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Regular exercise behavior among students with low level of ability in physical education

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Abstract
Regular moderate aerobic exercise can enhance cognitive performance in young adults; thus, university PE curriculums have a critical function. However, in Taiwan, exercise levels among university students are low. In addition, low-ability university students are typically considered lazy, but if adequate instruction is provided, they can improve their learning ability. In particular, PE has been found to facilitate positive change in such students. This study investigated the exercise behavior of low-ability students and discussed whether this affects their exercise habits after graduating. The study population comprised university students in Taiwan during the 2016–17 academic year. In total, 558 students completed an exercise learning experience scale questionnaire, and were classified into high-, medium-, and low-ability groups. The questionnaire comprised 25 questions. SPSS was used to calculate descriptive statistics and perform a two-way analysis of variance. The responses indicated that 118, 280, and 160 students engaged in regular, occasional, and little exercise, respectively. The high-ability students who exercised regularly attained the highest scores in the study scale, followed by the medium-ability students who exercised regularly. The low-ability students who engaged in little exercise had the lowest score. A significant interaction effect was indicated between regular exercise and PE ability; furthermore, the low-ability and little-exercise groups exhibited the lowest level of perception toward learning PE. Overall, when low-ability students perceive that the PE curriculum provides a pleasant learning experience, they are more likely to foster regular exercise habits. Therefore, universities should design PE curriculums, promote health education, and host extracurricular sports activities.

Keywords: Physical education underachievement, regular exercise, study experience

1. Introduction
The university physical education (PE) curriculum influences a person's exercise habit [1]. Huang *et al.* [2] asserted that knowledge of regular exercise should be transferred to students on a yearly basis through systematic teaching because in students' learning process, university PE class is their final opportunity to systematically learn knowledge on regular exercise. Fu and Sheu [3] indicated that regular, moderate aerobic exercise can enhance cognitive performance, particularly attention, in young adults. The university PE curriculum has a critical function, responsibility, and mission in graduates' habits, knowledge, and skills for regular exercise. Chen [4] maintained that the health-related role of PE is not only confined to improving physical fitness and boosting positive experiences in PE classes but should also motivate students to adopt a positive physical activity pattern and foster a regular aerobic exercise habit, thereby effectively improving students' health. In their follow-up study, Sparling and Snow [5] found that the optimal time for developing an exercise habit is during students' university years; 84.7% of students who exercised regularly maintained their exercise habit after graduation, and 81.3% of students who did not exercise regularly had no exercise habit after graduation. Du *et al.* [6] reported that regular physical activity can effectively lower the risk of developing diabetes, cardiovascular disease, depression, and specific cancer and even reduce the factors associated with mortality. Increasing physical activity is vital for health promotion.
According to an exercise participation survey published by the Ministry of Education in Taiwan, university students spent the least amount of time exercising, with only 30–40% of students performing 210 minutes of exercise per week [7]. PE in school is aimed at helping students to experience the positive effects of exercise through various forms of physical activity and to develop a positive attitude toward physical activity and exercise.

The healthy life style behaviors and positive health behaviors of individuals helps them protect their health and that of others [8]. PE can help students to acquire skills, knowledge, and values to achieve and maintain a healthy lifestyle through regular participation in PE activity [9]. Hsieh [10] found that the time students spent on exercise occurs mainly during PE; additionally, introducing creative elements in PE classes can stimulate students' learning interest and intention, which in turn enhance their learning outcomes. Mohammed and Mohammed [11] surveyed the opinions and attitudes of 2700 Kuwaiti students toward PE; the students indicated that PE classes are fun (72.8%) and make them feel happy (67.7%) and satisfied (60.5%). The students acquired more friends in class (67.3%) and improved their understanding of healthy lifestyles. The benefits of regular exercise are undeniable. Being healthy is a goal everyone pursues, and a regular exercise habit not only promotes physical health but also shapes healthy social development through positive exercise behavior.

Studies have increasingly reported how regular exercise improves our functional capacity as we age, leading to improvements in muscle function, mobility, and metabolism [12]. Gallé *et al*. [13] contended that PE class facilitates improving physical conditions and promoting health; however, its importance is often underestimated. PE has been considered a subject that involves skill practice and fitness training. In contrast to science-based teaching, PE is often considered secondary and marginal. Positive experience or perception of PE class can enhance students' physical, mental, and spiritual development and provide an opportunity for developing a regular exercise habit and the motivation to exercise. The university freshman year is the critical period for weight gain [14]; in general, students gain 2–3 kg during freshman year. Additionally, regular exercise prevents weight gain among freshman-year university women [15]. Barney *et al*. [16] indicated that PE is the primary factor conducive to combating the obesity epidemic. Health might be a difficult concept for students to comprehend. PE educators are responsible for teaching students the concept of health. Huang [1] reported that university students have almost no opportunities to participate and do not develop an exercise habit. As the screen size of entertainment devices have gradually decreased in size, students spend most of their free time using such devices (e.g., computers and mobile phones to watch movies, television, browse the Internet, and play games) and performing other sedentary activities. This phenomenon shows the increasing prevalence of diseases of affluence among contemporary students. The aforementioned studies have reported that contemporary lifestyles are mostly sedentary, which increases the medical resource burden and negatively influences physical health development. If PE activities can satisfy students' expectations and needs, these activities will improve their understanding of health concepts. Therefore, the university PE curriculum not only facilitates the transfer of skills and experiences but also acts as a crucial promoter of health.

Davis and Rimm [17] asserted that a low level of ability is caused by low self-esteem. Students with a low level of ability are generally considered lazy and apathetic, which results in their unsatisfactory academic performance. However, the reasons for such performance may be more complicated. Low-ability students can be characterized cognitively, socioemotionally, and behaviorally. If adequate instructional training is provided to students who lack the ability to learn effectively, they could improve their learning achievement. Conventional lecturing employs visual and audio presentation as the primary learning patterns. However, most low-ability students find learning easier when physical contact and personal experiences are involved in teaching. Perlman and Caputi [18] asserted that PE induced a considerable change in low-ability students; their findings indicated support for the idea that PE can facilitate positive change in low-ability students. Luo [19] found that low-ability students are easily distracted; they have problems receiving, integrating, and organizing information. These students can only repeatedly learn new learning materials but cannot integrate and associate new information with their experiences. Therefore, low-ability students develop inappropriate levels of self-efficacy and expectations. Kao [20] determined that strategic teaching interventions enable low-ability students to obtain peer assistance and support, and that improvements and team success motivate these students to learn. Roth and Weinstock [21] collected long-term data on the perception toward teachers' teaching methods among students from 23 seventh- and eighth-grade classrooms; their hierarchical linear regression analysis of these data indicated that low-ability students perceived a low level of autonomy support in the classroom when their teachers' epistemology was simple.

The aforementioned studies indicate that because of unsatisfactory time management, low-ability students spend little time exercising, leading to health problems. When designing curriculum content according to the cognitive, skill, and affective aspects of teaching goals, PE teachers should assess students' learning outcomes on the basis of their exercise skills and adopt different teaching methods for low-ability students. Students who perform unsatisfactorily in PE tend to lose concentration in class. If a PE class is properly designed, it should facilitate students' health-related cognitive performance and motivate exercise participation. In addition to special circumstances or for goals that the individual has attempted to achieve independently, exercise self-efficacy is also crucial to increasing exercise participation. When students are confident in their exercise skills, they can understand how to exercise and in turn develop a high level of self-efficacy. Therefore, low-ability students in PE are most in need of attention and suitable strategic teaching interventions capable of assisting them with the aspects that they are struggling with and alleviating their aversion to exercise. Education is the key to successful skill acquisition and individual, family, community, and societal development [22]. PE is not only a physical activity that is fun and enjoyable but also requires teaching methods that incorporate health-related designs. The objective of this study was to understand the behavioral performance of low-ability students in exercise habits. This paper provides information on whether this performance has an effect on students' regular exercise habits after they enter the workforce.

2. Materials and methods

2.1 Population and Sampling

The population of this research comprised the students enrolled at a university in Taiwan in the 2016–2017 academic year. The sample comprised 558 students, who could be reached from among the sample. The demographic variables of the students are presented in Table 1.

2.2 Study Experience Scale

The study experience scale was revised by Luo *et al.* [23] and comprises 25 questions. It included a 5-point Likert-type

scale. The reliability coefficient of the learning motivation scale was.904, and the cumulative amount of explained variance was 68.59%, indicating that it possessed excellent reliability and validity.

2.3 Data Analysis
SPSS was employed to calculate the descriptive statistics and to perform two-way analysis of variance. The significance level was set at $p<.05$.

3. Results
As shown in Table 1, 558 samples were collected, which were classified into high-ability (n = 168), medium-ability (n = 188), and low-ability (n = 202) groups. Of the students, 118, 280, and 160 students engaged in regular exercise, occasional exercise, and little exercise, respectively. On the PE curriculum exercise learning experience scale, the high-ability students who exercised regularly attained the highest score (M = 3.46 ± 0.25), followed by the medium-ability students who exercised regularly (M = 3.45 ± 0.30). The low-ability students who engaged in little exercise had the lowest score (M = 3.18 ± 0.21).

Table 1: Exercise habits and ability

Exercise habits		Ability			Total
		High	Medium	Low	
Regular exercise	N	27	87	4	118
	M	3.46	3.44	3.26	3.44
	SD	0.25	0.23	0.24	0.24
Occasional exercise	N	101	81	98	280
	M	3.45	3.40	3.36	3.40
	SD	0.30	0.26	0.32	0.30
Little exercise	N	40	20	100	160
	M	3.42	3.41	3.18	3.28
	SD	0.27	0.22	0.21	0.26
Total	N	168	188	202	558
	M	3.46	3.42	3.27	3.37
	SD	0.27	0.24	0.26	0.27

Table 2 lists the statistical significance test results for the interaction between Factor A (exercise habit) and Factor B (ability in PE). The F value was determined to be 3.11 ($p<.05$), which indicated a significant interaction effect, suggesting that the main effect test of covariance could be conducted.

Table 2: ANCOVA for study experience scale

Source	SS	DF	MS	F	Sig.
Exercise habits (A)	0.20	2	0.10	1.41	.241
Ability(B)	0.96	2	0.48	6.79	.000
(A)*(B)	0.88	4	0.22	3.11*	.021
Error	38.94	549	0.07		
Total	6,404.70	558			

*$p<.05$

As shown in Tables 1 and 3, the experience scores differed nonsignificantly in the high-ability group between those who engaged in (F = 1.37, $p>.05$) regular exercise (M = 3.46), occasional exercise (M = 3.45), and little exercise (M = 3.42). The medium-ability group also exhibited nonsignificant differences (F = 2.25, $p>.05$) between those who engaged regular exercise (M = 3.44), occasional exercise (M = 3.40), and little exercise (M = 3.41). However, the low-ability group exhibited a significant difference (F = 1.28, $p<.05$). Post hoc comparison showed that the regular-exercise group (M = 3.26) and occasional-exercise group (M = 3.40) attained significantly higher scores compared with the rare-exercise group (M = 3.28).

The regular-exercise group (F = 0.06, $p>.05$) exhibited nonsignificantly different scores between those with high (M = 3.46), medium (M = 3.44), and low (M = 3.26) ability. The occasional-exercise group exhibited nonsignificant differences (F = 0.71, $p>.05$) in scores between the high (M = 3.45), medium (M = 3.40), and low (M = 3.36) ability groups. By contrast, the little-exercise group exhibited a significant difference (F = 10.68, $p<.05$). Post hoc comparison showed that the score of the high-ability group (M = 3.42) was superior to that of the low-ability group (M = 3.18).

Table 3: ANOVA of effects of exercise habits and ability on study experience

Source of variation	SS	DF	MS	F	Post hoc comparisons
A factor (Exercise habits)					
B1(High)	0.15	2	0.77	1.37	
B2(Medium)	0.39	2	0.20	2.25	
B3(Low)	2.57	2	1.28	24.21*	Regular, Occasional > Little
B factor(Ability)					
A1(Regular exercise)	0.01	2	0.01	0.06	
A2(Occasional exercise)	0.08	2	0.04	0.71	
A3(Little exercise)	1.58	2	0.79	10.68*	High > Low

*$p<.05$

4. Discussion & Conclusions
This study investigated the behavioral performance of low-ability students as well as their exercise habits. A PE curriculum exercise learning experience scale was used as the research instrument. The results showed that the low-ability and rare-exercise groups exhibited the lowest level of perception toward PE curriculum learning (17.92%). In other words, an interaction effect existed between regular exercise habit and PE performance, and low-ability students and students who exercise rarely did not identify with the PE curriculum and lack sufficient education concerning health-related concepts in PE. The presence of individuals with low ability is a social phenomenon; the existence of such people reflects the fair and value problems in education settings. Providing humanistic care for low-ability individuals in PE to help them solve their learning predicament is generally related to social medical resource use and reflects the objective to promote fairness in PE and social harmony. Physical fitness and health are the prerequisites for developing and enhancing state competitiveness. Regular physical activity is the primary path to improved physical fitness. Exercise participation has a positive influence on self-esteem [24]. Lin *et al.* [25] asserted that PE at school is crucial for students and that PE is an essential medium to foster a regular exercise habit in citizens. PE class is the only opportunity, aside from their spare time at school, for students to exercise and increase their physical

activity levels. Hsu and Tseng [26] found that students exercise primarily because they want to be healthy, both physically and mentally. This result suggests that university students are generally aware of health concepts; however, as these students age and advance in their studies, their workload increases, and they increasingly engage in other activities of daily living (e.g., working part-time). Consequently, students exercise less as they age. This phenomenon warrants investigation. Senturk and Camliyer [27] reported that the Turkish PE curriculum considers the principles of participating in regular exercise, maintaining physical activity levels, and internalizing health-related concepts; based on these principles, PE teachers fulfill the objective that "every child must be physically active." In PE class, teachers must use interactive learning methods for encouraging children's participation. School grounds provide a space for students to participate in PE activities. The more time and energy students spend exercising at school, the more beneficial it is for their learning outcomes. Moderate aerobic exercise improves cognitive performance, particularly attention, in young adults [3].

In summary, university students have grown increasingly aware of the importance of health. They more thoroughly understand the benefits of exercise and use their spare time at school to exercise to improve their physique and physical health. With guidance by professional teachers through the PE curriculum, students can acquire more exercise-related information. Although school PE curricula facilitate maintaining a basic exercise habit in students, their regular exercise habits after school requires external support as reinforcement. When low-ability students perceive that the PE curriculum provides pleasant learning experiences, they are more likely to take the initiative to foster a regular exercise habit. Cultivating a regular exercise habit in students requires support from the family and school. Parents should encourage and support students to participate in various types of exercise and sports. Schools should design a PE curriculum, promulgate health education, and host extracurricular sports activities to effectively promote regular exercise habits. These opportunities to participate in PE activities can increase students' physical activity levels and encourage them to develop exercise habits because the university PE curriculum is students' final opportunity to receive systematic PE classes at school. To emphasize the importance of the PE curriculum in fostering a regular exercise habit, students' perception toward learning in the PE curriculum is crucial, specifically from the perspective of low-ability students to achieve equality in educational opportunity.

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