



**SPORTS AND PHYSICAL ACTIVITIES ON ACADEMIC
PERFORMANCE AND OVERALL PERSONAL DEVELOPMENT:
A LONGITUDINAL CASE STUDYⁱ**

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Abstract:

Many researchers and scholars have done research and published theses, dissertations, scholarly papers and articles on the benefits and positive impacts of physical activities (exercise, sports, sports participations, and other related physical activities) on students' academic performance as well as overall personal development. In fact, these PA (physical activities) can be considered as the backbones of the lives of students. However, most of these studies have been done mostly in a quantitative approach, synchronically, which makes it difficult to find out what changes these physical activities can bring to the lives of students in the long run. The present study is a qualitative, longitudinal and descriptive individual case study, which investigated the benefits and positive impacts of sports and physical activities on a single male student's academic performance and his overall personal development during his 9 and half years of compulsory education in Taiwan region. For authenticity, reliability and validity, the research data were collected using a triangulation data collection approach - observation, documentation, and face-to-face interviews over a period of nine and half years of compulsory education in Taiwan. Results: First, there was a strong link between the case study subject's involvement level and frequency in sports and physical activity and his academic performance. Second, higher intensity and higher frequency yielded better academic results. Third, a slight declining tendency was found in both physical activity and academic performance over the course of the study. Fourth, doing sports and physical activities regularly not only helped the case study subject to be active, energetic and healthy but also helped him to outperform academically those physically inactive students. Fifth, the case study subject

ⁱ 運動與體育活動對於學業表現及全人發展的關聯：一個個案的長期研究

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improved physically and academically and became more disciplined, self-confident and responsible.

Keywords: sports activities; academic performance; self-esteem; overall personal development

摘要：許多研究人員和學者們曾經對於體育相關活動（包括訓練，運動，運動競技，及其它有關的體育活動）之於學生的學業成績與個人的全面發展所帶來的益處和積極影響分別進行了研究，並發表了報告，論文及專業論文。事實上，這些體育活動（PA, physical activities）就像是學生生活中的脊樑骨。然而，這些研究大多是截取特定時間的量化研究，難以發現體育活動(PA)對於學生生活所帶來的延續的(for a long run)變化。本研究採用的是質的、長時期的，以個案為研究對象的描述性研究。研究一名來自台灣地區男學生於9年半的義務教育期間，他的運動競技與體育活動對其學業成績和個人的整體發展所產生的益處與積極影響。為了取得真實、可靠和有效性，本研究所蒐集到的資料則採用三角交叉法分析，對於個案接受九年半的義務教育期間進行觀察、檔案分析和面對面訪談。研究結果發現：第一，研究對象的運動競技及體育活動的涉入程度和頻率與其學業成績之間曾有強烈的關聯。第二，較強度的和高頻率的運動及體育活動能產生更好的學業成績。第三，在研究過程中，體育活動和學業成績兩者都有輕微下降的趨勢。第四，從事規律的運動競技和體育活動，不僅有助於個案保持活躍、精力充沛和健康，他的學業成績也超越那些不愛運動的學生。第五，個案在身體和學業上得到提升，同時也變得更加自律、自信和負責任。

關鍵字：運動；學業表現；自尊；全人發展。

1. Introduction

1.1. Purpose and Background of the Study

Many researchers have researched, proved and published many theses, dissertations, scholarly papers, essays and articles about the benefits and the positive impacts of doing regular physical activities (exercise, sports, taking part in sports and other related physical activities) on students' academic and overall personal development. However, most of these studies were done on a quantitative approach to a cross-sectional population, synchronically. Very few qualitative longitudinal case studies have been done in this field, especially covering a long period of time, especially in the Taiwan region. Not only investigating the benefits and positive impacts of physical activities synchronically, it is also very important to observe what changes regular involvement in these physical activities can bring to students' lives in the long run. The present study is a qualitative, longitudinal single case study, which investigated the benefits and positive impacts of doing regular physical activities on a single male student's academic performance as well as on his overall personal development through observation, documentation, and interviews for a period of nine and half years of compulsory education in Taiwan region.

The sad news is that, in spite of all the benefits these physical activities contribute, it was found that, in Taiwan region, more and more students stayed away from these beneficial physical activities (Ngangbam, 2021). Thus, the overall purpose of the present study is to investigate the benefits and positive impacts of physical activities on the case study subject's academic performance and overall personal development during the nine and half years of compulsory education in Taiwan region. The study also presents some suggestions on how to encourage and support students to do exercise, sports, and take part in sports competitions and other related physical activities so that their lives can be healthier, happier, more rounded, complete, and successful.

1.2. Literature Review

The present study investigates the benefits and positive impacts of sports and physical activities on students' lives. This section will study some of the relevant and related studies done by other scholars in this field.

Studies have consistently demonstrated that physically active people are not only healthier but also perform better on tests of cerebral or intellectual ability. John J. Ratey, a Harvard University psychiatrist, in his book *Spark: The Revolutionary New Science of Exercise and the Brain* (2008), describes the increased volume in the hippocampus and frontal and temporal lobes, the regions of the brain associated with cognitive functioning, through MRI scans of the brains of sedentary people who have suddenly improved their fitness levels.

According to Gorton on James Coleman's classic work, "The Adolescent Society" (1961) students who participate in high school sports, on average, tend to perform better academically than their non-athletic peers. However, the positive impact of physical activities on academic performance on students also depends on the level and frequency of physical activities the students.

In his study, Laughlin examined the grades of wrestlers during the season and out of season at a rural high school in Iowa and found that athlete-students do better in academics during the training season than off-season. He found that the wrestlers earned higher grades during the wrestling season than out of competition, meaning the more regular physical activities, the better in academic performance. Laughlin's findings were also supported by Quirk and Silliker's study, which revealed that the in-season grades were substantially higher than out-of-season grades (Laughlin, 1972, Quirk & Silliker, 1998 as cited in Gorton, 2010, p. 15).

Sitkowski (2008) also found that athletic participation had a positive impact on academic performance and that impact may be attributable to the difference between in-season and out-of-season performance. It was found that there was a significant difference between the GPA (Grade Point Average) scores during and after participating in school-sponsored sporting events for male students.

Most parents might think that spending time on sports and physical activities will reduce their study time. However, according to CorneliBen and Christian (2007), time spent on sports does not necessarily reduce the time allocated to schooling but can also

reduce bad leisure activities, which might harm educational productivity, for example, activities like watching television, playing computer games, smoking, drinking, and going to parties. If participation in athletic activities reduces these bad activities, sport can have an indirect positive effect on educational productivity.

To keep students away from a sedentary lifestyle, Sharma (2019) states that parents should become role models in doing physical activities in their children's lives to keep them away from addiction to these techie-gadgets, so that their kids can also have an active lifestyle.

In his study for his Master's thesis, Prasad (2012) compared two groups of students. It was found that students who participated in sports generally did better than those who did not.

Regarding how exercise and physical activities work, according to Hillman (Hillman et al., 2008, as cited in Christopher, 2017, para. 6), one key causal mechanism underpinning the relationship between physical activity and academics is a direct, physiological link between activity and cognition. He continued that from the biological and neurological study physical activity activates the allocation of cognitive resources and promotes faster cognitive processing through stimulus encoding.

Donnelly et al. (2016) also found evidence to suggest that there are positive associations among physical education, fitness, cognition, and academic achievement. Based on the evidence available, they concluded that physical education has a positive influence on cognition as well as brain structure and function.

In a two-year, with three-time points longitudinal study of five public junior high schools in two suburban municipalities in Okinawa prefecture, Japan from April 2015 to July 2017, Kyan et al. (2018) detected a possibility that an increase in physical fitness leading to good academic achievement among junior high school boys, regardless of between-person differences of physical level.

In a two-semester study in a Shanghai high school to examine the effect of a strengthened physical education pilot program consisting of specialized sports training on students' academic performance in the high school context, Zhang et al. (2019) found that strengthened physical education had a significantly positive effect on overall academic performance among the high school students, especially in Chinese language and English language scores.

Recently, in their longitudinal study of 7, 11 and 14-year-old students, Vasilopoulos and Ellefson (2021) examined the relationship between physical activity, self-regulation in a multi-dimensional approach and educational outcomes. They found out that emotional regulation was linked to physical activity in early childhood to subsequently affect academic achievement.

Doing sports and physical activities is not just about regularity, it is also about intensity. In their study, Joca Zurc and Jurij Planinšec (2022) found that children engaged in physical activity most days a week, with moderate-intensity and unorganized activities showed significant associations with above-average academic competence. Higher frequency and intensity of physical activity, the absence of digital games, and

attending sports clubs seem to have the most beneficial effects in terms of academic competence in school children.

On their study on participation in sports and games as well as extracurricular activities and the development of personal and interpersonal skills in adolescents, Ivaniushina and Zapletina (2015) revealed that students who participated in sports and games activities offer a wide variety for developing various aspects of personality such as social skills, interpersonal skills, goal setting skills, self-identity and competencies.

In their study, Lazaro and Anney (2016) found that students who participate in co-curricular activities such as sports and games are more advantageous to developing talents, including enriching students' language skills and self-confidence.

Massoni (2011), in his study, found that students who participated in extracurricular activities reduced behaviors problems. Students who participated in these activities take pride in their accomplishments, hence they gain better self-respect, self-esteem and self-confidence. Elavsky (2010) states that, regardless of weight, size, gender, or age, exercise can quickly elevate a person's perception of his or her attractiveness, that is, self-worth.

Based on their study of 34 male and female high school students divided into experimented (15) and control groups (19), Soyturk and Ozturk (2020) revealed that among the high school students' behaviors, sports-based games are effective activities which can be used in reducing high school students' behavior problems.

In their study "Extra-curricular activities and youth risky behaviors in South Africa" including a sample of 10,502,705 including both male and female youths aged between 12-22, Muloiwa and Odimegwu (2018) it was revealed that participation in sports and games, as well as extracurricular activities, were found to be beneficial to youth self-esteem and discipline.

Many researchers have already proved that increasing time for physical activities in schools helps students to improve their academic performance. However, time for physical activity classes has been limited to less than 2 hours per week in the Taiwan region.

In spite of all the benefits and positive impacts sports and physical activities contribute, very few students, even their parents and teachers give fewer thoughts and importance to these activities to the student community. This negative attitude has kept many young students away from sports and physical activities, especially in the Taiwan region. According to Ngangbam's study (2021), in Taiwan, 82% of students knew doing physical activities could keep them physically and mentally fit and healthy, but only 28% of them did enough exercise.

Aerts et al. (1997) stated that while physical activities appear to be a natural part of children's everyday life, they declined during the adolescence period. This finding was supported by Kimm et al. (2002) study of 1213 black girls and 1166 white girls from the ages of 9 or 10 to the ages of 18 or 19 years. They found that these girls' physical activity levels declined during adolescence. Casey et al. (2009) also reported that participation in sports and physical activity declined during adolescence.

To create physical activity habits among adolescents, parents' role is important. Crumbley et al. (2019) talked about the importance of instilling a habit of doing physical activities during childhood. They stated that as physical activity and sedentary behaviors are developed during the early childhood period, for physical activity to occur in children, parents should also be engaged in and model the physical activity behaviors, increasing the likelihood of young children learning to be physically active.

In another study by Hosseini et al. (2013), two main themes were found played by parents: developing interest in physical activity and providing support to adolescents for physical activity through role models and support.

Not only parents' involvement in physical activities plays an important role in supporting and encouraging children and adolescents to involve in physical activities, but according to Qurban et al. (2018), those children and adolescents who involve in physical activities regularly are found to be more supported by their parents. They continued that greater parental support will result in enhancing students' academic motivation, skills and knowledge about school goals, thereby resulting in better academic achievement. Besides these benefits, physical activities also bring parents and children closer.

Based on these studies it can be considered that sports and physical activities are the backbones of the lives of the students' community. Not only for children and students, sports and physical activities are important to everyone of all ages for mental and physical fitness.

2. Research Methodology

The present study is a qualitative, descriptive, longitudinal, diachronic, non-experimental, non-controlled, and non-participant covered case study, which investigated the benefits, and positive impacts of sports and physical activities on academic performance and overall personal development on a single male case study subject. The present case study research is based on the data collected through a triangulation data collection approach through observation, documentation and face-to-face interviews conducted longitudinally during a period of nine and half years of compulsory education in Taiwan region.

The reason behind opting for a longitudinal single case study approach within the qualitative method is that it allowed the researcher to investigate what changes were brought under the influence and impacts of sports and physical activities on the present case study subject longitudinally over a period of nine and half years. And the main reason for choosing these three periods of elementary, junior and senior high schools is that sports and other physical activities (physical education classes) are compulsory during these schooling years in Taiwan region. There are two 50-minute compulsory physical activity classes per week. These physical activity classes are taught as credit courses and grades are given according to their physical activity performance by their PE (physical education) teachers. Besides these PE classes, there are many sports clubs,

which students can join depending on their interests. Thus, students can practice as many times as they need to.

To find out the link between the case study subject's sports and physical activities performance and academic performance and overall personal development, the present study observed the case study subject's involvement in sports and physical activities in school and outside the school, checked his physical activity and study grades, used original documents and interview responses. The researcher also checked his overall personal development during the study period.

2.1 Case Study Subject

The case study subject is a male student. The present case study subject finished elementary school for six years (2013 -2018) and three years of junior high school (2019 – 2021), and at present (2022- 2023) studying the first year of senior high school in Taiwan.

The main reason for choosing the present case study subject was that the researcher could access him and observe his involvement in sports and physical activities and performance, his study habits, academic performance, and his overall personal development over a long period of time 9 and half years.

2.2. Definition of Case Study

Kenneth Harling (2012) defines a case study as a holistic inquiry that investigates a contemporary phenomenon within its natural setting. To elaborate, it means to investigate a phenomenon which can be a program, an event, an activity, a problem or an individual through in-depth and detailed direct observations, interviews, audio-visual materials, documents, reports and physical artifacts in natural contextual conditions within which this phenomenon appears.

According to Creswell (2007), "*case study research is a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time*" through detailed, in-depth data collection involving multiple sources of information (e.g. observations, interviews, audiovisual material, and documents and reports) and reports a case description and case based themes (p. 74).

On the other hand, Stake (1995) defines case study as "*the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances*" (p. xi), giving his attention to the nature of the "case" as well as its context.

The following section will explain the details of the data collection and analysis approach.

2.3. Data Collection Procedures

To make the data more reliable, valid, authentic, objective and measurable, the present investigation used a triangulation data collection approach – observation, documentation, and interviews. The data were collected during the case study subject's nine and half years of compulsory education during elementary, junior, and senior high

school (first semester) in the Taiwan region. The following section talks about face-to-face interviews with case study subjects.

2.4. Face-to-face Interviews

To support the observation data and documents, the researcher also collected data through face-to-face interviews with the case study subject whenever necessary, especially to find out relevant information which the researcher could not observe directly or see physically. The researcher used mostly unstructured open-ended questions. The following table displays the questions used during the interviews.

Table 5: Table Displaying Interview Questions

What kinds of exercises or sports do you do during your physical education classes?
How many minutes or hours do you practice per week at school?
Outside physical education classes, do you do any other sports or physical activities in school?
Why do you like to join the Wushu Club in your school?
How many times do you practice Wushu in school?
Based on your experience, can you tell me the differences you feel mentally and physically between on-season and off-season?
Tell me some of the benefits, advantages, and disadvantages of doing sports and other physical activities?
Who are the people that encourage and support you in doing sports and physical activities?
Why did your PA/study grades go down?

The research interview responses are presented as text whenever necessary. The following section presents the research discussion.

3. Observation, Analysis, and Findings

To investigate the detailed benefits and positive impacts of doing regular physical activities (exercise, sports, sports participations and other related physical activities) on the case study subject, the researcher observed the case study subject's involvement in these activities as well as his study habits. To make the observation and findings more reliable, the observation was supported by related documents and interview responses. The observation of the case study subject was done in three different periods – elementary school, junior high school, and one semester of senior high school (senior high school still going on).

3.1. Elementary School

Elementary education is the first formal compulsory education in Taiwan. During the elementary school study, the case study subject had two 50-minute physical education classes per week. On these two periods of physical activity classes on two different days, students were allowed to play different sports like basketball, volleyball, badminton, soccer, and running. He took part in all those activities. Besides these activities at school,

the case study subject also did physical activities like running and rope skipping at home, or in the local parks after school, or on weekends. In the evening, before bed, the case study was reviewed and finished his school homework. He never went to bed without finishing his school homework. Overall, he did very well in both physical activities and study during elementary school. His physical activity (PA) and study grade points can be seen from the original grade sheet given by his elementary school below.

Table 1: Original Grade Sheet Displaying PA and Study Grades During Six Years of Elementary School

新 北 市 土 城 區 清 水 國 民 小 學 成 績 證 明 書															
111 新 北 市 土 城 區 清 水 國 民 小 學 績 證 字 第 00083 號															
學 生		陳 秀 貴		民 國		96 年 04 月 27 日 生		在 本 校		六 年 八 班					
107		學 年 度 第 二		學 期 第 一		核 任 成 績 如 後									
項 目		年 級		一 年 級		二 年 級		三 年 級		四 年 級		五 年 級		六 年 級	
		學 年 度		102		103		104		105		106		107	
學 文		學 期		上	下	上	下	上	下	上	下	上	下	上	下
		學 文	本 國 語 言	86.8	95.8	91.8	96.6	90.6	90.3	86.2	90.9	88.9	89.4	92.3	91.7
鄉 土 語 言	88.0		91.0	94.0	92.0	94.0	93.0	93.0	92.0	93.0	93.0	91.0	93.0		
英 語	93.0		88.9	87.5	95.6	95.0	93.2	94.5	95.3	94.8	95.1	98.3	96.2		
領 域	健 康 與 體 育	90.0	94.0	92.5	90.5	90.8	89.7	90.8	88.9	94.0	93.1	92.2	92.1		
	數 學	91.0	96.8	95.6	95.2	93.3	92.8	93.6	92.8	91.0	94.5	90.1	89.6		
領 域	生 活 課 程	社 會				98.8	96.6	92.5	92.5	90.3	84.7	86.5	91.1		
		自 然 與 生 活 科 技	87.8	88.2	92.9	91.9	91.0	95.3	98.5	97.0	88.8	89.0	94.1	94.2	
		藝 術 與 人 文					94.5	94.0	92.0	92.5	96.0	94.7	94.3	95.3	
綜 合 活 動		93.0	94.0	92.0	93.0	91.0	91.3	91.2	90.7	93.6	96.6	94.6	93.2		
學 期 領 域 總 成 績		89.0	92.8	92.4	94.0	92.9	92.6	91.8	92.4	91.6	92.0	92.5	92.5		
日 常 生 活 表 現															
備 註		1. 五等第成績：「優」90分以上，「甲」80分以上未滿90分，「乙」70分以上未滿80分，「丙」60分以上未滿70分，「丁」未滿60分。 2. 成績證明欄可單獨提列個別之學期或學年成績。													

註冊組長：

教務主任：

校長：

中 華 民 國 1 1 2 年 0 2 月 0 3 日

Note: PA = Physical Activity

The above document in Table 1 displays the original grades of all the subjects during six years of elementary school. For convenience, clarity, and necessity, only the PA and study average grade points are translated.

3.2. Junior High School

By the beginning of the first year of his junior high school, besides the two 50-minute physical education classes, the case study subject joined the school Wushu Club. However, he was not serious about his Wushu nor physical activities. Based on the interview responses, he said he was naughty, not so serious on both physical activities nor study. He also mentioned that his parents didn't care much about either his physical activity or his study. That's right, his parents were too busy encouraging their daughter's (case study subject's elder sister) Wushu practice, taking part in Wushu championships and winning. Thus, in his first and second semesters of junior high school, his PA (physical activity) grade points were 74.3% and 75.5% respectively, giving an average PA average grade point of 75% by the end of his first-year junior high school. In all his study career so far, case study subjects never got such a low average grade point in physical activity.

Regarding his academic performance, the present case study subject's academic performance didn't go as well. He scored 82.85% and 86.63% respectively in the first and second semesters, leading to an average grade point of 85% in study by the end of his first-year junior high school. So far, the case study subject has never got so low average grade points in his physical activity or study.

However, by the beginning of the second year of junior high school, things changed. He became more serious and involved more in his Wushu sports practice, championships, and other physical activities. Now, in his third and fourth semesters of junior high school he could score 84.5% and 83.3% respectively, leading to an average grade point of 84% in PA by the end of his second year of junior high school. At the same time, his study grade points also improved to 88.31% and 90.4% respectively, leading to an average grade point of 89 % by the end of his junior high school second year.

During the third and final year of his junior high school, the case study continued his Wushu practice, did running, and did free hand physical exercise at home or in the local park. He also joined Wushu and fitness championships, where he lost some and won some. By the end of his junior high school, his PA grade points in the fifth and sixth semesters were 89.5% and 92.2% respectively, leading to an average grade point of 91%. He also improved his academic performance in study scoring 89.5% and 93.3% in the fifth and sixth semesters providing him with an average grade point of 91% by the end of his junior high school. Not only did he improved his average grade points in PA and study, but his overall ranking also climbed up to second place in the class, and among 450 graduating junior high school students, he managed to be in the top 7. The following original grade sheet document displays the PA and study grades. For those who cannot read Mandarin Chinese, the relevant PA and study average grade points are translated into English.

Table 2: Original Grade Sheet displaying PA and Study Grades during Three Years of Junior High School

科考日期：112/02/02
 科考時間：10:06:50
 學 號：855100
 姓 名：陳秀實

成績		(108學年度)七年級												(109學年度)八年級												(110學年度)九年級											
		上				下				上				下				上				下															
		成績	等	第	分	成績	等	第	分	成績	等	第	分	成績	等	第	分	成績	等	第	分	成績	等	第	分												
語文	國文	87.8	甲	5	1	88.7	甲	5	1	90.3	優	5	1	91.5	優	5	1	93	優	4	1	92.2	優	4	1												
	英語	95.3	優	3	1	93.3	優	3	1	95.8	優	3	1	96.4	優	3	1	93.7	優	3	1	95.5	優	3	1												
	平均	90.6				90.4				92.4				93.3				93.3				93.6															
學習領域	數學	77.5	乙	4	2	76.7	乙	4	2	79.3	乙	4	2	93.7	優	4	1	88.3	甲	4	1	98	優	4	1												
	社會	77.4	乙	3	2	84.5	甲	3	1	84.1	甲	3	1	93.6	優	3	1	91.5	優	3	1	92.9	優	3	1												
	自然科學	77.3	乙	3	2	87.8	甲	3	1	87.9	甲	3	1	86.1	甲	3	2	87.7	甲	3	1	96.8	優	3	1												
	藝術	93.2	優	3	1	95.8	優	3	1	92.8	優	3	1	92	優	3	1	93	優	3	1	91.8	優	3	1												
	綜合活動	93.8	優	3	1	95.3	優	3	1	92.2	優	3	1	87.7	甲	3	1	85.4	甲	3	2	87.5	甲	3	1												
	科技	59.8	丁	2	1	82.8	甲	2	1	90	優	2	1	86.5	甲	2	1	78.5	乙			90.5	優	2	2												
	健康與體育	74.3	乙	3	3	75.5	乙	3	2	84.5	甲	3	1	83.3	甲	3	1	89.5	甲	3	2	92.2	優	3	1												
	學習領域平均	82.85				86.63				88.31				90.4				89.5				93.3															
	學習領域等第		甲			甲				甲				優				甲				優															
	彈性課程	社會大環境	72.5	乙	1	2	75	乙	1	2																											
英語繪本		90	優	1	2	95	優	1	1																												
巧手剪紙秀		95	優	2	1	72.5	乙	2	2																												
紙建築										87.5	甲	1	1	94.5	優	1	1																				
英語歌唱										92.5	優	1	1	100	優	1	1																				
科學實驗										83.5	甲	1	1	96	優	1	1																				
水境域鄉情										79	乙	1	2	94	優	1	1																				
科學動動腦																		93	優	2	1	98.5	優	2	1												
特色公民																		91	優	1	1	94.5	優	1	1												
英語聽力																		100	優	1	1	100	優	1	1												
國際教育																		95	優	0.5	1	93	優	0.5	1												
全人教育																		92.5	優	0.5	1	92.5	優	0.5	1												
出席紀錄	應出席日數	99.0				97.0				100.0				91.0				99.0				79.0															
	事假節數	0				0				0				0				7				10															
	病假節數	0				0				0				0				0				5															
	曠課節數	0				0				0				1				0				3															
	集會缺席次數	0				0				0				0				0				1															
導師評語	個性大方，很有自己的想法。思考創造力佳。上課專注，勇於表現，對自己有期待並努力完成。打掃勤奮，做事用心。字跡端正，有藝術天份且勤學。九年級成熟穩定很多，愛開玩笑的個性。																																				
	導師	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君	葉怡君													
畢業成績	總成績												等第												<input checked="" type="checkbox"/> 准予畢業 <input type="checkbox"/> 發給修業證書												
	平均																																				

努力程度：1. 值得讚賞 · 2. 表現尚佳 · 3. 需再加油

Note: Only the PA (physical activity) and study average grade points are translated into English.

The above document in Table 2 displays the original grades of all the subjects during his three years of junior high school education. For convenience, clarity, and necessity, only the most relevant PA and study average grade points are translated into English. The following documents are some of the merit certificates the present case study subject won during his junior high school.

Figure 1: Merit Certificate for Winning 1st Place in Teenage Fitness Category at the Taiwan National Bodybuilding and Fitness Championship, 2021



The above merit certificate was presented to the present case study subject on winning first place in the teenage category at the 2021 Taiwan National Bodybuilding and Fitness Championship, which was held in New Taipei City, Taiwan.

Figure 2: Merit Certificate for Winning 1st place at the
Chungcheng Cup National Wushu Championship, 2021



The above merit certificate was presented to the present case study subject to winning first place among teenage students at the 2021 Chungchen Cup National Wushu Championship, which was held in Taiwan.

Figure 3: Merit Certificate for Winning 3rd Place at the
Taiwan World Cup International Wushu Championship, 2021



The above merit certificate was presented to the present case study on winning a third place among teenage students at the 2021 Taiwan World Cup International Wushu Championship, which was held in Taiwan. The following section gives details about the interview data collection approach.

3.3. Senior High School

After finishing junior high school, the case study subject joined the national selection test and got a scholarship to study at the one and only National Military Academy, Taiwan,

R.O.C. Last year, by the second half of 2022, he joined the National Military Academy, Kaohsiung, Taiwan. Now, by the end of January 2023, the case study subject has just finished his first semester of first-year senior high school which was started in August, 2022. Following his sports and physical activity habits, the case study subject did very well in his PA class scoring 91% in the first semester. However, his study grades didn't go as high as his PA grade. He got 83% on average by the end of the first semester of his senior high school. When asked why he got an average grade point of 83% in his study, he explained that the tests were quite tough for all the students there. His rankings 6th in his class and 15th among the 600 newly recruited students prove his explanation about why he couldn't get a higher average grade point in the study. The following section will present the original grade sheets.

Table 3: Original Grade Sheet Displaying
First Semester Grades in First Year Senior High School

科目		上學期			下學期			學年 成績
		屬性	學分	成績	屬性	學分	成績	
國語文	必修	4	84	必修				
英語文	必修	4	96	必修				
數學	必修	4	72	必修				
化學	必修	2	80	必修				
地球科學	必修	2	78	必修				
歷史	必修	2	74	必修				
地理	必修	2	79	必修				
公民與社會	必修	3	83	必修				
美術	必修	1	86	必修				
體育	必修	2	91	必修				
生涯規劃	必修	1	88	必修				
資訊科技	必修	2	86	必修				
看電影學英文	選修	1	92	選修				
各項總成績		上學期			下學期			學年
學科平均	Study grade	83.3						
智商成績		82.8						
體育成績	PA grade	91						
實習成績								
軍訓成績								
實得學分		30						
實得素計		30						
學期名次		6						
日常綜合表現								
上學期								
日常生活表現		服務學習	校內外特殊表現	具體建議	其他			
評量	描述							
待人誠信：表現優異	學習態度認真	負責公共事務認真勤勉	校運會榮獲大隊接力第一名、校運會榮獲趣味競賽第二名	學行俱優、誠懇踏實				
整潔習慣：表現優異	禮節：表現優異							
班級服務：表現優異	社團活動：表現優異							

Note: Only PA (physical activity) and study grades are translated into English.

The above document displays the original grades of all the subjects during the first semester of senior high school. For convenience, clarity, and necessity, only the PA and study grade points are translated into English.

Table 4: Original Grade Sheet Displaying First Semester Grades for Different Subjects and Study Rankings in First Year of Senior High School

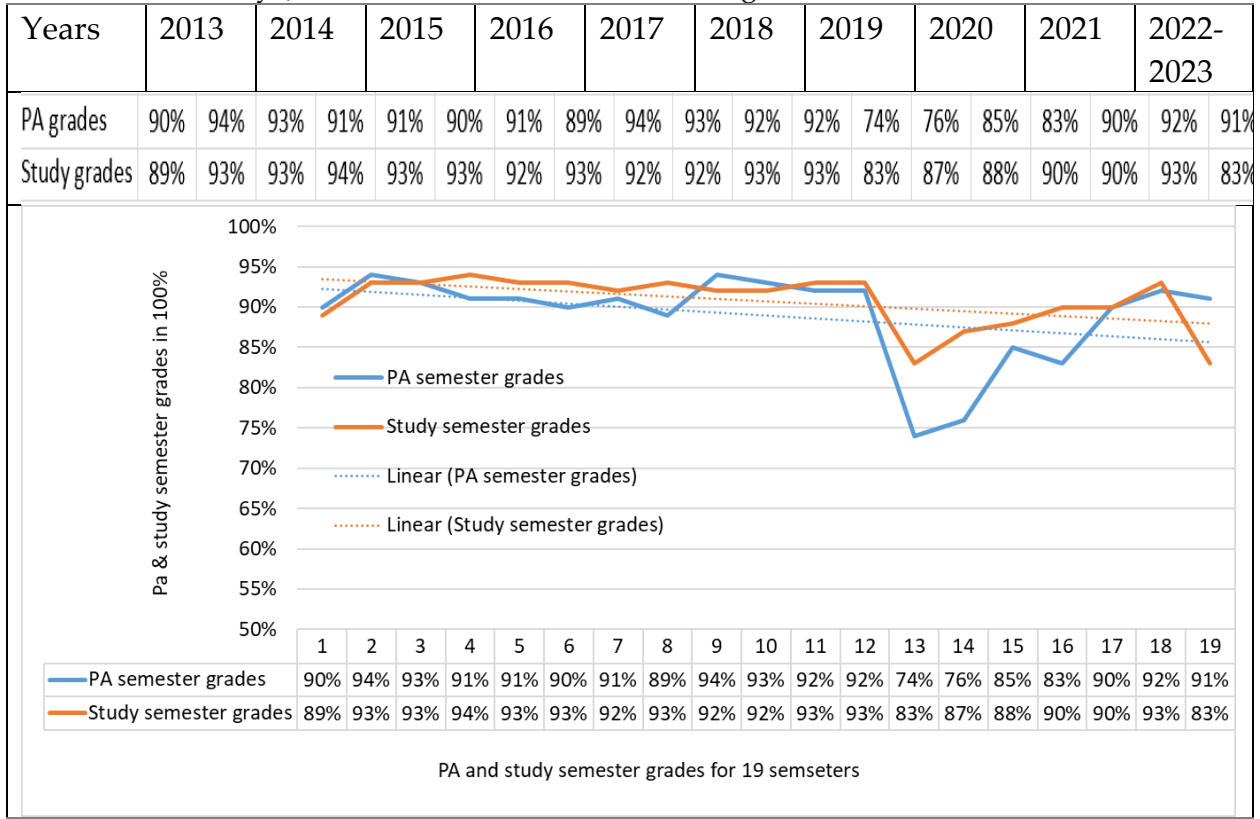
學號：114385 姓名：陳秀實 班級：愛9班		
考試科目	考試成績	全班平均
國語文	86	80.65
英語文	93	64.27
數學	67	62.05
化學	94	81.95
地球科學	89	79.14
公民與社會	82	71.08
地理	72	74.38
歷史	78	76.65
<hr/> 總分：1896 平均：82.44 排名：6 年級排名：15 類組排名：		

Note: Yellow highlighted number 6 represents case study subject's ranking in the class while 15 represents his ranking among the 600 newly recruited students.

The above document in Table 4 displays the original grades of all the subjects and the rankings during the first semester of senior high school. For convenience, clarity, and necessity, only the PA and study average grade points were translated into English and displayed. By the end of his first semester of senior high school, the case study subject ranked top 6th in his class and top 15th among the 600 newly recruited students.

For a complete and clear picture, all the 19 semesters' PA (physical activity) and study grade points were entered into Microsoft Excel and converted into a Line chart as given below in Figure 7.

Figure 4: Combined Table and Chart Displaying PA and Study Semester Grade Points for Elementary, Junior and One Semester Senior High School without Decimal Points



Note: The PA (physical activity) and study grade points for 19 semesters are displayed without decimal points.

From the observation and analysis of the case study subject's involvement in exercise, sports, sports participations, and other related physical activities, study habits, documents and face-to-face interviews, and the combined Line chart above in Figure 7, it can be concluded that case study subject did regular exercise, did well in school physical activities, practiced his Wushu and fitness, and took part in sports competitions. In those competitions, he lost some but won mostly. All in his 9 and half years of education (19 semesters) so far, the case study subject did very well in both physical activity performances as well as in academic performances, except during the first year of junior high school when he got the lowest PA (75%) and study (85%) average grade points.

Through face-to-face interviews, the researcher also found how well the case study subject' involvement, level and frequency in exercise, sports, sports participations and other physical activities depended on his parents' encouragement and support. As mentioned before, when the researcher asked the case study subject why he got so low grade in PA (75%) during the first year of his junior high school, he explained that he was not so serious and his parents didn't care about his sports or physical activities at school. Yes, the case study subject was right. His parents were too focused on their daughter's Wushu practice, competitions and winning, which led them to neglect the present case

study subject's needs, encouragement and support. It was a big mistake on his parents' side.

To conclude, the present case study subject learned many things from doing regular exercise, sports practice and taking part in sports championships. Through his sports practice, he learned to be more obedient, disciplined, responsible, and how to respect others from his coaches. Training and practicing with others, he also learned team spirits, social and interpersonal communication skills. Through sports championships and winning, his self-confidence improved. Sports and other physical activities also instilled in him a sense of hardworking and satisfaction in his life. Through his intense sports training and practice for improvement and competitions, the case study subject learned the will to bear pains and deal with mental and physical pressures.

From the research observation of the case study, documentation, face-to-face interviews, and data analysis and Line chart of his PA and study average grade points during the 9 and half years of compulsory education in Taiwan, five important results were found. First, there was a pattern between the case study subject's PA average points and study average points going parallel side by side, whether the grade points were going up or down. Second, there was a strong link between the case study subject's involvement and frequency level in sports, physical activities and his study habits and academic performance. The higher the intensity and frequency, the better the academic results yielded. Third, a slight declining tendency was found in both physical activity and academic performance over the course of the present study. Fourth, through the present case study subject, it was also found that doing sports and physical activities regularly not only helped the case study subject to be active, energetic and healthy but also helped him to outperform academically those physically inactive students. Fifth, involvement in sports and physical activities helped the case study subject to be more disciplined, responsible, respectful, self-confident, and to stay away from sedentary lifestyle and adolescent behavioral problems. Above these, sports and physical activities also provided him with a sense of team spirit, hardworking, satisfaction, social and interpersonal communication skills, and the will to deal with pressures and pains.

4. Research Discussion

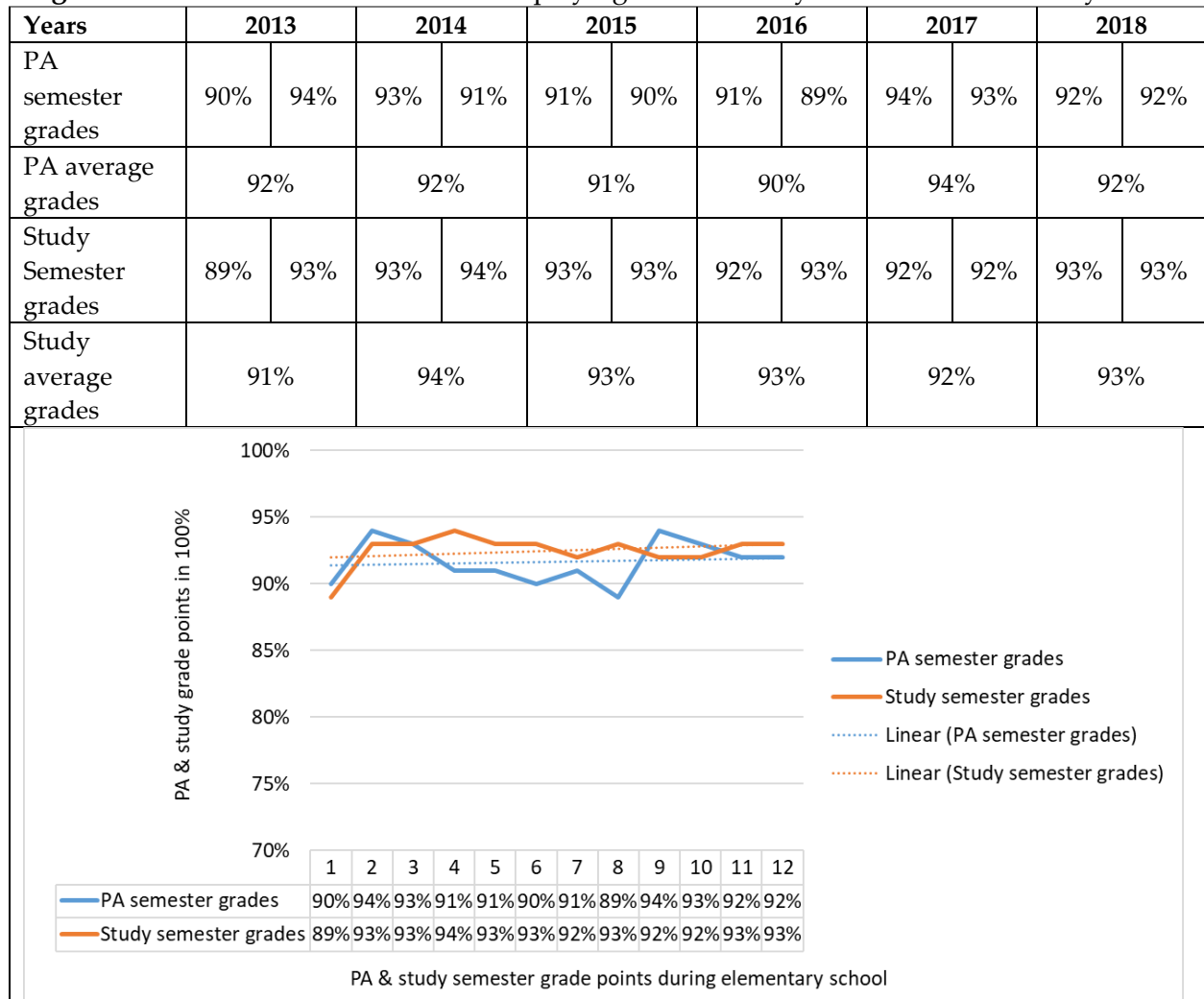
The present research investigated longitudinally the benefits and the impacts of doing regular exercise, sports, taking part in sports competitions and other related physical activities on the case study subject's academic performance as well as overall physical and personal development through observation, documentation, and face-to-face interviews during the case study subject's 9 and half years of compulsory education in Taiwan (compulsory education still going on).

The following three sections will discuss the research findings in detail with reference to previous studies on the benefits and positive impacts of exercise, sports, sports participations, and other related physical activities on students' academic

performance and overall personal development during his three different stages of compulsory education.

4.1. Elementary School

Figure 5: Combined Table and Chart Displaying PA and Study Grades for Elementary School



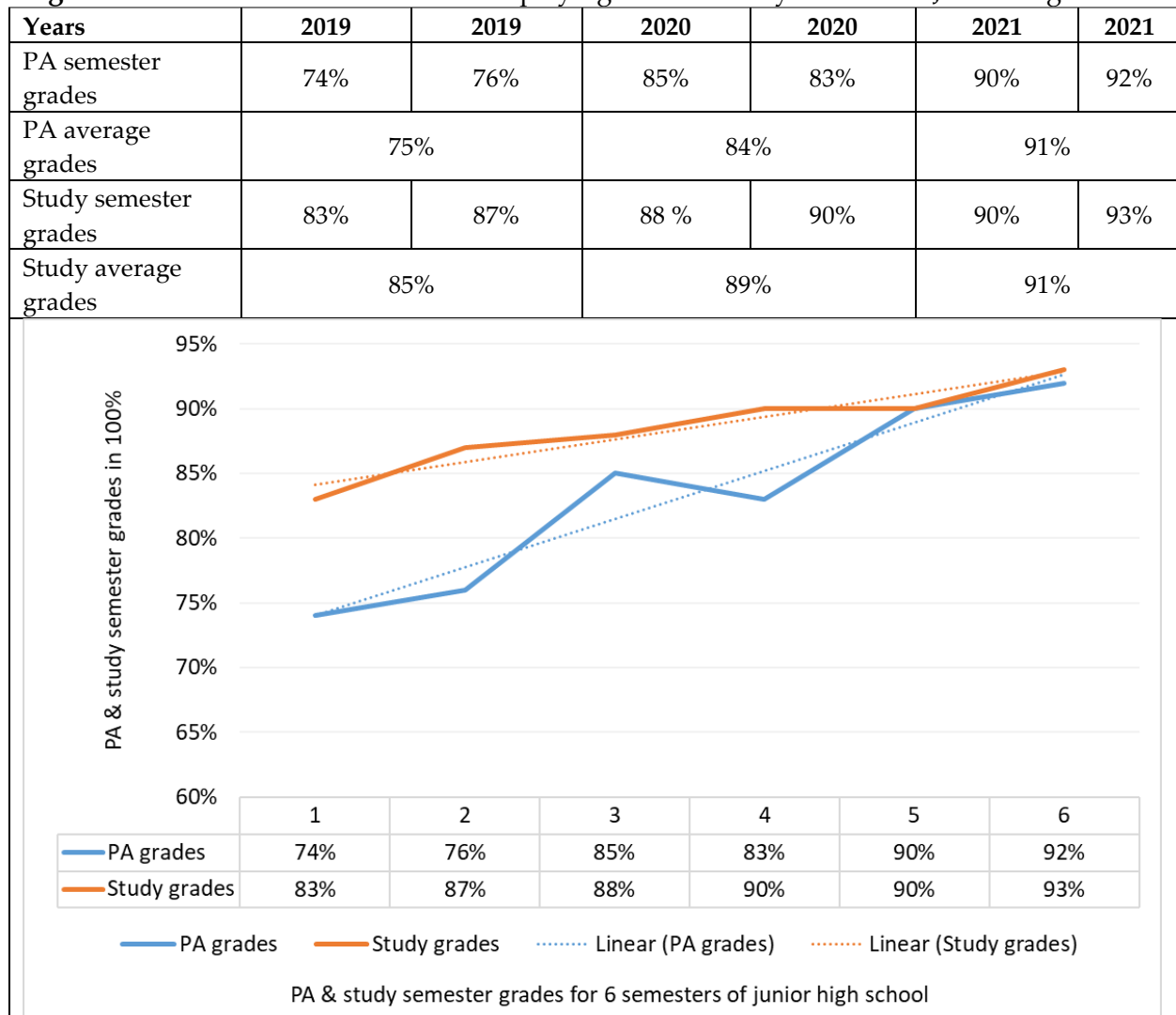
Note: PA (physical activity) and study semester grade points extracted from the original elementary school grade sheet in Table 1 without decimal points.

During elementary school, as can be seen from the chart above in Figure 4, it can be seen that case study subject did very well in both PA (physical activities) and study scoring semester grade points above 90%, except in semesters 1 and 8 where the PA and study grade points were just 89%, which is not that significant as the percentage is just 1% difference. The case study subject's PA and study grades went along parallel very well. This shows that there was a strong link between the case study subject's physical activity performance and academic performance as found by Kyan et al. (2018), and Joca Zurc and Jurij Planinšec (2022) in their studies.

From the trend lines on PA and study, it can also be seen that being active in physical activities also influenced his study habits. This led to both PA and academic levels climbing up slightly. The reason for this trend is that it is quite natural for children to be involved in physical activities while they are younger as stated by Aerts et al. (1997).

4.2. Junior High School

Figure 6: Combined Table and Chart Displaying PA and Study Grades for Junior High School



Note: PA (physical activity) and study semester grade points were extracted without decimal points from the original junior high school grade sheet in Table 2.

The case study subject did very well during those six years of elementary school. However, things changed when he moved to another school for his junior high school. During the first year of junior high school, the case study subject joined Wushu club at his new school following his elder sister who was also studying senior high school at the same school. During the first year of his junior high school, he neither did well in Wushu and other physical activities nor in academic performance. In the first and second

semesters of junior high school, the case study subject just scored 74% and 76% in PA (physical activity), leading to an average grade point of only 75%, which was very low compared to his previous PA grades during elementary school. He explained the reasons.

Based on the interview, he explained that he was naughty and didn't take his physical activities seriously. At the same time, as he said, his parents didn't care much about his sports or physical activities. The case study subject was right. His parents were too focused on their daughter's (case study subject's elder sister) Wushu practice, improvement, Wushu championships representing her school, and her winning, neglecting about the case study subject's needs, encouragement and support. It was a big mistake from his parents. However, things changed in a better way in the remaining two years of junior high school.

By the beginning of his second year of junior high school, when the case study subject got encouragement and support from his parents, he became more serious about Wushu sports practice and other physical activities. Besides his school Wushu practice and physical education classes, now the case study subject also started training his muscles at home using some free weights his parents bought for him. He also did chin-ups, sit-ups, and push-ups. From time to time, the case study subject also did 2,000 – 5,000 meters of running at the local park to increase his stamina. He also joined Wushu and fitness championships. In the beginning, he lost in Wushu championships but started winning gradually.

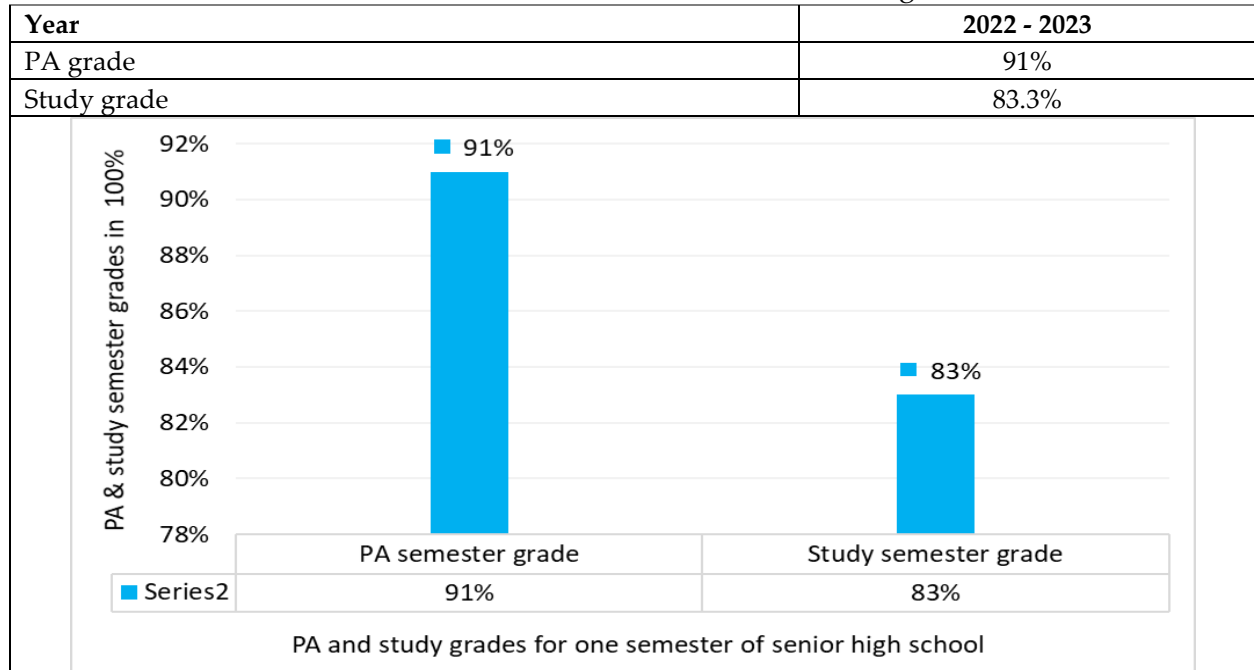
Thus, by the end of his second junior high school, his third and fourth-semester grade points in PA improved to 85% and 83% respectively, leading to an average grade point of 84%, a significant improvement from his previous year's PA grade of 75%. At the same time, his study semester grade points also improved to 88% and 89% respectively, leading to an average grade point of 89% by the end of his second-year junior high school. The case study subject kept improving.

During the third and final year of his junior high school, the case study subject kept improving his physical activity level and frequency, and joined more Wushu championships, thus helping him to score 90% and 92% respectively in PA, leading to an average grade point of 91% by the end of his junior high school. He also improved his study grade points scoring 90% and 93% respectively, giving him an average score of 92% by the end of his junior high school.

These PA and academic results during the case study subject's junior high school in Figure 5 above also clearly show that there is a very strong link between students' physical activity performance and their study performance. Declining or improvement in physical activity performance depends a lot on encouragement and support, especially from parents. Both children and adolescents can do much better in both physical activity and academic performance when they are encouraged and supported by their parents constantly (Aerts et al., 1997; Kimm et al., 2002; Casey et al., 2009; Crumbley et al., 2019; Hosseini et al., 2013).

4.3. Senior High School

Figure 7: Combined Table and Chart Displaying PA and Study Semester Grade Points for First Semester Senior High School



Note: The above PA (physical activity) and study semester grade points were extracted from the original first semester senior high school grade sheet in Table 3.

Since the case study subject started to involve in sports and physical activities seriously and regularly, he has become stronger, faster, and fitter than ever. He also grows up faster, taller, and becomes more handsome. Mentally and personally, the case study subject has become more mature and understanding. One of the best-case study subjects has learned from doing sports and other related physical activities is that he has learned the meaning of “No pain no gain” - how to deal with pressure, pains, and suffering through his sports training and persistence.

Because of all these years of involvement in exercise, sports, sports practice, sports participations, and other related physical activities, now, studying at his new and strict, one and only National Military Academy (Taiwan, R.O.C.), the case study subject is able to deal with any problems effectively. He never complains about his study, physical activities, or friends there.

Now, the case study subject has just finished his first-semester final examination (Jan. 2023). He scored 91% in PA and 83% in the study. His study score is not as high as his PA grade point. He said the test questions were very tough for everyone. Among some 32 students in his class, he ranked 6th, while he ranked top 15th among the newly recruited 600 students. This proves his explanation about why he got 83% in his senior high school first semester study grade point.

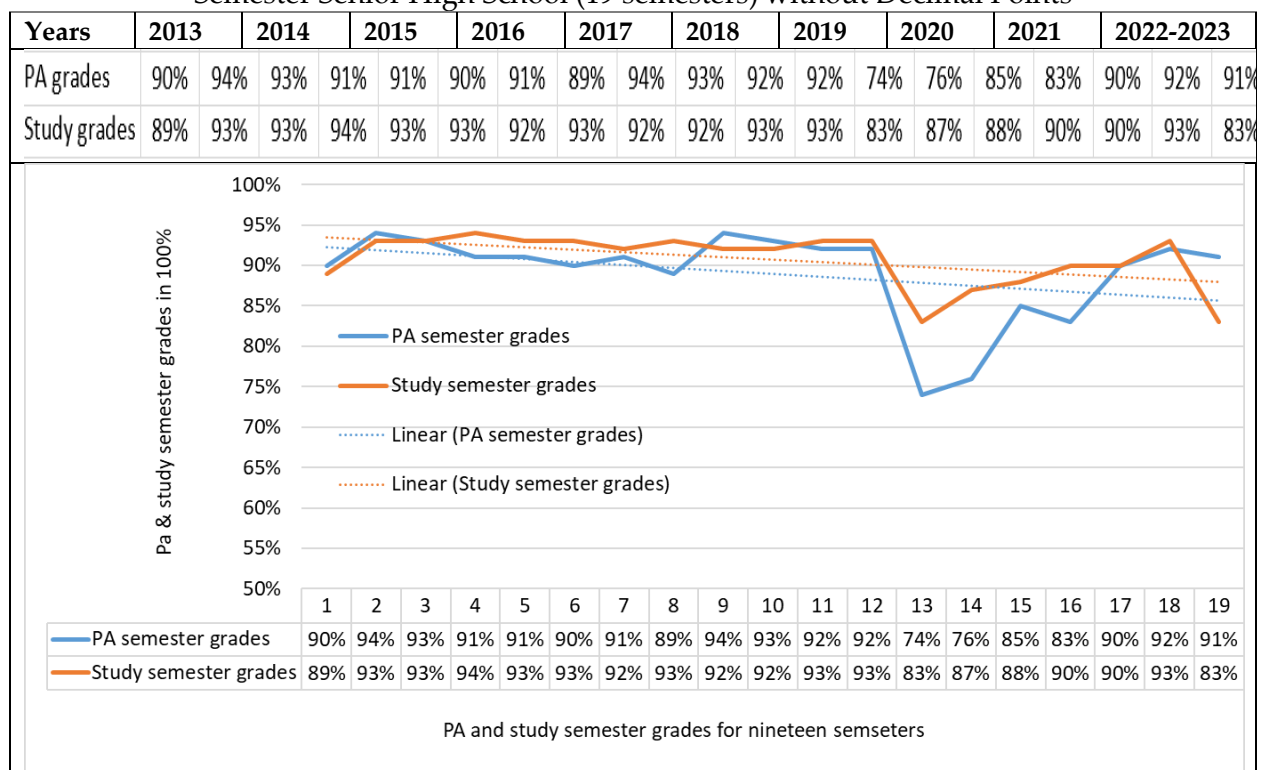
At his new school, there is no Wushu club for now. However, like before, he does other physical activities like running, pushups, chin-ups, sit-ups and stretching almost

every day in his room or on the school campus. Whenever he comes home to his Taipei home, he would do his weight training at home. Seeing his interest in sports and building his muscles, recently, his father admitted him to a local gym and he trained with his father whenever he comes home for holidays. He is getting stronger, healthier, happier, and more handsome. Above all these, he is humbler than ever.

One of the best things about staying in touch with sports and physical activities is that, through his busy schedule in study, exercise, and sports activities, the case study subject does not have much time to spend on digital screens and internet. In fact, the World Health Organization is so worried about the negative effects of excessive use of modern gadgets, like mobile phones on young teenagers' and adolescents' physical and mental health.

To discuss the benefits and impacts of doing regular exercise, sports, physical activities, and taking part in sports championships on the case study subject's academic and overall personal development as a whole, Figure 7 is reproduced once again as Figure 8 below.

Figure 8: Combined Table and Chart Displaying PA and Study Semester Grade points for Elementary, Junior and One Semester Senior High School (19 semesters) without Decimal Points



Note: The PA (physical activity) and study grade points for 19 semesters are displayed without decimal points.

From the above line chart, the observation of the case study subject's involvement in exercise, sports, sports participations, and other related physical activities, his study habits, his attitudes, face-to-face interviews, and the analysis of his PA and study grade

points during the 9 and half years of compulsory education in Taiwan, five important results were found as presented below.

First, there was a strong link between case study subject's PA grade points and study grade points as found by scholars like Coleman (1961); Laughlin (1972); Quirk & Silliker (1998); Gorton (2010); and Sitkowski (2008). Throughout his nine and half years of compulsory education, the case study subject's study grade points were very much influenced by his sports and physical activities which is very much supported by the Line chart in Figure 7.

Second, there was a strong link between the case study subject's involvement and frequency level in PA (sports, related physical activities) and his academic performance. Higher intensity and higher frequency in physical activities yielded better academic results as found by Kyan et al. (2018), and Joca Zurc and Jurij Planinšec (2022) in their studies.

Third, as stated by Aerts et al. (1997); Kimm et al. (2002); and Casey et al. (2009) a slight declining tendency was found in both physical activity and academic performance as the case study grew up over the course of the research as can be seen from the trend lines on PA and study chart in Figure 8 above.

Fourth, through the present case study subject, it was also found that doing sports and physical activities regularly not only helped the case study subject to be active, energetic and healthy, but also helped him to outperform academically those physically inactive students as found by Coleman (1961 as cited by Gorton) and Gorton (2010).

Fifth, from doing regular exercise, sports, physical activities and taking part in sports activities, the case study subject learned to be more obedient, disciplined, with respect for others, and to stay away from a sedentary lifestyle and behavioral problems. Doing sports and physical activities regularly also instilled in the case study subject a sense of team spirit, hardworking, self-respect, self-esteem, self-confidence, responsibility and self-satisfaction. These physical activities also taught him social and interpersonal communication skills, and the will to bear pressures and pains (Elavsky, 2010; Massni, 2011; Ivaniushina & Zapletina, 2015; Lazaro & Anney, 2016; Muloiwa & Odimegwu, 2020).

In spite of getting all these benefits and good habits from sports and physical activities, the present case study subject cannot be left alone thinking he will do all these physical activities by himself. His parents need to encourage and support him constantly as physical activity levels decline when children enter the adolescent stage (Aerts et al., 1997; Kimm et al., 2002; Casey et al., 2009).

4.4 Research Limitations

The present study has its own limitations. As the present investigation used only one case study subject the findings of the present study cannot be compared with other athletic or non-athletic students. However, despite the limitations, based on the research findings, it can be suggested that if doing regular exercise, sports and other related physical activities helped the present case study subject physically, mentally, morally,

academically and in developing different aspects of life, then this good habits also will work well for all student communities as well, if parents can constantly encourage and support their children to do exercise, sports and physical activities.

4.5 Research Implications

The findings of the present study suggest that doing exercise, sports and sports-related physical activities can be beneficial to children, adolescents and adult students. The findings also suggest that these activities not only can help students to be physically and mentally healthy and fit, but also can help them to do better in their academic fields and help their overall personal development. Through these research findings, it can be suggested that parents should change their indifferent attitudes towards the benefits and positive impacts of sports and physical activities on students' academic performance and overall personal development. It is also suggested that teenage and adolescent students need constant encouragement and support from their parents.

5. Conclusion

In conclusion, the present case study research is a qualitative, longitudinal case study which investigated the benefits and impacts of doing regular sports and physical activities on a single case study subject. The research data were collected through a triangulation data collection approach – observation, documentation, and interviews. From the present investigation, five important things were found. First, there was a strong link between the case study subject's PA average points and the study average points. Second, there was a strong link between the case study subject's involvement and frequency level in sports and physical activities and his study habits and performance. Higher intensity and higher frequency yielded better academic results. Third, a slight declining tendency was found in both physical activity and academic performance over the course of the study. Fourth, through the present case study subject, it was also found that doing sports and physical activities regularly not only helped the case study subject to be active, energetic and healthy, but also helped him to outperform academically those physically non-active students. Fifth, involving in sports and physical activities helped the case study subject to be more disciplined, responsible, respectful, self-confident, and stayed away from a sedentary lifestyle and adolescent behavioral problems. Above these, sports and physical activities also provide him with a sense of team spirit, hardworking, satisfaction, social and interpersonal communication skills, and the will to deal with pressures and pains.

The researcher hopes that through this research findings, students, parents and teachers can change their indifferent attitudes on the benefits and positive impacts of doing regular exercise, sports, and taking part in sports-related physical activities and competitions on students' academic performance as well as overall personal development. The researcher also suggests parents constantly encourage their adolescent

children to do sports and physical activities for overall physical and mental health, and future success and happiness.

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Conflict of Interest Statement

The author of this research, Dr. Ngangbam, Shantikumar Meetei, has no conflict of interest to disclose/declare. The present research article is original and has not been published in any form/s. The author of this research article certifies that he has no commercial associations that might pose a conflict of interest in connection with the submitted article.

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