

## Chapter 6

### SUMMATION OF THE STUDY

This chapter will present a review on the purposes and the methods of the 3 phase-studies, and the results drawn from the 3 phase-studies which were conducted toward 3 groups of physical education classes for elementary school students in Kanto area Japan. Then, the chapter will be closed with recommendations for methods of fitness education and for further study on students' physical activity level (PAL) during physical education (PE) classes.

#### 6.1. A review of the study

One of the biggest current worldwide problems in children is increasing number of children with sedentary lifestyle. In relation with this problem WHO recommended children to participate in at least moderate physical activity level for one hour per day. For promoting physically active lifestyle in children, school physical education is believed to have strategic position, but still leaving some problems. Most of school age children could participating in physical education (PE) classes, but no guarantee for them to enjoy their moderate to vigorous physical activities (MVPA) during practicing skills or game in their PE classes. Therefore, it is important to design effective or good PE classes so that enable students to not only have enough time to engage in various motor learning activities but also to enjoy their MV-PAL during PE class.

In addition, conflict in deciding the main purpose of school physical education is still exists among physical education practitioners today. In Japan for example, the two-fold objectives of PE class were: (1) to

promote students' fitness; and (2) to prepare lifetime sport for students. Some practitioners believe that there is conflict between both objectives. In one side, if we fully applying fitness exercise inside PE time, many students may engage in MV-PAL during their learning activities, but this kind of PE classes believed to be hated or avoided by many students. In other side, if we focusing on students' enjoyment in doing motor skill exercises or game practices, many students in this kind of PE classes believed do not enough opportunity to engage in MV-PAL for building their habit in physically active lifestyle (life time sport). Therefore, the harmony among students' PAL, students' learning engagement and students' enjoyment or satisfaction toward their PE class is needed.

Many scholars such as Siedentop, Tannehill, Graham, Metzler, and Takahashi, have producing many reports on the characteristics of good or effective PE classes. Siedentop and Tannehill, for example, appealed only effective PE teachers could produce effective PE classes that could ensure for achieving their various PE goals. Takahashi, for example, have reported the similarity in characteristics between the PE classes that highly evaluated by students and the effective PE classes. Thus, the PE classes that given high formative class evaluation (FCE) score by students must not only have a rich of learning activities, but also be liked by many of their students. For evaluating students physical activity level (PAL) during PE class, McKenzie has developed 5 PAL categories as a part of SOFIT (System for Observing Fitness Instruction Time) instrument. But unfortunately, it was not covering for evaluating the effectiveness of PE class in term of density of learning activities and evaluation from students' viewpoint. Thus, the information the relationships among

students' evaluation score toward their PE classes, the richness of students' learning engagement, and students' PAL during their PE classes was not available yet.

We believe that in a certain conditions, PE classes could not only provide students with a rich of learning activities and appropriate amount of MV-PAL engagement, but also to be highly evaluated by their students. We also believe that during PE class, students' engagement in learning has relationship to their physical activity level (PAL). In addition, enthusiasm in learning, motivation in learning, and interest in learning will increase students' PAL and will have effect on students' fitness. Those will also improve students' evaluation toward their PE class. Basically, if we could develop PE class that interesting and meaningful for students, they will learn and move enthusiastically, so that increases the amount of learning engagements. As a result, their evaluation toward their PE class will also increase. Unfortunately, the hypothesis is still lack of empirical data. Therefore, the main purpose of these studies was to clarify the relationship among students' PAL, students' LB, and students' FCE during elementary school physical education (ES-PE) classes.

The first phase of this study was conducted for measuring the relationship among students' learning behavior (LB), students' engagement in moderate to vigorous physical activity level (MV-PAL), and students' formative class evaluation (FCE) score. For gathering data, the students' MV-PAL was measured by using McKenzie's 5 level categories (1991), the students' LB was measured by Fukugasako's 6 learning behaviors categories (2003), and the students' FCE was measured by 9 items questionnaire developed by Takahashi et al. (1994) and

Hasegawa et al. (1995). The students' MV-PAL engagement and the students' LB was analyzed from videotaped PE classes that conducted by using GTS (group time sampling) recording system. The subjects of the first study were 60 PE lessons for 5<sup>th</sup> and 6<sup>th</sup> graders. The PE lessons were selected from the middle of unit that taught by 42 different PE teachers from 16 different elementary schools in Kanto area Japan. The subject matter was gymnastics and ball games.

Results from correlation analysis among students' PAL, students' LB, and students' FCE indicated that: (1) students' LB has significant strong relationship with students' FCE, (2) students' engagement in MV-PAL has significant strong relationship with students' LB, and (3) students' engagement in MV-PAL has significant but weak relationship with students' FCE. It is indicated that in general, in the PE classes in which many students engage in learning and engage in MV-PAL, many of them evaluate their PE class highly. But, unfortunately, compared to gymnastics classes, the relationship among variables in ball games classes was so weak. In addition, the relationship between students' engagement in MV-PAL during motor leaning (A2) episodes and students' FCE score in both groups was not significant.

The weak relationship between variables of students' PAL and students' FCE score was supposed to be caused by not proper instrument or method for measuring students' PAL and not proper subject matter to be investigated. For clarifying the relationships, in the next study it was suggested: (1) to use more objective PAL measure such as pedometer for complementing the MV-PAL measure; (2) to analyze whole classes of a unit or more (not only select one or two classes from a unit); and (3) to

focus on units that many of students engage in MV-PAL such as fitness unit.

The second phase of this study was conducted for: (1) describing students' physical activity level (PAL), students' learning behavior (LB), and students' formative class evaluation (FCE) score during 2 fitness units; (2) comparing the students' PAL, the students' LB, and the students' FCE in both units; and (3) checking the relationship among students' PAL, students' LB, and students' FCE inside the fitness units. For providing data, the students' MV-PAL was not only measured by using McKenzie's 5 level categories (1991), but also by using pedometer (LifeCorder produced by Suzuken-Japan). As same as in the first phase studies, in the second phase study, the students' LB was also measured by using Fukugasako's 6 learning behaviors categories (2003), and the students' FCE was also measured by using 9 items questionnaire developed by Takahashi et al. (1994) and Hasegawa et al. (1995). The subject was 14 lessons of 2 fitness units (7 lessons of aerobics unit and 7 lessons of non-aerobics unit) for 6<sup>th</sup> graders from T and K elementary schools in Ibaraki prefecture. The students' MV-PAL engagement and the students' LB was analyzed from videotaped PE classes that conducted by using GTS (group time sampling) recording system.

Results of the second phase study indicated that: (1) the aerobic unit provided students with significantly higher PAL (averagely 2498.6 steps, 2.47 levels of intensity, and 54.17% of MV-PAL engagement) than the non-aerobic unit (averagely 1243.0 steps, 1.17 levels of intensity, and 31.1% of MV-PAL engagement); (2) the aerobic unit provided students with significantly more learning engagement (averagely 86.4%) than the

non-aerobic unit (averagely 50.3%); but (3) students in the aerobic unit give FCE score to their PE classes significantly lower (averagely 2.72) than those in the non-aerobic unit (averagely 2.88); (4) results of comparison analysis on average data (data of PAL, LB and FCE in the aerobic and in the non-aerobic as shown in appendix 4-1 on page 54), indicated that there were negative relationship tendency between students' FCE score and both students' PAL and LB, but results of correlation analysis inside each unit (as shown in appendix 4-2, 4-3, 4-4, and 4-5 on page 54), indicated that although it was not significant because of less number of data, there were clear relationship tendency between students' PAL and both students' FCE and LB, but there was no clear relationship tendency between students' LB and students' FCE score; (5) the relationships tendency among 3 variables inside the aerobic unit was found more clearly than those in the non-aerobic unit; and (6) thus, related the results from previous study (first phase studies), the results of the second phase study were fail to reconfirm the close relationships among variable PAL, LB, and FCE.

There were some factors that probably causing the unclear relationships between students' PAL, students' LB and students' FCE score during fitness units. Those factors were: (1) in aerobic unit, students did not know exactly the product of their learning from each lesson and did not know how to evaluate or measure them exactly so that they did not aware about the progress of their learning product. As a result, they evaluate consistently significant lower score of dimension product of FCE that causing significantly lower average total score of FCE comparing total score. In contrast, non-aerobic unit had many movement tasks to

achieve the skills, so that students could have pleasure to challenge and also could fulfill their achievement targets; (2) the high level of PA during the aerobic unit were disliked by many students (too high for many of them) so that causing significantly their lower score of dimension interest in the aerobic unit; (3) although both units have high average FCE score, as a unit, fitness units in this study did not have characteristics as a good unit evaluated by student. In a good unit, the length of motor learning unit is getting longer and the teacher's instruction is getting shorter; and (4) during both fitness units, there were other than variable PAL and LB that more strongly affecting students' FCE score. The content or the quality of learning may be more important factors for affecting students' FCE score.

In addition, in gymnastics classes of that selected from the middle of various gymnastics units (in the first phase studies), compared to the ball games classes, we found more clearly relationship among variable students' LB, students' FCE, and students' PAL. But, we did not have information on whether the relationships among those three variables were also consistently found in gymnastics classes as a unit (not in one or two sample classes of a unit). In addition, we also found consistently result on the close relationship between students' PAL and students' LB, but fail to reconfirm the strong relationship between students' LB and students' FCE. Therefore, for the third phase study, it was suggested to using academic learning time (ALT) recording system for measuring both students' engagement in MV-PAL and students' LB, and to focus on gymnastics units for clarifying the relationships among those three variables.

The third phase of this study was conducted for: (1) describing variation of students' engagement in MV-PAL during A2 episodes and the relationship with students' LB, and (2) to check the relationship among students' PAL, students' LB, and students' FCE in gymnastics unit of PE classes. The students' engagement in MV-PAL and students' LB were measured by indirect observation toward ALT data. The students' FCE and students' PAL were measured by using instruments as same as in the second phase study (LifeCorder and 9 items questionnaire). The subject was 4 gymnastics units (24 lessons) for 2<sup>nd</sup> and 3<sup>rd</sup> graders.

Results indicated that: (1) not all students' engagement in MV-PAL during A2 episodes were for learning, but some was for non-learning activities; (2) proportion of engagement in MV-PAL for learning correlated positively with proportion of students' learning engagement, and in reverse, proportion of engagement in MV-PAL for non-learning correlated negatively with proportion of students' learning engagement; and (3) the relationship among 3 variable was not fully clear especially on the relationship between variable LB and FCE. Based on findings from the third phase study, it was clear that students' engagement in MV-PAL for learning activities was essential for ensuring the richness of learning engagement during motor learning (A2) episodes of PE classes. But, unfortunately, in the gymnastics classes for 2<sup>nd</sup> and 3<sup>rd</sup> graders as a unit, the relationships among the three variables were not clear. Comparing to the characteristic of good classes evaluated by students, the proportion of A2 episode and total score of FCE from the first lesson until the end of unit in the third phase study were moved in fluctuation or did not tend to



increase smoothly. This could be one factor that caused the unclear relationships.

In total, there were five specific questions that this research attempt to answer through analyzing teacher and students behaviors during elementary school PE classes. After conducting 3 phase-studies, the answers toward the 5 specific questions were as listed below.

(Q1) What did the means proportion of students' engagement in MV-PAL during each of class context?

A1: The means proportion of students' engagement in MV-PAL during each of class context of general PE lesson could be seen in table 3-6 on page 27. In general, there were averagely 40.48% of students engage in MV-PAL during PE classes. In each learning context the proportion was found quite different (In A2 episode = 50.47%, in M episode = 46.70%, in I episode = 4.32% and in A1 episode = 13.37%).

(Q2) In PE classes that scored higher by students, did more students engaged in MV-PAL?

A2: Yes. Although it was not always found, in phase 1 and phase 2 of this study we found positive but weak relationship between students' MV-PAL engagement and students' FCE.

(Q3) Did the length of motor learning (A2) episode positively related to quantity of the students' MV-PAL engagement during the episodes?

A3: Not always. The length of motor learning (A2) episodes in a unit was just a place for the existence of students' engagement in MV-PAL.

(Q4) Did the quantity of motor learning engagement (LB) during motor learning (A2) episodes of the PE classes positively related to the quantity of students' MV-PAL engagement (PAL) during the episodes?

A4: Yes. In phase 1 and phase 2 of this study we found consistency in the close relationship between students' LB and students' PAL.

(Q5) Were there any factors inside motor learning (A2) episodes that differentiated the quantity of the students' MV-PAL engagement during the episodes?

A5: Movement force factor (MFF) and maximum involvement rate (MIR) were important factors in determining the quantity of students' MV-PAL engagement during PE classes.

Thus, in general, the relationship among students' physical activity level (PAL) during physical education classes, students' learning behaviors (LB) during motor learning (A2) episodes, and students' formative class evaluation (FCE) score toward their classes was not always clear. But, those 3 factors were important for developing appropriate fitness unit for fulfilling amount of daily PA and for satisfaction of students. The length of motor learning (A2) episodes, the existence of movement force factor (MFF), and the appropriate of maximum involvement rate (MIR) were important for improving students' PAL during PE classes.

## **6.2. Results**

The results will be divided into 3 groups based on phases of this study. The results for each group will be presented in the following order:

(1) result on students' PAL, (2) result on students' LB, (3) result on students' FCE, and (4) result on relationship among students' PAL, students' LB, and students' FCE.

The first group-results are those resulting from analyzing 60 lessons for 5<sup>th</sup> and 6<sup>th</sup> grade elementary school students (30 gymnastics and 30 ball game lessons). The results were as the follows:

(1) During the 60 PE classes, there were averagely 40.48% of students who engaged in MV-PAL. The MV-PAL engagement in both gymnastics and ball games classes was statistically similar. During A2 episode of the 60 PE classes, there were averagely 40.47% of students who engaged in MV-PAL. The MV-PAL engagement in 30 ball games classes was significantly higher than those in 30 gymnastics classes (55.23% vs. 45.72%). This different was mainly because of very active level (PAL 5) engagement in ball games classes was significantly higher. In reverse, the sitting and lying down levels engagement in gymnastics classes were significantly higher than those in ball games classes.

(2) During A2 episode of the 60 PE classes, there were averagely 42.3% of students who engaged in learning activities. The engagement in learning activities during 30 ball games classes was significantly higher than those during 30 gymnastics classes (61.5% vs. 26.7%). This different was mainly because the maximum involvement rate (MIR) in gymnastics classes was very limited comparing with those in ball game classes.

- (3) Students in the 60 PE classes gave FCE score toward their classes averagely 2.68 (grade 4 from the maximum of 5 level diagnostic standard score). The average FCE score of students in 30 ball games classes was statistically similar with those during 30 gymnastics classes (2.65 vs. 2.71).
- (4) During 60 PE classes, the relationship between students' PAL and the effectiveness of their classes was significant. The significant relationships were found between the following variables: (a)  $r = .549^{**}$  between students' learning engagement vs. students' FCE in 30 ball game classes, (b)  $r = .675^{**}$  between students' learning engagement vs. students' FCE in 30 gymnastic classes, (c)  $r = .548^{**}$  between students' MV-PAL engagement during A2 episodes vs. students' learning engagement during A2 episodes, and (d)  $r = .280^*$  between proportion of students' MV-PAL vs. students' FCE.

The second group-results are those resulting from analyzing 14 lessons for 6<sup>th</sup> grade elementary school students (7 aerobic lessons and 7 non-aerobic lessons). The results were as follows:

- (1) The students' PAL during aerobic unit was significantly higher than those in non-aerobic unit. The significant was supported with the different in the following variables: (a) average proportion of MV-PAL engagement in total during the aerobic unit was statistically higher than those during the non-aerobic unit (54.17% vs. 31.06%); (b) average proportion of MV-PAL engagement during A2 episodes of the aerobic unit was statistically higher than those during the non-aerobic unit

(76.26% vs. 48.49%); (c) average number of students' steps during the aerobic unit was statistically higher than those during the non-aerobic unit (2498 steps vs. 1243 steps); (d) average intensity of students' PA in total during the aerobic unit was statistically higher than those during the non-aerobic unit (2.47 levels of PA vs. 1.17 levels of PA); and (e) average intensity of students' PA during A2 episodes of the aerobic unit was statistically higher than those during the non-aerobic unit (3.30 levels of PA vs. 1.53 levels of PA).

- (2) The average proportion of students' engagement in learning activities during A2 episodes of the aerobic unit was significantly higher than those during the non-aerobic unit (86.4% vs. 50.3%). This different was mainly because of the maximum involvement rate (MIR) in the non-aerobic unit was less than those in the aerobic unit.
- (3) Students in the non-aerobic unit gave FCE score toward their classes significantly higher than those in the aerobic unit (2.88 vs. 2.72 or level 5 vs. level 4). As shown in figure 4-10 and figure 4-11 on page 48, the different was mainly because of the dimension "product" in aerobic unit averagely always lower than the other dimension scores until the end of the unit.
- (4) Based on Pearson correlation analysis among 3 variables (PAL, LB, and FCE) that was only conducted toward 7 data in each unit, the results were as follows: (1) as could be seen in appendix 4-2 on page 54, although it was not significant, the coefficient correlation between students' PAL measured using

LifeCorder and total score of students' FCE in both units was positive and relatively high. In addition, as shown in appendix 4-3 on page 54, the relationship between students' PAL measured by using McKenzie's 5 PAL observation categories and students' FCE score was clear in the aerobic unit, but not clear in the non-aerobic unit; (2) the relationship between students' FCE and students' LB in both units, as shown in appendix 4-4 on page 54, was not clear; and (3) as shown in appendix 4-5 on page 54, the clear relationship between students' PAL and students' LB was only found inside motor learning (A2) episodes with the PAL was measured by using the McKenzie's 5 PAL observation categories. Thus, we could summarize the relationship among students' PAL, LB and FCE as follows: (1) although it was not significant because of small number of data (only 7 score in each unit), the clear relationships were found in between students' PAL and students' FCE in both units, and also in between students' MV-PAL engagement during motor learning (A2) episodes and students' LB in both units; (2) the not clear relationship was found in between students' LB and students' FCE score in both units; and (3) in general, the relationships was more clearly found inside the aerobic unit than inside the non-aerobic unit.

The third group-results are those resulting from analyzing 24 lessons for 2<sup>nd</sup> and 3<sup>rd</sup> grade elementary school students (18 gymnastics lessons for 2<sup>nd</sup> graders and 6 gymnastics lessons for 3<sup>rd</sup> graders). The results were as follows:

- (1) In general, the students' PAL during the gymnastics units was located in between the students' PAL during the aerobic unit and those during the non-aerobic unit in the previous study. The students' PAL during the gymnastics unit for the 2<sup>nd</sup> and the 3<sup>rd</sup> graders were as follows: (a) averagely during 72.2 % of A2 episodes, students observed engaged in MV-PAL, (b) averagely students produced 2146 steps, and (c) averagely students in the PE classes produced 1.89 level intensity of PA.
- (2) The average proportion of A2 episodes used by students to engage in learning activities was 62.6%.
- (3) The average total score of students' FCE was 2.74 (level 4 of the maximum 5 level).
- (4) The total score of students' FCE and students' PAL (number of steps and intensity of students' PA) has positive non significant relationship ( $r = .203$  and  $r = .089$ ). The significant relationship was only found between students' PAL and item score of spontaneous learning ( $r = .442^*$  and  $r = .477^*$ ). Total score has non-significant relationship with the proportion of students MV-PAL engagement during A2 episodes ( $r = .283$ ), proportion of MVPA-learning ( $r = -.046$ ), and proportion of MVPA-Non-learning ( $r = .379$ ). No significant relationship was found between students' FCE scores and total proportion of both learning engagement and non-learning engagement. The significant relationships were found between student's PAL and student's LB. Proportion of student's engagement in MV-PAL for learning (MVPA-L) correlated positively with proportion of

student's engagement in learning activities ( $r = .847^{**}$ ), especially engagement directly in motor learning ( $r = .956^{**}$ ), and correlated negatively with non-learning engagement activities ( $r = -.887^{**}$ ) especially for waiting or transporting activities ( $r = -.822^{**}$ ). In contrast, proportion of student's engagement in MV-PAL for non-learning (MVPA-NL) correlated negatively with proportion of student's engagement in learning activities ( $r = -.687^{**}$ ), especially engagement directly in motor learning ( $r = -.444^{**}$ ), and correlated positively with non-learning engagement activities ( $r = .679^{**}$ ) especially for waiting or transporting activities ( $r = .729^{**}$ ).

### 6.3. Conclusion

In the first phase studies that were conducted toward 60 samples of gymnastics and ball games units, we found significant relationships between: (1) students' LB and students' FCE; (2) students' PAL and students' LB; and students' PAL and students' FCE. But, although it was significance, the relationship between students' PAL and students' FCE was very weak.

In the second phase study that was conducted toward 2 fitness units (aerobic and non-aerobic units) as a case study, the aerobic unit that has significantly higher students' PAL and LB was given significantly lower FCE score by students. Thus, the results fail to reconfirm the close relationship among variable PAL, LB, and FCE. But, although it was not significance because of small number of data, results of correlation analysis toward 7 data from inside each unit indicated that: (1) there were



clear relationships between students' PAL and both students' LB and FCE; (2) there was no clear relationship between LB and FCE; and (3) there was clear relationship between students' PAL inside motor learning (A2) episodes of aerobic unit and students' FCE score.

In the third phase study that was conducted toward 4 gymnastic units (4 x 6 lessons) for 2<sup>nd</sup> and 3<sup>rd</sup> graders as a case study, in general episodes level we was not found significant relationships among students' PAL, LB and FCE, but in motor learning (A2) episodes level there was significant relationship between students' PAL and students' LB.

In total, the hypotheses that we want to clarify was: "during effective PE classes, many of the students enthusiastically engage in learning activities so that many of them engage in MV-PAL. As a result, the learning product was high and students satisfied with their PE activities. About 98 selected PE classes have been collected and analyzed, but it seems that the classes were not fit to proving the relationships.

Results indicated inconsistency in the relationships among the variables of students' PAL, students' LB, and students' FCE. Therefore, improving students' fitness and improving students' PAL during PE classes was important, but for improving learning products, besides improving students' PAL, it is important to improve also students' engagement in learning activities. Thus, during PE classes, it is important to obtain not only high level of students' PA, but also high intensity of students' engagement in learning activities, and high quality of learning products.

#### **6.4. Recommendations for further study**

This present study represented the initial effort to measure the relationships among students' PAL, students' LB, and students' FCE during PE lesson in elementary school level with limited grades and subject matters. As such, it can be used as comparison basis for conducting further studies involving students' PAL and for conducting fitness education. Future research studies on students' PAL should be grouped into three categories: additional descriptive studies; experimental studies; and process-product studies.

The recommendations for further descriptive studies are:

- (1) Replication of the present to include more subject matters in an effort to determine norms for the students' PAL in term of the proportion of PE time and the proportion number of students.
- (2) Replication of the present to include more grade and school levels in an effort to determine norms for the students' PAL in term of the proportion of PE time and the proportion number of students.

The recommendations for further experimental studies are:

- (3) Experimental studies should focus upon intervention methods to increase students' PAL without decreasing students' engagement in learning behaviors.
- (4) Experimental studies should focus upon intervention methods to increase students' PAL without decreasing students' satisfaction toward their PE class (FCE score).

The recommendations for further process-product studies are:

- (5) Process-product studies involving students' PAL should be contingent upon the development of valid and reliable measures of effectiveness physical education.
- (6) Process-product studies involving students' PAL should be contingent upon the development of applicable instrument for helping PE teachers monitor their classes.