Impact of Smartphone Usage on Physical Education Scores and Learning Motivation

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***Abstract*—Smartphones have become exceedingly prevalent and changed the lifestyles of their users. Teenagers are at particularly high risk of becoming addicted to their devices, which leads to the adoption of sedentary lifestyles and lower quality of life. This study surveyed 460 students at a college in Taiwan. Learning motivation was assessed using a scale with excellent reliability and validity, and one-way analysis of variance and Student's t-test were employed to identify significant differences between smartphone usage groups. More than 71% of the college students were discovered to use their smartphones for more than 4 hours daily; only 28 participants (6.09%) had daily usage of less than 2 hours. This study also discovered significant differences between the physical education scores and learning motivation of students with different smartphone usage times. Students with higher smartphone usage obtained lower physical education scores and had significantly lower learning motivation. To prevent the negative effects of mobile phone addiction, schools should actively educate students on how mobile phones can be used correctly and healthily. An appropriate combination of smartphones and education could result in a powerful mobile learning tool that enhances teaching quality and efficiency, as well as promoting fun and interest in learning.**

***Index Terms*—smartphone, learning motivation, physical education scores**

I. Introduction

The growing popularity of smartphones has not only changed human's lifestyles but also produced a revolutionary transformation in social activities [1]. According to a survey on primary and secondary school students' Internet usage, which was published by the Taiwanese Ministry of Education in 2015, high school students have the severest addiction to online games and smartphones, with more than 140,000 high school students belonging to the high-risk group of smartphone addiction; the prevalence of addiction increases with age. Utilization of mobile phones in Taiwan is high, and mobile phone addiction has begun to affect teenagers' normal life and education. A mobile phone usage survey released by Google in 2013 revealed that Taiwan had a smartphone dependence of 81%, the highest in Asia, followed by Japan (80%), Hong Kong (77%), and Singapore (73%). Survey results released by Yahoo in 2014 revealed that the average daily use of mobile Internet in Taiwan exceeded 3 hours, 55 minutes more than the global average and the highest worldwide [1]. Using consumer electronics and other technology products has become the most common leisure activity for students, with a gradual shift from big screens to handheld screens, resulting in an unhealthy sedentary lifestyle. A survey of Korean university students by Park and Gilleard [2] discovered a significant correlation between mobile phone addiction and leisure time, whereas Kim, Wang, and Oh [3] revealed that 98% of Americans aged 18–29 years have their own smartphones. Australian scholars Howie *et al*. [4] discovered that the upper limb activity of children using tablets is less than that of children playing with conventional toys; specifically, the whole-body muscle activity of the tablet-playing group was only half that of the conventional-playing group. Children's bones are not yet fully developed; living a sedentary lifestyle can easily result in developmental abnormalities. Ito and Daisuke [5] surveyed Japanese college and high school students and discovered that Japanese teenagers lack normal socialization channels, with mobile phones becoming a substitute for social contact. Ezoe *et al*. [6] discovered a negative correlation between the healthiness of Japanese female students' lifestyle and their mobile phone dependency. The findings demonstrated that the teenagers' exceedingly intensive mobile phone usage results in personal health and time management crises in their daily lives. Chen [7] argued that the role of physical education in health is not merely to enhance health and fitness and provide positive experience of physical exercise, but also to enable students to have active physical activity patterns and develop aerobic exercise habits. To enhance health management and regular exercise capabilities, campus activities should be more diverse and exciting. A platform for peer interaction should be constructed through various group activities such as clubs, sports, or competitions to encourage students to increase physical activity, thereby enhancing their interest in learning and reducing the duration of their phone usage.

High quality of life has become a goal pursued by many people, rendering health and happiness indispensable. How to maintain a healthy body therefore becomes a crucial teaching objective of physical education. Physical education plays an essential role in providing students with correct understanding of health. Physical education courses have a crucial function and

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mission in the formation and acquisition of students' postgraduation exercise habits, sports knowledge, and athletic skills. Understanding students' learning motivation has become the most crucial topic for teachers wishing to formulate a more attractive teaching design. A panel study by Sparling and Snow [8] discovered that the most appropriate period for the development of exercise habits is during university years; 84.7% of their respondents who exercised regularly while at university maintained their exercise habits after graduation. Shangguan *et al*. [9] noted that college freshmen are a unique group, with numerous new students developing unhealthy behaviors such as insufficient sleep, academic-related stress, and little exercise; long-term sedentary lifestyle could lead to higher health risks postgraduation. College physical education courses play an extremely crucial role in the healthy lives of students, specifically that it is the last opportunity in school education for students to acquire systematic knowledge about regular exercise and to establish exercise habits. Good health is potentially a lifelong asset; however, many students neglect this most valuable asset once they enter the workplace, losing much of their health without means of recovery. This study investigated the impacts of smartphone usage on students' scores and learning motivation in college physical education courses. The results can provide future studies with a reference in planning more efficient physical education courses, in which students' activity and learning motivation are enhanced while smartphone usage is reduced.

II. Methods

A. Population and Sampling

The population of this research is the students enrolled at college of Taiwan in 2016-2017 educational year. The sampling consists of 460 students, who could be reached from among the sampling. The distribution of students according to demographic variables is seen in Table I.

B. The Learning Motivation Scale

The learning motivation scale. The scale was revised by Kao [10] and comprised 13 questions. A 5-point Likert-type scale was applied for these questions. The reliability coefficient of the learning motivation scale was .87 and the cumulative amount of explained variance was 60.94%, indicating that this scale possessed excellent reliability and validity.

C. Data Analysis

The SPSS was employed to calculate the descriptive statistics and to perform a t-test and One-Way ANOVA. The significance level in this study was set to .05.

III. Results

According to Table I, the 460 respondents in this study consisted of 181 men and 279 women. The most common daily smartphone usage was 4–6 hours (127, 27.61%), followed by 6–8 hours (111, 24.13%); only 28 respondents (6.09%) had a daily smartphone usage of less than 2 hours.

TABLE I. Descriptive Statistics of the Research Participants

	N	Pct.
Gender		
Male	181	39.35
Female	279	60.65
Total	460	100.00
Smartphone daily use time		
Under 2 hours	28	6.09
2-4 hours	105	22.83
4-6 hours	127	27.61
6-8 hours	111	24.13
Over 8 hours	89	19.35
Total	460	100.00

A. Difference in Daily Smartphone Usage in Relation to Learning Opportunity and Physical Education Scores

As detailed in Table II, the group with daily smartphone usage of less than 2 hours had the highest learning motivation (mean = 3.51 ± 1.03), whereas those with more than 8 hours of smartphone usage had the lowest learning motivation (2.40 ± 0.78). Regarding their physical education performance, participants with less than 2 hours of daily smartphone usage achieved the highest scores (89.96 ± 5.04) and those with more than 8 hours of smartphone usage the lowest scores (81.08 ± 9.21).

TABLE II. Daily Smartphone Usage Time, Learning Motivation, and Physical Education Scores

Smartphone use time	Learning Motivation				P.E. Scores			
	N	Mean	SD	SE	N	Mean	SD	SE
A. Under 2 hours	28	3.51	1.03	0.19	28	86.96	5.04	0.95
B. 2-4 hours	105	3.18	0.92	0.90	105	82.76	7.82	0.76
C. 4-6 hours	127	3.01	0.78	0.69	127	81.91	9.01	0.80
D. 6-8 hours	111	2.50	0.86	0.81	111	81.34	9.38	0.89
E. Over 8 hours	89	2.40	0.78	0.83	89	81.08	9.21	0.98
Total	460	2.84	0.91	0.42	460	82.27	8.75	0.41

A significant difference was identified between differing smartphone usage times and learning motivations ($F = 19.97$, $p = .00$, $\eta^2 = 0.15$; Table III). Posthoc comparison discovered that participants with less than 2 hours of daily smartphone usage time had significantly higher learning motivation in physical education (mean = 3.51 ± 1.03) compared with those who used their smartphone for 6–8 hours daily (2.50 ± 0.86) or more than 8 hours (2.40 ± 0.78).

TABLE III. Variance Analysis of Daily Smartphone Usage Time and Learning Motivation

	SS	df	MS	F	p	η^2	MC
Between Groups	58.01	4	14.50	19.97*	0.00	0.15	A>D, E
Within Group	330.33	455	0.73				
Total	388.34	459					

*$p < .05$

A significant difference was obtained between the physical education scores of students with different smartphone usage times ($F = 2.53$, $p = .04$, $\eta^2 = 0.02$; Tables II and IV). Posthoc comparison discovered that

participants with less than 2 hours of daily smartphone usage (mean = 86.96 ± 5.04) achieved higher physical education scores compared with those with more than 8 hours of daily smartphone usage (81.08 ± 9.21).

TABLE IV. VARIANCE ANALYSIS OF DAILY SMARTPHONE USAGE TIME AND PHYSICAL EDUCATION SCORES

	SS	df	MS	F	Sig.	η^2	MC
Between Groups	767.88	4	191.97	2.53*	0.04	0.02	A> E
Within Group	34400.69	455	75.60				
Total	35168.57	459					

*$p < .05$

IV. DISCUSSION

The study results indicated that the most common daily smartphone usage time was 4–6 hours (27.61% of participants), followed by 6–8 hours (24.13%); only 28 participants (6.09%) had daily usage of less than 2 hours. More than 71% of the college students used smartphones for more than 4 hours daily. To prevent mobile phone addiction from negatively affecting students' lives, health, and academic performance, schools and teachers should actively educate students on the problems of mobile phone addiction and how mobile phones can be used appropriately, thereby guiding them to develop healthy and appropriate leisure activities. Mobile phones increase the frequency of communication between teenagers and expand their opportunities for interpersonal relationships [11]; however, mobile phone addiction causes severe health and time management problems [12]. This study also discovered that students with higher smartphone usage obtained lower physical education scores and had lower learning motivation. High motivation indicates that a student has the incentive to pursue their goals [13], and individual differences in learning motivation are regarded as crucial predictors of learning and training effectiveness [14]. Xiang, Chen, and Bruene [15] stated that adolescent students' lack of interest in sports may be related to negative experiences at school. To formulate an attractive teaching design, teachers are increasingly focusing on enhancing learning motivation and developing corresponding teaching strategies. When students have strong motivation, they focus during the learning process, which yields positive learning scores. Positive physical education experiences and feelings can stimulate the development of the students' body and mind and serve as crucial motivation for their future development of regular exercise habits [16]. Campus is a location where students can participate in sports activities, and the more time and energy students spend on campus sports, the more beneficial such activity is to their learning scores, particularly in their attention and concentration [17]. Student's satisfaction with physical education course design is akin to consumer satisfaction; they enjoy physical education when they are satisfied with the course. Only by understanding students' learning process can educators identify approaches to improve students' learning, thereby positively influence student's physical health.

Other studies on physical education scores have rarely focused on the correlation between the scores and mobile phone usage. In terms of academic achievements, Chen [18] discovered a negative correlation between Internet usage and physical activity. Lo and Shieh [12] argued that longer mobile phone usage time and reduces learning time and leads to poorer academic performance; additionally, students' learning motivation may decline once they become addicted to their mobile phone. College students believe that their common motivation for using mobile phones daily is to maintain interpersonal relationships; improper mobile phone usage, however, potentially undermines social relations. Adolescents' improper Internet usage has been shown to be negatively correlated to the quality of parental and peer relationships and other social measures [19].

The application of smartphones in physical education can be a double-edged sword; the possible positive function of smartphones in teaching should also be considered along with the technology's negative impact. Researchers of this study believe that smartphones can serve as educational tools that facilitate physical education if used appropriately. However, if smartphones are to be used as a measure of intervention in learning processes, information security, students' level of independence, students' time management skills, and regulations for mobile phone usage should also be considered for effective implementation of this intervention. Inadequate time-management skills among most college students results in the excessive use of mobile phones and insufficient time for exercise; hence, poor time management leads to unwillingness to exercise, and further to health problems related to the lack of exercise. Physical education teachers generally design course contents on the basis of teaching objectives in the cognitive, psychomotor, and affective domains. In addition to determining whether students learn effectively through their athletic skills, the teachers should pay extra attention to groups with low learning motivation and poor learning scores from the perspective of health management.

V. CONCLUSION

This study recruited 460 Taiwanese college students as the research participants and used a questionnaire to determine the correlation of daily smartphone usage time with physical education score and learning motivation. The survey discovered that 71% of the students used their smartphone for at least 4 hours daily, and those with more extensive mobile phone usage had poorer physical education scores and lower learning motivation. Adolescence is a crucial stage for physical and mental development, during which time individuals' physical activity is generally higher and their basic athletic capacity is usually larger than those in their adulthood. Lack of exercise due to sitting in front of computers or other devices for long durations may affect the physical and mental health of teenagers. Appropriate smartphone usage, however, could help students satisfy their personal needs for a sense of belonging.

Students' attitude toward physical education courses reflect their willingness to participate in sports activities

outside the classroom and even in the future; thus, learning motivation regarding physical education is an essential determinant of students' participation in sports activities or their learning of various athletic skills. Learning interest and achievements can be effectively enhanced only through successful experiences and feelings of learning when an individual has been motivated to actively participate in physical education activities. Positive physical education experiences and feelings can stimulate students' physical and mental development and are also critical for future establishment of regular exercise habits. Effective teaching and time management have become a common topic for research and reform in the field of physical education. When students are no longer marginalized in class and take an interest in sports, their participation in sports increases; such a situation is the only opportunity to overturn a student's rejection of physical education.

Based on the results of this study, the following recommendations are proposed to serve as a reference for future relevant studies. The smartphone use time reducing learning motivation, teachers are still responsible for disseminating the learning attitude, knowledge, and skills to students; they should also pay attention to whether students' have sufficient time to practice their skills. Furthermore, this study only conducted research on students from one university in Taiwan. However, whether any differences are present in the results of students from distinct regions and socioeconomic backgrounds remains to be investigated.

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