

# Research on the Prolonged Effect of Physical Education Class on University Students: Effect Verification of the Intervention Program

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## Abstract

The purpose of this study was to verify the prolonged effect of the intervention program on university students in physical education class. Subjects were 211 university students who participated in physical education class. The intervention group is comprised of 81 students (40 males, 41 females), and the control group is comprised of 128 students (80 males, 48 females). All data were obtained through questionnaires. The questionnaires consisted of personal characteristics, skills relating to bachelor's degree ability (communication skill, teamwork skill, problem-solving skill, leadership skill), and exercise behavior (the stage of exercise behavior change, self-efficacy for exercise, decisional balance). The questionnaire data were obtained "at the beginning of the semester (pre)", "at the end of the semester (post)", and "two years after the end of the semester (the two-year follow-up)". Communication program and behavior change skills were applied to the intervention group. The main finding was that the stage of exercise behavior changed in the intervention group. Comparing "pre" with "post", the ratio of students with improved stage was 51.8%; the ratio of students who maintained their stage was 37.3%; and the ratio of students whose stage worsened was 10.8%. Additionally, comparing "post" with "the two-year follow-up", the ratio of students with improved stage was 19.3%; the ratio of students who maintained their stage was 43.4%; and the ratio of students whose stage worsened was 37.3%. The results of two-way repeated measures ANOVA (group-time) showed that there were significant interactions for

“perceived benefits of exercise (Pros)”, “decoding skill”, “properly transmitted skill”, “teamwork skill”, and “leadership skill”. The results of one-way repeated measures ANOVA showed that “properly transmitted skill”, “teamwork skill”, and “leadership skill” significantly increased on account of the intervention program post and at the two-year follow-up. These results indicate that the intervention program on university students, which consists of a communication program and behavior change skills, was partly effective for improving skills relating to bachelor’s degree ability two years after the end of semester.

## Keywords

**Skills Relating to Bachelor’s Degree Ability, The Two-Year Follow-Up, Physical Education Class on University Students, Exercise Behavior**

## 1. Introduction

The goal of physical education in Japanese universities, though varied between universities and courses, can be summarized with key principles such as “acquisition of knowledge and practical skill in lifelong sport”, “making exercise a daily habit”, “acquisition of physical and mental health”, and “improvement of social skill”. These goals lead to the “promotion of sport activities in line with the life stages and enrichment of sport opportunities”, proposed by the “the Sport Basic Plan” formulated according to the Basic Act on Sport in 2012, the building of “bachelor’s degree ability” which is mentioned in “The Structure of Bachelor Degree Education” compiled by the Central Council for Education in 2008 (Ministry of Education, Culture, Sports, Science and Technology, 2008), and the improvement of “Fundamental Competencies for Working Persons”, which was put forward by the Ministry of Economy, Trade and Industry in 2006. Thus, a physical education class in university can be said to play a pivotal role in Japanese society.

Consequently, considerable research is also being conducted to examine the impact of university physical education. For example, Hayashi & Miyamoto (2009) found that a weekly strength training class in university physical education was especially effective for students with no previous experience in such training. Moreover, Kiuchi, Arai, Nakamura & Urai (2005) and Kiuchi, Arai, Nakamura, Urai & Hashimoto (2009) suggested that self-monitoring (pleasant feelings/relationship with others/exercise intensity) at the end of a physical education class could increase the benefits of exercise, and “physical education homework” had a positive correlation with the amount of daily exercise undertaken by university students. Similarly, Nakayama, Tahara, Kamino, Marui & Murakami (2011) showed that the use of behavior change skills in physical education class could affect students’ daily exercise behavior. Using a combination of quantitative and qualitative analysis, this study helped clarify the effectiveness of class and provided future direction for the development of teaching material. Especially, when considering implementation of physical education for students in all types of university, it is important to evaluate class through qualitative analysis. While these studies deal with effects on lifelong sport, and the maintenance and improvement of physical fitness as the primary purpose of physical education, Nishida and Hashimoto (2009) revealed that a university physical education program intended for social skill improvement could enhance the “skill of empathy and assistance”, while Sugiyama (2008) indicated that physical education could have a partial influence on communication skill. Nakayama, Tahara, Watanabe, Kamino, Marui & Murakami (2012) further showed that physical education class aimed at “extracurricular learning and activity”, “communication among students”, and “joy of class participation” could impact general skills as well as attitude and intentionality in bachelor’s degree ability.

So far, most interventional studies on university physical education have investigated the effects of intervention programs by comparing “at the beginning of a semester (pre)” and “at the end of a semester (post)”; however, the amount of these tracking prolonged effect is very limited. For instance, Kiuchi, Arai, Urai & Nakamura (2006) conducted an interventional class with subsequent follow-up; however as its subjects were only male students investigated three months after the end of semester, there is a need for further investigation. Nakayama, Tahara, Kamino, Marui & Murakami (2014) explored the sustained effect of the class intervention one year after the end of class through “use of exercise behavior change skills aimed at improvement of exercise be-

havior, and the communication program aimed at improvement of skills relating to bachelor's degree ability" (the intervention program). The results demonstrated that prolonged effect was evident in exercise behavior, teamwork skill, and leadership skill. The present study is continuation of such studies; our objective was to show a prolonged effect two years after the end of semester (the two-year follow-up).

## 2. Methods

### 2.1. Subjects

Subjects were 209 university students who participated in physical education class. The intervention group comprised 81 students (40 males, 41 females) who participated in the intervention program in 2011 and answered the questionnaire in 2013. The control group comprised 128 students (80 males, 48 females) who did not participate in the intervention program. The departments that the intervention group attended included economics, literature, pharmacy, and technology. The control group belonged to departments of economics, literature, pharmacy, technology, and law.

### 2.2. Investigation Period

Questionnaire data from the intervention group were obtained "at the beginning of the semester (pre) in April, 2011", "at the end of the semester (post) in September, 2011", and "two years after the end of semester (the two-year follow-up) in November, 2013". Questionnaire data for the control group were obtained "pre" and "post". **Figure 1** shows the study design.

### 2.3. Investigation Contents

Investigation contents included factors relating to exercise behavior and skills relating to bachelor's degree ability. Factors relating to exercise behavior consisted of the stage of exercise behavior change, self-efficacy for exercise, and decisional balance. Skills relating to bachelor's degree ability consisted of communication skill, teamwork skill, problem-solving skill, and leadership skill. Communication skills consisted of decoding skill, properly transmitted skill, and self-control skill.

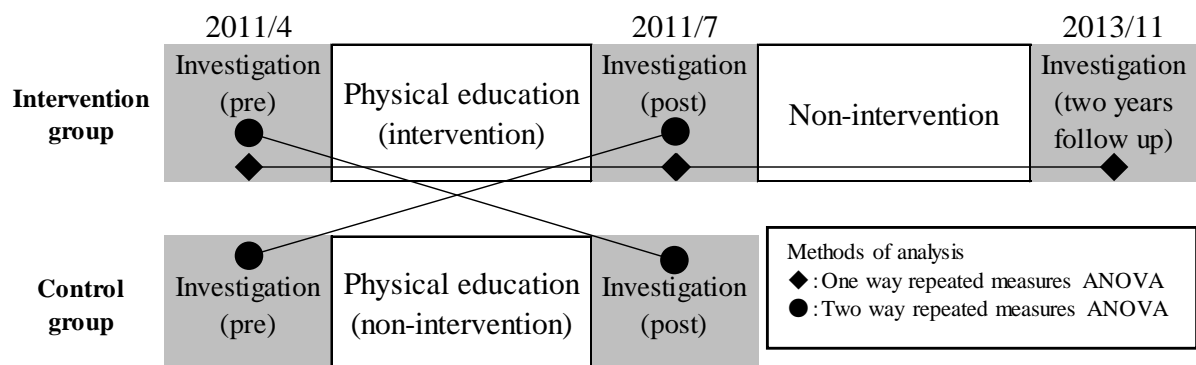
### 2.4. Measurement Scale

#### 1) Stage of exercise behavior change

The stage of exercise behavior change scale was defined by the exercise behavior transformation stage scale developed by Oka (2000a) and Oka, Takenaka & Miyazaki (2000b). Participants were required to choose the most appropriate answer from "Precontemplation (PC)", "Contemplation (C)", "Preparation (PR)", "Action (A)", or "Maintenance (M)". Here, regular exercise was defined as "three times or more per week, and each exercise duration must be 20 min or longer".

#### 2) Self-efficacy for exercise

Self-efficacy for exercise concerns how effective one feels the exercise is, and the scale used here comprises



**Figure 1.** Study design.

questions associated with the stage of exercise behavior stage developed by Oka (2003). A set of 5 answers, “very much (5 points)”, “so-so (4 points)”, “impossible to say how (3 points)”, “very little (2 points)”, and “not at all (1 point)” were provided for each question; the total points were then calculated. As the questionnaire is made up of four questions, the total points ranged between 4 and 20.

3) Decisional balance: perceived benefits of exercise (Pros), perceived barriers of exercise (Cons)

Decisional balance was measured by the scale of decisional balance in exercise formulated by Oka, Hirai & Tsutsumi (2002). It investigated the perceived benefits and barriers toward the execution of exercise. It consisted of 10 benefit questions and 10 barrier questions. The category and method of answers was identical to the aforementioned 5-point system used for measuring self-efficacy for exercise. Hence, the total points ranged between 10 and 50 for both benefits and barriers.

4) Communication skill (Decoding, Properly transmitted, Self-control)

Communication skill was measured using ENDE2, created by Horike (1994). The questionnaire was made up of 13 questions under three categories: “decoding skill (four questions)”, “properly transmitted skill (four questions)”, and “self-control skill (five questions)”. Each question was provided with a set of five answers: “very capable (5 points)”, “somewhat capable (4 points)”, “impossible to say how (3 points)”, “not very capable (2 points)”, and “not at all capable (1 point)”. The ranges of total points were decoding skill 4 to 20, properly transmitted skill 4 to 20, and self-control skill 5 to 25.

5) Teamwork skill, problem-solving skill, leadership skill

Teamwork skill, problem-solving skill, and leadership skill were measured using a section of the sports-specific positive characteristic scale (ICSS) formulated by Tokunaga & Hashimoto (2010). There were 14 questions under three categories: “teamwork skill (five questions)”, “problem-solving skill (five questions)”, and “leadership skill (four questions)”. A set of five answers was provided for each question: “very applicable (5 points)”, “somewhat applicable (4 points)”, “impossible to say how (3 points)”, “not very applicable (2 points)”, “not at all applicable (1 point)”. The ranges of total points were teamwork skill 5 to 25, problem-solving skill 5 to 25, and leadership skill 4 to 20.

## 2.5. Contents of the Intervention Program

The purpose of this intervention program was to carry out the communication program for the improvement of skills relating to bachelor’s degree ability and exercise behavior change skills within class. This was in line with the concepts of “lifelong sport” and “social skill improvement” as main goals of physical education in university. The contents of the intervention program are shown in **Table 1** for softball and table tennis activities.

In the first week, the class was divided into the intervention and control groups. In the orientation for the intervention group, the purpose of the research and the contents were explained, and in the both group, a baseline survey was conducted (pre).

In the second week, the communication program started and each student introduced themselves. From the third week onward, all students had to call out each other by their self-elected nicknames (nicknames seal). As an icebreaker, the first 10 min of the class was used for activities aimed at “cooperation”, “touch”, and “competition” (recreation). Although methods differed by activity type, the points of the same sort were assigned for each icebreaking activity.

The contents of exercise behavior change skills were carried out through “target setting (pedometer)”, “self-monitoring”, “cognitive intervention”, “feedback” and “physical education homework”. Exercise behavior change skills were performed from the third week by attaching a pedometer (calorie counter, Suzuken) to each student throughout the class duration. The number of steps recorded (record of the third week) was then used as a reference, and the target number of the steps in the class was set (target setting). From the fourth to 13th week, the students had to record the number of steps taken on a record sheet (self-monitoring), and then give intermediate feedback on the eighth week. Appraisal was given to subjects who achieved the target (operant reinforcement), while subjects who failed to achieve the target considered reasons for failure and possible improvement measures (barrier removal). In addition, “the physical education homework” (Kiuchi, Arai, Nakamura, & Urai, 2005) and the cognitive intervention (daily physical activity, flexibility, overall endurance, strength/strength endurance) were conducted between the 10th and 13th weeks. Explanation for the cognitive intervention was given during the last 10 min of the class.

A survey was conducted on the 14th week (post) and the results were fed back on the 15th week.

**Table 1.** The contents of the intervention program (softball/table tennis).

Activity	Communication program	Exercise behavior change skills
1	Class division, orientation	
2	Softball Self-introduction	
3	Softball Human disentanglement puzzle dub to each other by self-elected nicknames	Target setting (pedometer)
4	Softball Hula-hoop recreation dub to each other by self-elected nicknames	Self-monitoring
5	Softball Chain tag dub to each other by self-elected nicknames	Self-monitoring
6	Softball Chain tag (duo) dub to each other by self-elected nicknames	Self-monitoring
7	Softball Match dub to each other by self-elected nicknames	Self-monitoring
8	Softball Match dub to each other by self-elected nicknames	Feedback operant reinforcement barrier removal
9	Table tennis Table tennis recreation (one minute measurement by duo) dub to each other by self-elected nicknames	Target setting (pedometer) self-monitoring
10	Table tennis Table tennis recreation (one minute measurement by foursome) dub to each other by self-elected nicknames	Self-monitoring
11	Table tennis Table tennis recreation (one minute measurement by duo and foursome) dub to each other by self-elected nicknames	Self-monitoring physical education homework cognitive intervention
12	Table tennis Table tennis recreation (word chain) dub to each other by self-elected nicknames	Self-monitoring physical education homework cognitive intervention
13	Table tennis Walk blindhold dub to each other by self-elected nicknames	Self-monitoring physical education homework cognitive intervention
14	Table tennis Table tennis recreation (hit at PET bottle) dub to each other by self-elected nicknames	Physical education homework cognitive intervention feedback operant reinforcement
15	Table tennis Match dub to each other by self-elected nicknames	

## 2.6. Ethical Consideration

This study received the approval of the Ethical Review Board of the university (approval number 131103).

Before the study, we explained the purpose to all subjects and informed them that the collected data would be processed statistically and used for research purposes only. We took measurements from those who provided consent.

## 3. Results and Discussion

### 3.1. The Stage of Exercise Behavior Change

To demonstrate the effect of the intervention on the stage of exercise behavior change and its continuity, a cross tabulation of the stage of exercise behavior change at “pre and post” and “post and the two-year follow-up” was conducted. The results are shown in **Tables 2-5**. The number of students who maintained the stage of exercise behavior change in both “pre and post” and “post and the two-year follow-up” (stay) is indicated by shaded areas. The upper right-hand side of the shaded areas represents the number of students who had improved in stage (up), while the lower left-hand side represents students who declined in stage (down) (**Table 2** and **Table 4**). Observing the ratio of transformation in the stage of exercise behavior change, we found that “from pre to post semester”, 41 out of 81 students were “up” (50.6%), 31 out of 81 were “stay” at the same position (38.3%), and 9 out

**Table 2.** Change in the stage of exercise behavior (pre-post).

Total (number)						
Males (number)	PC	C	P	A	M	Number (%)
Females (number)						
PC	6	4	4	2	0	<b>16 (19.8)</b>
	2	3	0	0	0	<b>5 (12.5)</b>
	4	1	4	2	0	<b>11 (26.8)</b>
C	3	12	18	8	0	<b>41 (50.6)</b>
	0	6	8	3	0	<b>17 (42.5)</b>
	3	6	10	5	0	<b>24 (58.5)</b>
P	0	2	7	2	0	<b>11 (13.6)</b>
	0	2	4	1	0	<b>7 (17.5)</b>
	0	0	3	1	0	<b>4 (9.8)</b>
A	0	0	1	4	3	<b>8 (9.9)</b>
	0	0	1	2	3	<b>6 (15.0)</b>
	0	0	0	2	0	<b>2 (4.9)</b>
M	0	0	3	0	2	<b>5 (6.2)</b>
	0	0	3	0	2	<b>5 (12.5)</b>
	0	0	0	0	0	<b>0 (0.0)</b>
<b>Number (%)</b>	<b>9 (11.1)</b>	<b>18 (22.2)</b>	<b>33 (40.7)</b>	<b>16 (19.8)</b>	<b>5 (6.2)</b>	<b>81</b>
	<b>2 (5.0)</b>	<b>11 (27.5)</b>	<b>16 (40.0)</b>	<b>6 (15.0)</b>	<b>5 (12.5)</b>	<b>40</b>
	<b>7 (17.1)</b>	<b>7 (17.1)</b>	<b>17 (41.5)</b>	<b>10 (24.4)</b>	<b>0 (0.0)</b>	<b>41</b>

**Table 3.** Ratio of change in exercise behavior (pre-post).

	up	stay	down	total
Total	41	31	9	81
(%)	50.6	38.3	11.1	100.0
Males	18	16	6	40
(%)	45.0	40.0	15.0	100.0
Females	23	15	3	41
(%)	56.1	36.6	7.3	100.0

of 81 were “down” (11.1%) (**Table 3**). “From post to the two-year follow-up”, 16 out of 81 students were “up” (19.8%), 34 out of 81 were “stay” at the same position (42.0%), and 31 out of 81 were “down” (38.3%) (**Table 5**).

As a result of the intervention program, the ratio of students who maintained or improved in the stage from pre to post amounted to 88.9%. However, from post to the two-year follow-up, the ratio of students who had declined in stage had risen to almost 40% (38.3%). According to research on the exercise habits of 361 third-year university students carried out by Marui, Tahara, Nakayama, Kamino & Murakami (2011), the ratios of stage of exercise behavior change are “precontemplation” 26.9%, “contemplation” 13.9%, “preparation” 35.5%, “action” 4.7%, and “maintenance” 19.1%. In comparison with the results of the present research in which students attended the intervention program, even though the ratio of “precontemplation” declined, the ratio of “contemplation” increased, while that of “maintenance” decreased. Furthermore, previous research that investigated conditions one year after the completion of physical education class (Nakayama, Tahara, Kamino, Marui, & Murakami, 2014) showed that the ratio of students who were able to maintain or improve in stage was 72.1%, which is higher than the results of the current study. This suggests that the interventional effects on the stage of exercise behavior change after two years may be minimal.

**Table 4.** Change in the stage of exercise behavior (post the two-year follow-up).

Total (number)						
Males (number)	PC	C	P	A	M	Number (%)
Females (number)						
PC	7	1	1	0	0	<b>9 (11.1)</b>
	1	1	0	0	0	<b>2 (5.0)</b>
	6	0	1	0	0	<b>7 (17.1)</b>
C	2	9	5	2	0	<b>18 (22.2)</b>
	2	5	2	2	0	<b>11 (27.5)</b>
	0	4	3	0	0	<b>7 (17.1)</b>
P	3	10	16	3	1	<b>33 (40.7)</b>
	0	5	10	1	0	<b>16 (40.0)</b>
	3	5	6	2	1	<b>17 (41.5)</b>
A	1	5	6	1	3	<b>16 (19.8)</b>
	0	2	3	0	1	<b>6 (15.0)</b>
	1	3	3	1	2	<b>10 (24.4)</b>
M	0	0	4	0	1	<b>5 (6.2)</b>
	0	0	4	0	1	<b>5 (12.5)</b>
	0	0	0	0	0	<b>0 (0.0)</b>
Number (%)	<b>13 (16.0)</b>	<b>25 (30.9)</b>	<b>32 (39.5)</b>	<b>6 (7.4)</b>	<b>5 (6.2)</b>	<b>81</b>
	<b>3 (7.5)</b>	<b>13 (32.5)</b>	<b>19 (47.5)</b>	<b>3 (7.5)</b>	<b>2 (5.0)</b>	<b>40</b>
	<b>10 (24.4)</b>	<b>12 (29.3)</b>	<b>13 (31.7)</b>	<b>3 (7.3)</b>	<b>3 (7.3)</b>	<b>41</b>

**Table 5.** Ratio of change in exercise behavior (post the two-year follow-up).

	Up	Stay	Down	Total
Total	16	34	31	81
(%)	19.8	42.0	38.3	100.0
Males	7	17	16	40
(%)	17.5	42.5	40.0	100.0
Females	9	17	15	41
(%)	22.0	41.5	36.6	100.0

### 3.2. Self-Efficacy for Exercise, Perceived Benefits of Exercise (Pros), Perceived Barriers of Exercise (Cons)

The results of both the intervention and control groups from pre to post are shown in **Table 6**. The results of self-efficacy for exercise and decisional balance for the intervention group from pre to the two-year follow-up are shown in **Table 7**. When using two-way repeated measures ANOVA to examine the interaction between time (pre to post) and group (intervention and control), a correlation with perceived benefits of exercise (Pros) was also observed. However, when one-way repeated measures ANOVA was used to examine the results from pre, post, and the two-year follow-up, no significant difference could be observed in all categories.

This result indicates that from pre to post, the interventional effect on perceived benefits of exercise (Pros) could be observed in the intervention group but that this effect had diminished after two years. [Kiuchi, Arai, Nakamura, Urai & Hashimoto \(2009\)](#) reported that in university physical education, the perceived benefits of exercise (Pros) significantly increased with the intervention of self-monitoring; the results of this study concurred with such findings at the end of the semester. However, this effect did not last until the two-year follow-up. In a previous study ([Nakayama, Tahara, Kamino, Marui, & Murakami, 2014](#)), the sustained effect on



**Table 6.** Change in exercise behavior and skills relating to bachelor's degree ability (group-time, two-way repeated measures ANOVA).

Item	Intervention group (n = 81)				Control group (n = 128)				Time	Interaction
	Males: 40, females: 41				Males: 80, females: 48					
	Pre		Post		Pre		Post			
	M	SD	M	SD	M	SD	M	SD		
Self-efficacy for exercise	11.7	3.5	12.7	3.2	11.2	3.4	12.3	4.0	$p < .01$	n.s.
Perceived benefits of exercise (Pros)	36.3	5.4	37.9	4.8	36.3	5.2	36.5	5.0	$p < .01$	$p < .05$
Perceived barriers of exercise (Cons)	22.3	4.6	22.9	5.7	23.3	4.9	25.0	6.2	$p < .01$	n.s.
Communication skill										
Decoding skill	13.9	2.6	14.6	2.5	14.1	2.8	14.1	2.7	$p < .05$	$p < .05$
Properly-transmit skill	13.0	2.2	14.0	2.2	13.1	2.5	13.4	2.6	$p < .01$	$p < .05$
Self-control skill	16.6	2.8	16.5	2.5	17.0	2.1	17.3	2.4	n.s.	n.s.
Teamwork skill	17.5	2.8	18.6	2.6	17.3	3.2	17.5	3.5	$p < .01$	$p < .05$
Problem-solving skill	17.4	3.5	18.2	3.8	17.6	3.5	18.2	3.3	$p < .01$	n.s.
Leadership skill	11.0	3.0	12.6	2.9	11.2	3.0	12.0	3.2	$p < .01$	$p < .05$

**Table 7.** Change in exercise behavior and skills relating to bachelor's degree ability (intervention group, one-way repeated measures ANOVA).

Item	Intervention group (n = 81)					One-way repeated measures ANOVA				
	Males: 40, Females: 41									
	Pre		Post		2yfu <sup>†</sup>					
	M	SD	M	SD	M	SD	F		Dunnet	
Self-efficacy for exercise	11.7	3.5	12.7	3.2	12.0	3.3	1.87			
Perceived benefits of exercise (Pros)	36.3	5.4	37.9	4.8	37.6	4.7	2.50			
Perceived barriers of exercise (Cons)	22.3	4.6	22.9	5.7	23.4	5.1	0.90			
Communication skill										
Decoding skill	13.9	2.6	14.6	2.5	14.5	2.2	2.02			
Properly-transmit skill	13.0	2.2	14.0	2.2	14.1	2.4	5.33	**	Pre < post, 2yfu	
Self-control skill	16.6	2.8	16.5	2.5	16.3	3.1	0.17			
Teamwork skill	17.5	2.8	18.6	2.6	18.7	3.1	4.00	*	Pre < post, 2yfu	
Problem-solving skill	17.4	3.5	18.2	3.8	18.3	3.1	1.53			
Leadership skill	11.0	3.0	12.6	2.9	12.9	3.1	9.55	**	Pre < post, 2yfu	

<sup>†</sup>2yfu: two years follow up.

perceived benefits of exercise (Pros) one year after the completion of the physical education class had already been demonstrated. It might be possible to hypothesize that the effect of the intervention program may diminish one to two years after the end of the semester.

### 3.3. Communication Skill (Decoding, Properlytransmitted, Self-Control)

A correlation could be seen between decoding skill and properly transmitted skill when using two-way repeated measures ANOVA to analyze results (Table 6). Moreover, when analyzing properly transmitted skill with one-way repeated measures ANOVA, the figure revealed was significantly higher at post and the two-year follow-up compared with pre (Table 7).

This suggests that the communication program intervention used in this research had a prolonged effect on properly transmitted skill, which is a type of communication skill, not only at the end of the semester but also



two years following the end of the semester. In contrast, for the decoding skill, an effect was observed at the end of a semester, but it subsided at the two-year follow-up. Sugiyama's (2008) study did not use any special intervention to improve communication skill. Instead, he used ENDE2, as did this research, to investigate the transformation from pre to post university physical education class but found no significant change in all three skills. In other words, this research had also demonstrated the necessity of icebreaking activities such as self-introduction or calling out by self-elected nicknames in which students must actively participate in communication instead of merely playing team sports in university physical education class, which is aimed at improving communication skill.

### 3.4. Teamwork Skill, Problem-Solving Skill, Leadership Skill

The results of the two-way repeated measures ANOVA showed a correlation between teamwork skill and leadership skill ( $p < .05$ ) (Table 6). The figures for teamwork skill ( $p < .05$ ) and leadership skill ( $p < .01$ ) were both significantly higher at the end of the semester and the two-year follow-up than pre when using the one-way repeated measures ANOVA (Table 7).

This suggests that the intervention program was effective in the cultivation of teamwork skill and leadership skill as its impact persisted for two years following the end of the semester. According to Pauline and John (1995), the factors influencing teamwork are team objectives, team targets, and communication. In the present research, the goal of improving skills relating to bachelor's degree ability and promoting exercise behavior was made clear to the intervention group. The programs aimed at encouraging communication between students in class were also implemented, leading to the improvement of teamwork skill. In addition, Nakayama, Tahara, Watanabe, Kamino, Marui & Murakami (2012) reported that "extracurricular learning/activity", "communication among students", and "joy of class participation" all contributed to the improvement of leadership skill; similar results were also derived in this research. Regarding the fact that no significant increase in could be observed in problem-solving skill, a review of question items showed that students made remarks such as "Even when problems or difficulties arise, I am able to tackle things tenaciously in order to overcome them", and "Even when faced with adversity or predicament, I am able to tackle things patiently without losing myself". The students who participated in the intervention program did not seem to experience any problematic situations, i.e., situations that might be described as difficult, involving adversity or a predicament. A diminished effect could therefore be understood as the result of a lack of opportunity for problem solving.

## 4. Conclusion

The intervention program, which aimed at "acquisition of fitness habits" and "improvement of skills relating to bachelor's degree ability" was effective at the post-semester follow-up. However, at the two-year follow-up, only "skills relating to bachelor's degree ability" were improved.

## 5. Limitations and Issues in This Research

Three issues and limitations apply to this research. First, the sample of this study was limited to one university; hence, the generalizability of the results is unclear. Future investigation will need to increase the number of universities utilized to provide study subjects and take into account variation in environment, such as locality, gender and faculty. Second, the setting for the control group was insufficient. Originally, the examination of the control group should not be limited to pre and post semester but should also be set at the two-year follow-up to correspond with the intervention group. To more accurately reveal the intervention effect, future research ought to take this into account. Finally, besides the two-year follow-up, a longitudinal study that continues to examine the effect at three years from the end of semester and even post-graduation is desirable.

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