Procedures

2.1. Date and subject

【Unit Ⅰ】

From early November to mid-December 2019, we conducted an experimental class with 60 first-year male students (39 lectures in Class AB and 21 lectures in Class C) of Fukuyama Junior High School attached to Hiroshima University.

【Unit Ⅱ】

From the beginning of November to mid-December 2020, we conducted an experimental class for 60 second-year male students of Fukuyama Junior High School attached to Hiroshima University (40 students in Class AB and 20 students in Class C).

In addition, Units I and II were conducted with the same students. However, due to the recombination of members in the course, the number of members of Classes AB and C is not the same in each unit.

2.2. Analysis methods

What is considered to be the "form of movement" that we focus on in this experimental class? According to Sato and Urai (1997), the "form of movement" refers to certain movements that are indispensable for learning and developing the "form of the game" in ball games. Therefore, it was considered necessary to measure the results and effects of learning from the unit of composition in which tactical learning is the main subject.

After the completion of each program in both Units I and II, the students' free-response answers were obtained concerning their understanding of the common way of moving. Then, the following items were analyzed to clarify the usefulness of the sequence and arrangement of the "hybrid unit" learning in the goal type.

① Descriptions of common movement patterns in tag rugby and handball

② Descriptions of common ways of moving in handball and basketball

We used the text mining tool UserLocal (https://textmining.userlocal.jp/) to analyze the text data

obtained by the description. In this study, frequent words and co-occurring relationships were expressed and analyzed for further discussion.

3. Learning program

3.1. Classification of Goal Types and Learning Sequence

First, the characteristics and classifications of goal-type disciplines were organized to aid in the discussion of the characteristics and classification of goal-type events. Tag rugby is classified as a "position-grabbing event" among the goal-type events listed in the Courses of Study, while all other goal-type events are "ball-carrying and target-placement events" (Table 1). On the other hand, Sato and Urai (1997) described goal-based games as "enemy breakthrough type" games in which the "form of movement" of attacking tactics to break through the enemy's camp and the "form of movement" of defending tactics to stop them directly confront each other, and they can be divided into those with and without "physical interference" (Table 2). Based on the above, we devised a program in which students play tag rugby (a game in which they take a position) as the first unit of goal-based learning, followed by handball (a game in which they have to carry the ball and make it into a target); in tag rugby, dribbling is not permitted (Hayasaka, 2018).

Table 1 Classification of goal types

(created from Hirose 2019)

Ball-carrying and target-placement events	Position-grabbing event
Basketball Handball Soccer	Tag Rugby※

※Students can take courses according to the actual situation of their school or community.

Table 2 Classification of goal type

(enemy breakthrough type)

(Created by Sato and Urai, 1997)

With physical interference	Without physical interference
Handball Soccer Tag Rugby※	Basketball

※Students can take courses according to the actual situation of their school or community.

Tag rugby is a game in which the player moves the ball toward the opponent's position, primarily by passing. In other words, compared to other goal-based disciplines, the skill elements for playing the game are simpler. Therefore, we decided to use tag rugby as the starting material for goal-based learning. The reason we chose handball as the next teaching material is that tag rugby and handball both entail a form of physical obstruction (Table 2) and are played by handling the ball with hands. In the second unit, we devised a program to transition from a handball (with physical interference) to a basketball (without physical interference). Although there are similarities between handball and basketball in that the ball is handled with the hands, they differ in the presence or absence of physical interference. Therefore, we hypothesized that the change in the rule of physical obstruction from "yes" to "no" would create the skill elements necessary to make the game play more complex, which would lead to developmental learning, and decided to combine the two disciplines.

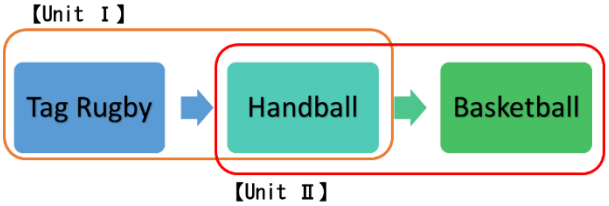

Fig.1 Goal-oriented "hybrid unit"

Based on the above arrangement of goal-based events, we decided to devise two "hybrid unit"

learning programs (Fig. 1).

3.2. Learning sequences and unit plans

In the Guidelines for the Course of Study, goal-type skills are shown as "ball manipulation" and "movement without the ball." Among them, an example of "movement without the ball" is "movement such as running into a space." However, according to Mori (2019), the acquiring knowledge of ball games involves not only "learning of skills" but also "learning of judgment". This may be because the skill of manipulating the ball is a means to learn ball games, and the actual purpose is to compete in games. Therefore, it is suggested that we replace the goal-type skills indicated in the Courses of Study as "ball manipulation" with "technical learning" as the main focus, and "movement without the ball" with "judgment learning" as the main focus. In goal-based learning, along with "learning skills," students need to engage in "learning judgment," in which they actually make their own decisions and move, such as running into a certain space. Miwa et al. (2011) confirmed that ball game skills are a combination of technical and tactical skills, and that insulating one or the other will not lead to improvement. Therefore, goal-based learning should have a balanced composition of both skill learning and judgment learning. This leads us to ask, "How much of the learning should consist of learning of skills and learning of judgment?" The theory of the "tactical approach" (Griffin et al., 1999) can be used to answer this question. This approach suggests that by linking skills and tactics, students can learn the game and improve their performance. In other words, the aforementioned "learning to make decisions" includes tactical learning. Thus, we thought it effective to construct a unit that incorporates the necessary "learning of skills" according to the proficiency level while working on the "learning of decisions" (Fig. 2).

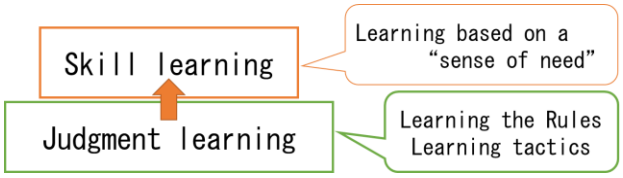

Fig 2 Conceptual diagram of goal-based learning

Next, we discuss the content and arrangement of lessons. In fact, we decided to structure the content of the "learning of skills" with skill improvement drills and the "learning of judgment"' with task games to improve their skills. According to Nagamine (2015), by having students play back and forth between task and drill games, it is possible to develop lessons that are successful in improving individual skills. Therefore, we set up an array in which both skill-up drills and task games were conducted in each hourly class, followed by the main game. First, for skill improvement drills, we devised and implemented a program in which the minimum elements necessary for playing the games were selected as the characteristics of each event. The details of the actual content of these programs are presented later. Next, regarding task games, Miwa et al. (2011) stated that they were able to improve children's ball game skills, i.e., ball manipulation and movement without the ball, in an integrated manner by considering "easy games" and "simplified games", with competitive objectives and tasks of goal-type games based on children's actual conditions, and by creating teaching plans and implementing them. In addition, Saito (2014) examined game performance in relation to the number of players in a basketball game and found that students' awareness (self-evaluation) of positioning increased when the number of players was reduced. Based on these

suggestions, we decided to play the task game by increasing the number of players step by step from a small number of players, starting with one-on-one games and moving to two-on-two games, which would eventually lead to the main game. Finally, the main game is arranged in a sequence that starts with defensive tasks and leads to offensive tasks. Based on the aforementioned "tactical approach" (Griffin et al., 1999), the task setting can be divided into two phases: attack and defense. In addition, Mori (2016) states that defensive learning is also necessary to develop game aspects, and that defending does not require proficiency in ball-handling skills and can often be done quickly with intention. Based on the above ideas, we decided to set up the main game learning model as one that shifts the task from defense to attack while relating it to the aforementioned task game.

Based on the above ideas, we created a unit plan (Tables 3 and 4).

Table3　Unit plan【Unit　I 】

Rounds	Event	Lessons	Study Contents
1	Tag Rugby	Guidance① Team Organization Skill-up Drill Guidance	• Goal setting, Class explanation • Grouping (Role assignment) • Run&Pass, 1-on-1 Breakdown 1-on-2 Defense
2 ∫ 3		Skill-up Drill Task Games Adaptation Games (5-on-5)	 • 1-on-1(On the ball) 2-on-2(Off the ball) • Walking Game(Checking the rules)
4 ∫ 7		Skill-up Drill Task Games Main Games	 • 2-on-2 (Off the ball) 5-on-3(Match up) • 5-on-5
8		Reflection① Guidance② Skill-up Drill Guidance	• Reflection on how to move in tag rugby • Goal setting, Class explanation • Catch&Throw, Shots Penetration Games
9 ∫ 10	Handball	Skill-up Drill Task Games Adaptation Games (5-on-5)	 • Half court 1-on-1 (On the ball) Half court 2-on-2 (Off the ball) • Walking Game(Checking the rules)
11 ∫ 13		Skill-up Drill Task Games Main Games	 • Half court 2-on-2 (Off the ball) All court 4-on-4 (Cooperation) • 6-on-6
14		Reflection②	• Reflection on how to move in handball Reflection on common ways of moving

Table 4　Unit plan【Unit Ⅱ】

Rounds	Event	Lessons	Study Contents
1	Handball	Guidance① Team Organization Skill-up Drill Guidance	• Goal setting, Class explanation • Grouping (Role assignment) • Catch&Throw, Shots Penetration Games
2 ∫ 3		Skill-up Drill Task Games Adaptation Games (5-on-5)	 • Half court 1-on-1 (On the ball) Half court 2-on-2 (Off the ball) • Walking Game (Checking the rules)
4 ∫ 6		Skill-up Drill Task Games Main Games	 • Half court 2-on-2 (Off the ball) All court 4-on-4 (Cooperation) • 5-on-5
7		Reflection① Guidance② Skill-up Drill Guidance	• Reflection on how to move in handball • Goal setting, Class explanation • Shot, Dribbling vs. Defense 1-on-1 Rebounding
8 ∫ 9	Basketball	Skill-up Drill Task Games Adaptation Games (5-on-5)	 • 1-on-1 Under the goal (On the ball) All court 2-on-2 (Off the ball) • Walking Game (Checking the rules)
10 ∫ 13		Skill-up Drill Task Games Main Games	 All court 2-on-2 (Off the ball) Half court 3-on-3 (Cooperation) • 4-on-4
14		Reflection②	• Reflection on how to move in handball Reflection on common ways of moving

3.3. Actual tag rugby lessons

In tag rugby, "tags" are necessary as teaching tools. However, the general tags sold on the market are long and thin, and it was thought that there were many cases in which students failed to take the tags even though they could reach them in the actual game. We were concerned that this would lead to many situations where aggressive students would be able to break through and score. Therefore, we created a larger tag (Fig. 3), a 30 cm square piece of cloth with Velcro attached, to make it easier and give the defenders an advantage as the tags could be grabbed from various angles, such as from the front or back, thus reducing the impact of the aforementioned concerns. The next was the court setting. The main game was set at 5-on-5, and the width of the court had to be appropriately determined. If the court is too narrow, it is difficult to break through, and if it is too wide, there is a large space that can be easily

Fig 3　Tag Rugby teaching tool

penetrated. We thought it was important that the game should be a developing game with repeated conflicts between offense and defense. According to the practical example of Mori (2019), the appropriate width is "reach x 2 x number of players" and the appropriate height is "width x 2.5." Based on this, the width was set with the reach set at approximately 160 cm (Fig. 4). The height was slightly shortened owing to the size of the schoolyard.

Fig 4　Tag Rugby court setting

Finally, there is the "learning of skills," which we considered to be the minimum requirement. We tried to improve individual skills with skill improvement drills, as shown in the unit plan (Table 3). In tag rugby, it is important to catch the ball securely to develop a pass. Therefore, drills were conducted to catch the ball while running by "run" and "pass." We also considered tagging (or being tagged) as a necessary skill for the game. Therefore, drills such as "1-on-1 breakdown" (Fig. 5) and "1-on-2 defense" were conducted. The task for the defenders was to immediately place the taken tag on the ground, while the attackers had to immediately stop and turn their bodies to face the rear of their teammates.

Fig 5　1-on-1 breakdown

3.4. Actual handball lessons

For the main game, we decided to play 6 vs. 6 (including one keeper) in Unit I, which was a transition from tag rugby to handball, and 5 vs. 5 (including one keeper) in Unit II, which was a transition to basketball. We thought that by matching the number of players in each unit, the students would be able to learn the shapes of the movements. In order to reduce the number of players compared to a normal game, the court setting was also set to a smaller size than usual (30m long and 15m wide), with the aim of increasing the opportunity to touch the ball and using more space (Fig. 6 Fujimoto et al., 2017).

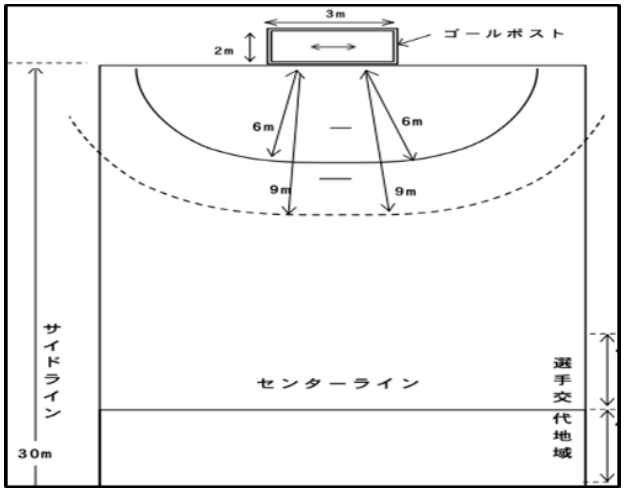

Fig 6　Handball court setting

Then, in the "learning of skills" section, we considered that a characteristic skill in the

aforementioned "disciplines with ball-carrying and target-placement tasks" (Hirose, 2019) was target-placement shooting. Therefore, in the handball games, we drilled the action of throwing the ball with one bounce while adding jumps and steps. In addition, we had students work on catching the ball and throwing it immediately (Catch and Throw), which was developed from tag rugby. Finally, a "Penetration Game" was played to improve individual skills, including "learning to judge" (Fig. 7). This is a game of penetration (or blocking penetration) within the 6 m line, played with the same tags used in tag rugby. The aim of this drill was to learn how to move without the ball, such as moving into a space or creating a space for a teammate.

Fig7　Penetration Game

3.5. Actual basketball lessons

The main game of basketball was played with one less player than the usual number of players: 4 vs. 4. Saito (2014) found that students' awareness of positioning (self-evaluation) increased when the number of players was reduced in a basketball game. On the other hand, the size of the court was not reduced as in the aforementioned handball game, but remained at the normal size of the court. Therefore, we thought that making the main game on a regulation court with a small number of players would facilitate space creation and utilization and make role recognition easier to understand.

Fig 8　Dribbling vs. Defense

Fig 9　1-on-1 Rebounding

As for the "learning of skills," we first set up shooting as we did in handball. In basketball shooting, the control required to get the ball into the hoop is more important than the speed and strength needed in handball shooting. We thought that repeating this point as a drill would become a skill that could be utilized in games. In addition, we considered dribbling and rebounding as necessary elements in the game of basketball. Therefore, we conducted drills such as "Dribbling vs. Defense" (Figure 8) and "1-on-1 Rebounding" (Figure 9). We thought that dribbling and rebounding in the presence of defenders would help students acquire skills that could be used in games.

4. Results and Discussion

4.1. Tag Rugby and Handball

We analyzed the free-text responses regarding the movement styles common to tag rugby and handball. From the responses obtained, the words that appeared were, in order of greatest frequency, "line," "pass," "make," and "defense" (Table 5). The words that co-occurred with these frequent words are shown in Figure 10. In the case of "line," the word that appeared most frequently, the words "make" and "awareness" were co-occurring. Next, in "pass," the words "friend" and "turn" appeared in a co-occurrence relationship. In the case of "defense," the words "switch," "opponent," and "mark" appeared in a co-occurrence relationship.

Table 5　Number of appearances

[Tag Rugby-Handball]

Word	Number of Appearances
line	51
pass	38
make	23
defense	20

We will summarize what we have learned from the above results by dividing them into defensive and offensive movements. First, the students understood that the common way to move in defense was to prevent the opponent from breaking through by forming a line. In fact, many students wrote, *"The part where you defend with the line in mind."* In the case of tag rugby and handball defense, the line became a clue for the students to understand how to move. It can be said that they were able to learn how to move and defend in cooperation with their friends. On the other hand, in the attack, there were responses such as *"passing and cooperation among friends"* and *"connecting passes to advance"*.It turned out that they understood that the common way of moving was to pass effectively among teammates to formulate attacks.

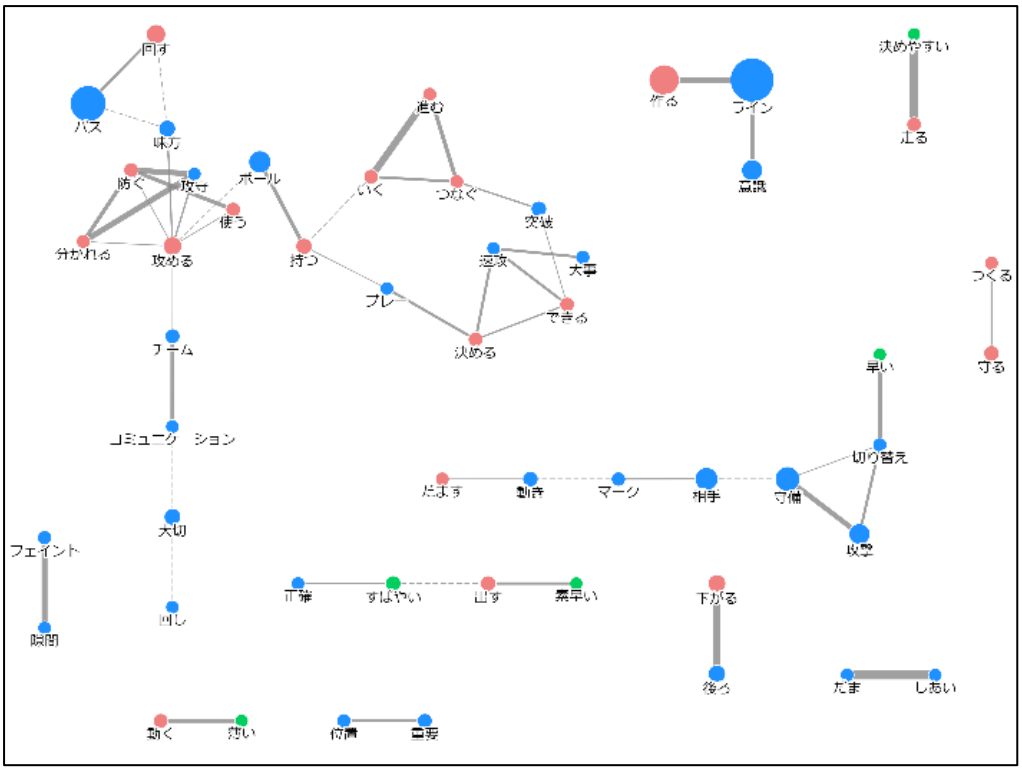

Fig10　Co-occurrence network [Tag Rugby-Handball]

From the above discussion, it can be shown that the common way of moving in tag rugby and handball is "to form a line in defense" and "to pass effectively in attack." In the defensive movement, it was possible to find a commonality in the way of moving in cooperation with friends in order to prevent the opponent from entering. It was also found that the formation changed from a straight line in tag rugby to a curve along the 6m line in handball. However, in the attack, it was found that the common movement method was to pass effectively to break through the aforementioned defensive formation.

4.2. Handball and Basketball

The same kind of analysis was conducted for the movement styles common to handball and basketball. The words that appeared most frequently in the descriptions were, in order of frequency, "line," "defense," "pass," and "make" (Table 6), and the co-occurrence relationship between these frequently occurring words shows that the words "defense" and "make" are associated with "line." We also saw the association of the words "turn," "attack," and "break down" with "pass" (Figure 11).

Table 6　Number of appearances [Handball-Basketball]

Word	Number of Appearances
line	25
defense	24
pass	24
make	22

From the above results, it was found that handball and basketball have similarities in the way players move in the defensive phase, as described above. Students wrote, "*As soon as the ball is passed to the opponent, I form a defensive formation*" and " *Be aware of the line formation, although the form is different*." It was found that using the word "line" and defending in cooperation with

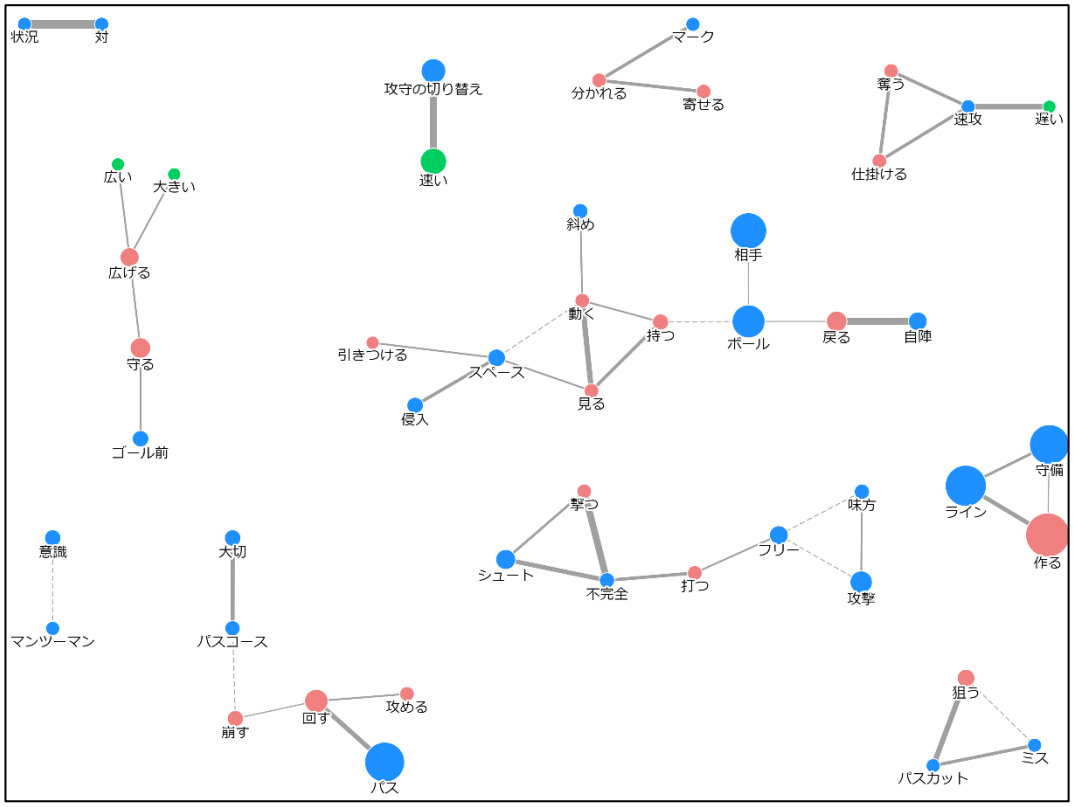

Fig11　Co-occurrence network [Handball - Basketball]

friends is a common way of moving. As for the shape of the "line," it was seen that in handball, the formation was a curve along the 6 m line, but in basketball, the line was connected and the formation changed to a triangle. On the other hand, in terms of attacking moves, students wrote *"Break down the opponent's defense with passing"* and *"Advance with aggressive passing"*. It was clear that the students understood that the common way of moving was to formulate an attack by passing effectively between teammates, similar to the unit on tag rugby and handball.

In summary, it can be said that the common movement styles of handball and basketball, as in the units of tag rugby and handball, is "to form a line formation in defense" and "to pass effectively in an attack." However, the defensive line formation changed from a curve along the 6m line in handball to a triangle-like line in basketball. This shows the process of shifting from straight and curved line formations, in which the movements were mainly in front and to the sides, to more developed and complex movements, in which the movements were extended to 360° in front, back, left, and right.

4.3. Usefulness of hybrid-unit learning

In this study, we devised a "hybrid unit" learning system that combines two goal-type events in one unit (from tag rugby to handball and from handball to basketball) and conducted an empirical lesson on its usefulness. The order of learning was based on the suggestions of previous studies on the classification of goal types. In addition, the sequence of the drills and the task games were conducted in a back-and-forth manner every hour, and the drills were selected from those that were considered to be the minimum necessary to play in each event. In the task game, the number of players was increased step by step to lead to the main game, and the main game was set up to lead from defensive movement tasks to offensive tasks.

From the above empirical lessons, it was found that forming a line in a defense and passing effectively in an attack were common ways of moving. In the case of defensive movements, the formation became a straight line in tag rugby, followed by a curve in handball. In basketball, the formation changed to a triangle-like line (Fig. 12). This indicates that the range of defensive actions has gradually expanded from mainly the front and sides in tag rugby to include a little bit of the rear in handball, and then to 360 degrees in basketball. In basketball, the range was gradually expanded to 360° from front to back and left to right. Therefore, it can be said that the process of movement became more complicated, and the sequence of learning was shown to be more developed. In addition to the development of defensive moves, the idea of conflict between offense and defense suggests that there was a similar gradual development of attacking moves that evolved into more complex moves for effective passing.

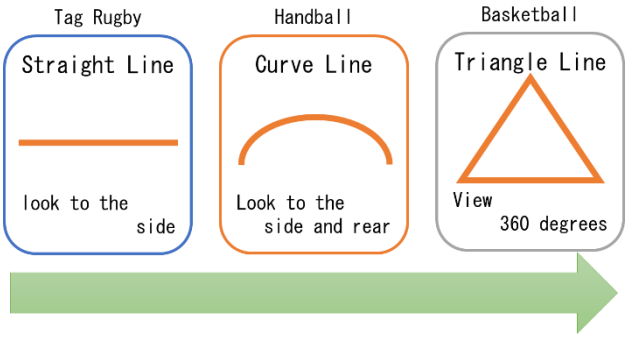

Fig12 Changes in the formation of defense lines

It can be said that the hybrid-unit learning in this study was a learning process that was developed

step by step by finding commonalities in the movement styles of different disciplines. This means that although most of the "learning of skills" in each discipline is unique, commonality can be found in the "learning of judgment," and there is great significance in learning to relate them. Therefore, it can be said that this hybrid-unit learning is a useful method for improving classes from the dual viewpoints of effective learning in a limited class time and fostering a rich sports life by experiencing a large number of events.

5. Conclusion

In this study, we devised a "hybrid unit" learning method in which different events are "combined" in a single unit of goal-based learning, and conducted an empirical lesson. The purpose of this study was to clarify the usefulness of the sequence and arrangement of goal-based learning by analyzing common movement patterns among disciplines.

From the above empirical lesson practice, it was found that "forming a line formation in defense" and "passing the ball effectively in attack" were the common ways of moving. In both the defensive and offensive phases, the students were able to learn in a developmental sequence, as they gradually moved to more complex movements. It was found that the commonality in the "learning of judgment" of each discipline was significant for the learning to be related step by step. The results suggest that hybrid-unit learning is a useful method for improving classes, both from the perspective of effective learning in a limited class time and from the perspective of fostering a rich sports life by experiencing a large number of events.

The present study is an empirical lesson combining three goal-type events, but should be further verified by adding other events. In the future, it will be necessary to compare the effectiveness of the learning sequence by combining not only goal-type events but also other types of ball games and events in other domains.

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