

The Impact of Manabiai in Physical Education Swimming Classes

—Focusing on the Elimination of Polarization of Performance through Students' Skills
in the Vicinity—

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Abstract: Century 10.5P Our study addressed the effect of applying manabiai in swimming classes. In conclusion, the following three points were clarified: (1) dialogue among students was serving to fulfill the relationship of "teaching" - "being taught," (2) improvement in skills through interactive activities was conspicuous and had a great influence on the resolution of polarization of exercise capacity, and (3) the learning strategies of manabiai can be performed efficiently among students and individually necessary guidance.

1. Introduction

Recently in Japan, some attention has been paid to issues concerning physical education (PE) in schools, such as children's lower physical fitness levels compared to past years and the "polarization of exercise capacity"—the separation of children who can exercise from those who cannot. The opportunity for exercise outside of school and the presence or absence of exercise habits in particular have caused polarization with regard to these issues (Ministry of Education, Culture, Sports, Science and Technology, 2012). In contrast, physical education departments within schools play a major role in reducing polarization.

Useful practices have been developed to help solve these issues in various exercise fields. However, the sport of swimming in PE is distinct, with a large difference in student proficiency levels (Hamagami, 2017; Oda et al., 2014). Furthermore, the difference in skill level is a major factor for creating a dislike of swimming (Nakano et al., 2004). Therefore, it is urgent to devise new learning content ideas for swimming lessons and improve teaching methods to eliminate the polarization of ability to exercise in swimming class.

For instance, it is important for students to adapt cooperative learning as a few strategy, which could help solve polarization of exercise capacity in swimming class. Cooperative learning is defined as a teaching method utilizing small groups of students who work on tasks together to maximize their mutual learning (Johnson et al., 2010). In addition, the aim of collaborative learning as the academic ability, it is necessary to consider "self-directed and autonomous study of learning, reliable wide intellectual acquisition, interpersonal skills that can head towards problem solving

with fellows, and democratic attitude" (Sugie, 2011). Moreover, cooperative learning strategies are normally intentionally incorporated into the class by PE teachers. Thus, learning outcomes of cooperative learning in physical education have been found to be able to predict not only exercise capacity but also ability to understand tactics and communication skills (Dyson et al., 2004). In this way, useful reports and research on cooperative learning have proven its learning effects.

One of several theories of cooperative learning seen in Japan is manabiai (Nishikawa, 2016). Nishikawa advocated manabiai as a learning strategy in which students achieve tasks that contribute to an overall goal through dialogue among learners. A major feature of manabiai is the idea that "everyone will achieve" by the end of the lesson. We hypothesized that this approach could contribute to the elimination of polarization of physical capacity in swimming class. However, few studies have applied manabiai to PE lessons, and there has been no research focusing on swimming classes in particular.

2. Purpose

Our study addressed the effect of applying manabiai in swimming classes. To do so, we posed the following two research questions:

- (1) How will students' learning outcomes be influenced by swimming classes applying manabiai?
- (2) Can students who are polarized because of their exercise capacity become more integrated into swimming class through manabiai practice?

3. Methods

3.1. Survey period and survey target

The research was carried out in June, July, September, and October 2017. Subjects were second grade students (37 boys and 43 girls for a total of 80 people) studying at S junior high school located in H city in Japan.

Two teachers were included in our study: Teacher X, experienced in health and physical education, and Teacher Y, a novice part-time instructor. Teacher X was the lead teacher during the lessons mainly to ensure students' safety. Teacher Y conducted team teaching, which included providing support like group feedback, personal guidance, and safety confirmation.

3.2. Contents and survey method

There were 10 lessons in total—lesson 1: orientation; lessons 2-9: swimming skills practice; lesson 10: summary. The practice of swimming was continued for 2 lessons (50 minutes × 2). We conducted three tasks as part of the survey: (1) implementing skills tests, (2) preparing self-assessment sheets, and (3) interview surveys. The survey method is described below.

(1) Analysis of skills test

For the analysis of the skills test, average values before and after the unit were calculated, and a t-test with correspondence was performed using Excel 2013. The significance level was set to less than 5%.

In addition, the groups were classified into three subgroups based on the distance each student

was able to swim before taking their first lesson. Specifically, 35 students with a distance of 0 m to 59 m in the breaststroke before the unit were classified into one subgroup, 14 students with a distance of 60 m to 199 m were another, and 24 students who were able to swim 200 m were another. I excluded students unable to participate in the first lesson of the unit, students unable to complete the unit's skills test, and students who did not carry out the skills test from the unit before (7 people).

(2) Analysis of the self-assessment sheet

With the self-assessment sheet, we analyzed each of the above three groups' responses to the questions focusing on how students were working in classes that were applying manabiai and how students' skills were changing. We classified students' responses inductively using the KJ method (Kawakita, 1967).

A university faculty member with 12 years of experience specializing in physical education pedagogy, graduate students, and several students majoring in the field and "Internal Relevance" (Merriam, 2004) was secured.

(3) Implementation of interview survey

The data obtained through interviews was recorded on a voice recorder and garbled. Based on the data, it complemented the above two analysis results and was used to inform our findings.

4. Results

The change in students' skills evidenced with the skills test administered before and after the unit of the swimming class is shown in Figure 1. Results showed that swimming performance significantly increased ($p < 0.001$) after the unit. In particular, while it was $98 \text{ m} \pm 77$ before the unit, it increased to $189 \text{ m} \pm 37$ after the unit.

Figure 2 shows increase in swimming performance for each group in the above-mentioned three groups. Regarding the upper subgroup, because it comprised students who were able to swim 200 m before taking lessons, there was no change in terms of skill growth. For the middle subgroup, the mean value before the unit was $105 \text{ m} \pm 19$ and increased to 200 m after the unit. Finally, for the subgroups, the average value before the unit was $29 \text{ m} \pm 18$, whereas after the unit, it increased to $176 \text{ m} \pm 50$. When comparing the upper subgroup to the lower subgroup, the difference between their respective average values before each unit was 171 m; conversely, the difference after the unit decreased to 24 m.

Table 1 shows an analysis of the item "the ability to devise an approach to exercise towards a reasonable solution" of the self-assessment sheet. As a result, it was classified into five major categories: "dialogue," "skill," "lesson content," "safety," and "others." It also shows the proportion of each category among the upper group, middle group, lower group, and overall. As for Table 1, only the large category of "dialogue" was extracted and described. The statement on the question about "dialogue" had the highest percentage: 56.2% in the overall description.

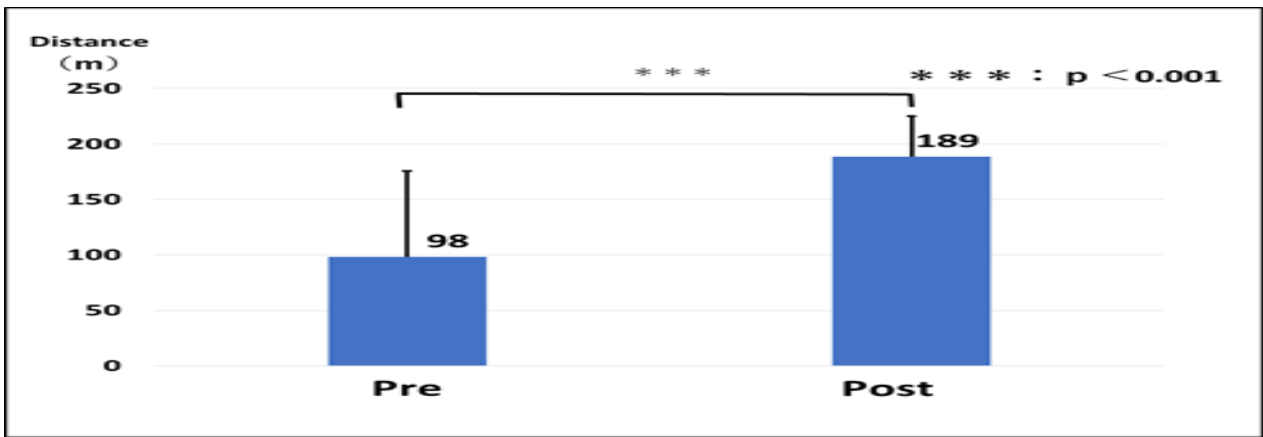


Figure 1. Difference in swimming ability before and after the unit.

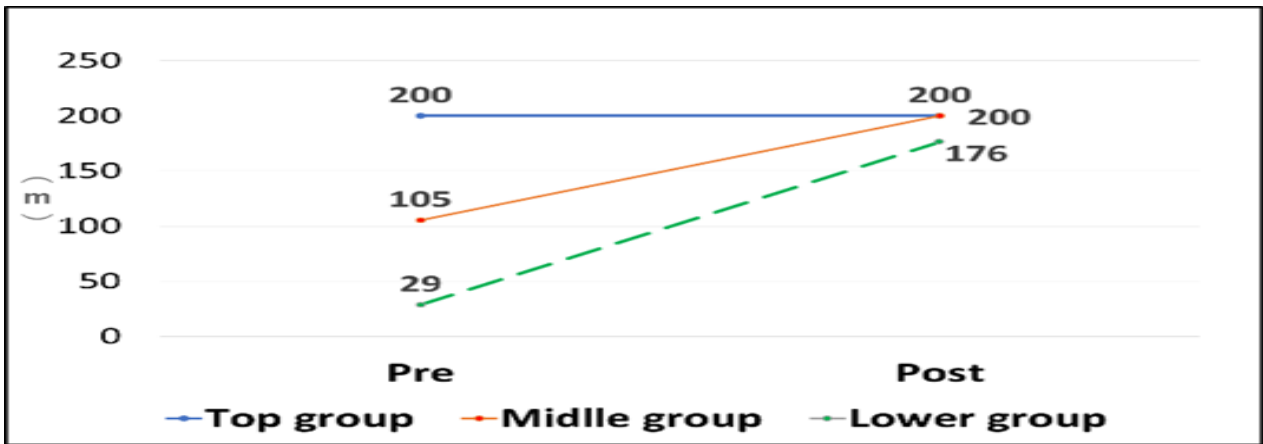


Figure 2. Before and after the unit seen by the top group, the middle group, and the lower group Changes in skills (swimming distance).

Table 1. Category of contents written in self-evaluation sheet and number of descriptions (ratio) I : " The ability to devise an approach to exercise towards a reasonable solution "

Cate 1	Cate 2	Cate 3	Number of statements													
			Top group	SUM		Middle group	SUM		Lower group	SUM		SUM (Top, Middle, Lower)				
Dialogue	Teach	Abstract	11 (16.9%)	14 (21.5%)	5 (12.5%)	5 (12.5%)	1 (1.0%)	1 (1.0%)	17 (8.4%)	20 (10.0%)	38 (58.5%)	25 (64.9%)	50 (52.0%)	5 (2.5%)	113 (56.2%)	
		Technique	3 (4.6%)		0 (0%)		0 (0%)		3 (1.5%)							
	To tell	Abstract	5 (7.7%)	6 (9.2%)	5 (12.5%)	7 (17.5%)	10 (10.4%)	18 (18.8%)	20 (10.0%)	31 (15.4%)						
		Technique	1 (1.5%)		2 (7.5%)		8 (8.3%)		11 (5.5%)							
		Challenges of teaching methods		0 (0%)		4 (100%)		1 (1.0%)		5 (2.5%)						
		How to engage	Positive	17 (26.2%)	18 (27.7%)	5 (12.5%)	9 (22.5%)	30 (31.3%)	30 (31.3%)	52 (25.9%)						57 (28.4%)
	Tsak		1 (1.5%)	4 (10.0%)		0 (0%)		5 (2.5%)								
Skill	Your own skills		0		2		10		21							
	Achievement of task		6 (15.4%)		3 (25.0%)		4 (21.9%)		41 (20.4%)							
	Self assessment		4		5		7									
Lesson content	Class evaluation		7 (15.4%)		1 (5.0%)		0		17 (17.7%)							
	Practice devises		2		1 (5.0%)		8		29 (14.4%)							
Safety	Motivation		1		0		9									
	Injury		2		1		5		8 (7.5%)							
Others	Place		3 (7.7%)		1 (5.0%)		3		15 (7.5%)							
	Challenges for next time		2		1		0		3 (1.5%)							
	Unit		0 (3.1%)		1 (2.5%)		0 (0%)		0 (0%)							
	Sum		65		40		96		201							

5. Discussion

5.1. Transformation of student's learning outcomes: enhancement of "subjective and interactive deep learning"

Students are required to work together on their own and other tasks to maximize learning (Johnson et al., 2010; Sugie, 2011). Physical education teachers intentionally incorporate cooperative learning into lessons, thereby contributing not only to exercise performance but also to thinking and communication skills (Dyson et al., 2004).

In this study, we found the percentage for the statement on "dialogue" was the highest of all the results of the self-assessment sheet. This item represents what students were focusing on to achieve the task in this practice. In other words, a majority of students responded that "dialogue" was the most important factor for them to be able to swim a 200 m breaststroke. Furthermore, categories of "teaching" and "learning" in "dialogue" were extracted and compared across the three groups, and we established the relationships between "teaching" and "learning" between the upper group and the middle and lower groups. Moreover, there was a remark that "There are cases in which learning has been taking place other than the three people who picked up," "There are several examples of such cases" in the interview by teacher X. From this, it can be considered that the relationship between "teach" and "learning" described above was found in various scenarios throughout the class.

Based on the above, it was revealed that the relationship "teaching" - "learning" by "learning by each other" was built among students, and interactive activities were fulfilling in this practice. Thus, it seems that the dialogue found among those activities encouraged students' cooperative approach to problem-solving (Sugie, 2011).

5.2. Elimination of "Polarization of exercise capacity" and its factors

It is important to eliminate differences in student's swimming ability in swimming class (Nakano et al., 2004; Hamagami, 2017; Oda et al., 2014). We were interested in how manabiai contributed to the elimination of differences among students' athletic ability. First, as can be seen in Figure 1, students' swimming skills improved significantly after this practice. Furthermore, when comparing skills improvement with three classes divided by proficiency degree, it is evident that the difference in skills improvement was overwhelmingly large in the lower group. An improvement in skills with the middle group was observed as well, after all the units achieved achievement. In other words, it seems that it exercised a big influence on reducing the polarization of exercise capacity in swimming class.

How did manabiai contribute to improving students' swimming skills? When it comes to swimming ability, lessons are required so all students can advance toward the same goal while solving individual problems regardless of proficiency level (Motozuka, 2014). In our study, we found that students collaboratively tackled lessons regardless of proficiency level so that all students advance to some degree, which is one of manabiai's major features.

While examining the answers to questions on the self-assessment sheet in the upper group, we found responses such as "I taught S the correct posture to be more streamlined, where to look and

how to bend the neck," as well as many responses centering on "teaching," such as "support of feet movement and able to support full support to become able to swim." Some of the responses from the middle and lower groups included "Trying the tricks from good people with friends, putting the beat board in the rush guard, letting them go, let's swim that succeeded I was able to learn properly by taught people who did not have it "or" I can go to see a friend who was able to swim 200 m for telling me it, or I do not know the shape of the foot and it is difficult I thought that I was able to teach the place properly and I was taught."

Okade (1994) explained such relationships between student interactive learning and skills development in this way: "A better child will further deepen his/her understanding of technical points through teaching to friends." We insist that the upper group was in a teaching position, and it was possible for those students to confirm their own skills and problems through teaching activities. Conversely, the middle and lower groups were in learning positions and were able to improve their skills. Therefore, depending on the learning environment, students can obtain necessary instruction from fellow students for specific needs. Moreover, we reasoned that the upper group contributed to the considerable improvement in skills during our study.

However, through this practice, students in subgroups may have no understanding of breaststroke technique even if overall swimming skills improved. Because of that, we suggest that direct guidance to students from teachers is necessary for swimming classes applying manabiai. Further research will be necessary in the future.

6. Conclusion

In conclusion, the following three points were clarified: (1) dialogue among students was serving to fulfill the relationship of "teaching" - "being taught," (2) improvement in skills through interactive activities was conspicuous and had a great influence on the resolution of polarization of exercise capacity, and (3) the learning strategies of manabiai can be performed efficiently among students and individually necessary guidance.

However, two problems remain that will require further research. First, even if skills improve by "learning from each other," some students may still have a low level of skill. As an example from this study, it is possible that an understanding of the breaststroke technique may not accompany an improvement in skills. Second, regarding swimming lessons applying manabiai, direct intervention from teachers is necessary in some cases.

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