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The Influence of Self-Efficacy and Physical Exercise on the Swimming Performance Ability of College Students in a Public University in China

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Abstract: This study draws key conclusions and provides recommendations by analyzing students' interests in sports, self-efficacy, and the impact of sports activities on their fitness levels. Firstly, the research reveals that male students tend to show a higher inclination towards sports such as swimming, reflecting a common gender-related trend in sports activity choices. Secondly, students' self-efficacy significantly influences their performance in exercise, underscoring the importance of psychological factors in sports participation. Lastly, overall, engagement in swimming has a positive effect on students' fitness levels, emphasizing the benefits of sports activities for overall health. Based on these findings, this study offers reasonable recommendations, including promoting gender equality, enhancing students' self-efficacy, diversifying sports activity choices, providing health education, and creating individualized exercise plans. These recommendations aim to encourage more students to actively participate in sports, improve their fitness levels, and enhance overall health.

Keywords: Gender Differences; Self-efficacy; Sports Activities; Fitness Levels; Health Education; Diversification; Student Interests; Swimming; Recommendations.

1. Introduction

Swimming as a competitive sport is popular worldwide and has been a part of the Olympic program since the first modern Olympic Games in 1896. Today, competitive swimming includes 16 Olympic pool events from 50 to 1500 m lasting from approximately 21 s to 15 min. Swimming differs from most other sports in several aspects, such as: (1) swimmers are in a prone, horizontal position during performance and training; (2) both arms and legs are used actively for propulsion; (3) water immersion causes pressure on the body and affects breathing; (4) aside from starts and turns, the forces from the athlete are at all times applied to a moving element; and (5) the equipment (e.g. swimming suit and cap) used during swimming has a minimal effect on swimming performance . Nevertheless, swimming performance is determined by physiological, psychological and anatomical factors . Barbosa et al. specified that swimming performance depends on energetics, kinematics (the relationship between swim velocity [v], stroke length [SL] and stroke frequency [SF]) and kinetics (a swimmer creates work energy [kinetic energy] by propelling through the water). Loss of energy transfer is caused by inefficient movement, motor control (coordination of multiple segments at the same time to propel the swimmer forward), anthropometrics (e.g., body proportions, wingspan, body length and mass) and strength and conditioning. Many of these factors are hard, if not impossible, to change (e.g., body proportions and wingspan. Others are hard to investigate and measure (e.g., improvements in technique caused by better motor control).

2. Methodology

2.1. Research Design

The study utilized the Quantitative Approach using the descriptive comparative- correlational research design. The stratified random sampling used to analyze the causal relationship between the independent and dependent variables.

Based on the questionnaire survey and previous theoretical research results, this study investigated the self-efficacy, physical exercise routine and swimming ability physical education students who are enrolled in swimming course, and form an analysis report based on the findings to analyze the relationship between the three Variables. Finally, according to the research results, the researcher proposed a contextualized swimming program.

2.2. Sample and Sampling Technique

The research was conducted at Harbin University of Commerce in Harbin, Heilongjiang Province, China for the second semester of school year 2022-2023. The participants of this study were the freshman and sophomore physical education students from different majors like Economics, Engineering, Management, Arts and Science.

The researcher works in Harbin University of Commerce and he is teaching swimming there. There are many freshman and sophomore students, which is conducive to the smooth progress of questionnaire survey and research.

2.3. Research Locale

The research was conducted at Harbin University of Commerce in Harbin, Heilongjiang Province, China for the second semester of school year 2022-2023. The participants of this study were the freshman and sophomore physical education students from different majors like Economics, Engineering, Management, Arts and Science.

3. Results and Discussion of the Study

3.1. Profile of the Student- respondents in Terms of:

Table 1. The Profile of the Student-Respondents

SEX	Frequency (f)	Percentage (%)
Male	280	59.8
Female	188	40.2
Total	**468**	**100**
AGE		
18 years old and below	27	5.8
19 years old and above	441	94.2
Total	**468**	**100**
GRADE LEVEL		
Freshmen	74	15.8
Sophomore	394	84.2
Total	**468**	**100**
COLLEGE AFFILIATION		
Economics	54	11.5
Engineering	79	16.9
Management	86	18.4
Science	134	28.6
Arts	98	20.9
Law	17	3.6
Total	**468**	**100**

As shown in Table 1, in terms of sex, 280or 59.8% were male- students and 188 or 40.2% were female- students. It showed that majority of the respondents were male- students. This shows that there are more male students than female students who are enrolled in the different sample colleges. This reflects a higher level of participation by the male students in the field of study.

In terms of age, 27 or 5.8 % of the students were 18 years old and below, 441or 94.2% were 19 years old and above. This indicates that this age group is when most students enroll in colleges and universities, and that the physical education program is a field that attracts younger students.

In terms of grade level, there were 74, or 15.8% freshmen and 394, or 84.2%, sophomores. This indicates that majority of the students who are enrolled in the swimming class are sophomore students.

In terms of college affiliation, there were 54or 11.5% who were enrolled in the college of economics, 79 or 16.9 % who were enrolled in the college of engineering,86 or 18.4% who were enrolled in the college of management, 134 or 28.6% who were enrolled in the college of science,98 or 20.9% who were enrolled in the college of arts and 17or 3.4 %who were enrolled in the college of law. This indicates that majority of the student-respondents came from the college of science and the least of them came from the college of law.

3.2. The Assessment of the Student-respondents on the Level of Self-efficacy

Table 2 shows the data about the assessment of the student-respondents as to their level of situational self-efficacy. It shows here the factors that causes instability in one's perceptions of self-efficacy and behavioral reactions.

In general, table 2 shows that the student-respondents agreed that they have a high level of situational self-efficacy. It is evident in the composite mean result of 3.28 and a standard deviation result of 0.064.

Table 2. Situational Self Efficacy

Indicators	Mean	SD	Interpretation	Adjectival interpretation	Rank
1. I believe I can perform well in a given situation.	3.35	.579	Agree	High level	1
2. I believe I have sufficient ability and skills to solve problems in specific situations.	3.30	.588	Agree	High level	4
3. I believe I can communicate and interact effectively with others in specific situations.	3.31	.616	Agree	High level	3
4. When I am faced with a new task, I feel confident.	3.15	.682	Agree	High level	7
5. When I need to deal with something urgent, I believe I have sufficient resilience.	3.24	.606	Agree	High level	6
6. When I need to learn new knowledge or skills, I believe I have enough learning ability.	3.31	.560	Agree	High level	3
7.When I am in a difficult situation, I know how to handle it in a positive way	3.29	.589	Agree	High level	5
Composite mean	3.28	0.064	Agree	High level	

N-468 Legend: *4.00-3.51=Strongly Agree/Very high level; 3.50-2.51=Agree / High level; 2.50-1.51=Disagree /Low level; 1.50-1.00=Strongly Disagree / Very low level*

Looking closely at the mean results of the different indicators, it shows that indicator #1" I believe I can perform well in a given situation" has the highest mean result of 3.35 which shows that the student-respondents agreed that they can perform well the different skills in swimming in any situations. The second highest indicators are #3 and 6," I believe I can communicate and interact effectively with others in specific situations" and "When I need to learn new knowledge or skills, I believe I have enough learning ability". both indicators received 3.31 mean result which mean that the student-respondents has a high level of belief in themselves that they can do the specific task assigned to them by their teachers. But they need to improve more their level of self-confidence because this is evident in the mean result of the lowest indicator #7,". When I am faced with a new task, I feel confident." They can still strive harder to improve their skills especially in performing the different skills in swimming.

Self-efficacy can affect students' athletic learning performance to a certain extent; the higher the self-efficacy, the more students are not afraid of difficulties, they will persist and persevere; on the contrary, they will choke and give up halfway (Wang, P. 2020).

3.3. Significant Difference in Student-Respondents' Level of Self-Efficacy When Their Profiles are Taken as Test Factors

Table 3. Multiple Comparisons (College Affiliation)

Test	Factors	Factors	p-value	Ho	VI
Tukey HSD	*Economics*	*Engineering*	.000	Reject	Significant
		Management	.250	Do not Reject	Not significant
		Science	.000	Reject	Significant
		Arts	.065	Do not Reject	Not significant
		Law	.000	Reject	Significant
	Engineering	*Management*	.000	Reject	Significant
		Science	.876	Do not Reject	Not significant
		Arts	.002	Reject	Significant
		Law	.780	Do not Reject	Not significant
	Management	*Science*	.011	Reject	Significant
		Arts	.991	Do not Reject	Not significant
		Law	.021	Reject	Significant
	Science	*Arts*	.065	Do not Reject	Not significant
		Law	1.000	Reject	Significant
	Arts	*Law*	.106	Do not Reject	Not significant

Legend: Significance at 0.05

Table 3 shows the post hoc analysis of the p-value of the responses of the students enrolled in the different colleges. The data on the table shows that those who are enrolled in the colleges of engineering, science, law, management and arts when compared together have significant differences.

This analysis shows that there are significant differences between these universities.

Assumed values:

A P-value is a statistical measure that represents the likelihood of obtaining the observed difference between groups by random chance. In post hoc analysis, P-values are often used to compare specific group pairs to determine if the observed differences are statistically significant.

Comparison of institutions:

The statement indicated that the comparison involved students from multiple faculties, including engineering, science, law, management, and the arts. The above significant differences indicate that there are significant differences in responses among students from these colleges.

Taken together, the post-mortem analysis in Table 3 shows significant differences in student responses across faculties, including engineering, science, law, management, and the arts. Identifying and understanding these differences helps to make informed decisions to improve the educational experience and outcomes for students at each university. In order to obtain more precise insights, it is often necessary to further analyze and fully examine the potential influencing factors.

3.4. Level of Influence of the Different Physical Exercise Routines on the Performance of the Student-Respondents in Terms of.

Flexibility exercise routine are very important for the body because the range of motion can be improved through participation in these kinds of physical exercises.

In general, table 4 shows that the student-respondents agreed that flexibility exercises have a high level of influence to the body and in dloing swimming. It is evident in the composite mean result of 3.29 and a standard deviation result of 0.0375.

Looking closely at the mean results of the different indicators, it shows that indicator #1". I can stretch my upper limbs as far as I can reach,." has the highest mean result of 3.34 which shows that the student-respondents agreed that they can perform well the different flexibility exercise given the fact that they are still young and their bones are still very flexible. The second highest indicator is #3" Through regular stretching, my whole body becomes flexible" with a mean result of 3.33. This is a support to the first indicator which validate that by regularly participating in regular flexibility exercises, the body can really become more flexible which make the body easy to move. The indicator with the lowest mean is #5" I can perform different swimming kicks because my thighs and legs can move freely: with a mean result of 3.25. This cpuld mean that there is a need to focus more the exercise routine on the lower limbs of the students so that the thighs, legs and feet can be strengthened and more flexible.

Table 4. Flexibility Exercises

Indicators	Mean	SD	Interpretation	Adjectival interpretation	Rank
1. I can stretch my upper limbs as far as I can reach	3.34	.56542	Agree	High level	1
2. I. am comfortable stretching my lower limbs	3.29	.57219	Agree	High level	3
3. Through regular stretching, my whole body becomes flexible	3.33	.59919	Agree	High level	2
4. I can perform different swimming strokes because my shoulders and arms are flexible	3.26	.66047	Agree	High level	6
5. I can perform different swimming kicks because my thighs and legs can move freely	3.25	.66698	Agree	High level	7
6. I feel less pressure when moving my body parts	3.26	.61507	Agree	High level	6
7. I can do the different flexibility exercises comfortably	3.26	.63143	Agree	High level	6
Composite mean	3.29	0.0375	Agree	High level	

N-468 Legend: *4.00-3.51=Strongly Agree/Very high level; 3.50-2.51=Agree / High level; 2.50-1.51=Disagree /Low level; 1.50-1.00=Strongly Disagree / Very low level*

Strength training are exercise routines that help strengthen the body parts.it can be done without the use of weights like dumbbells or barbells. The body parts need to be strengthened to ensure that activities that needs extra effort will be done with ease and less to no enjuries.

In general, table 5 shows that the student-respondents agreed that strength training exercise has a high level of influence to their body particularly in doing swimming activities. It is evident in the composite mean result of 3.23 and a standard deviation result of 0.053.

Table 5. Strength Training Exercises

Indicators	Mean	SD	Interpretation	Adjectival rating	Rank
1. I can do Strength training exercises like push-ups and sit-ups comfortably	3.28	.67605	Agree	High level	2
2. I can do Strength training exercises with the use of weights like dumbbells with less pressure on my muscles and joints	3.25	.66536	Agree	High level	3
3. Strength training exercises help my body become stronger	3.32	.59542	Agree	High level	1
4. I can do different swimming strokes because my upper body parts are very strong	3.17	.73410	Agree	High level	7
5. I can do different swimming kicks because my lower body parts are very strong	3.19	.71400	Agree	High level	6
6. I can swim for a longer period of time because my body is strong and healthy	3.19	.71400	Agree	High level	6
7. Through Strength trainings exercises, I can swim freely and comfortably because of my well-toned muscles	3.24	.66609	Agree	High level	4
Composite mean	3.23	0.053	Agree	High level	

N-468 Legend: *4.00-3.51=Strongly Agree/Very high level; 3.50-2.51=Agree / High level; 2.50-1.51=Disagree /Low level; 1.50-1.00=Strongly Disagree / Very low level*

Looking closely at the mean results of the different indicators, it shows that indicators #3" Strength training exercises help my body become stronger" has the highest mean result of 3.32 which shows that the student-respondents agreed that they can perform well the different strength exercise given the fact that they are still young and full of energy. But they need to exercise regularly so that the strength of the muscles will be improve which could help them improve the level of their strength and endurance. This is evident in the indicator with the lowest mean result of 3.17" I can do different swimming strokes because my upper body parts are very strong".

3.5. Significant Difference on the Level of Influence of the Different Physical Exercise Routines on the Performance Student-Respondents When Their Profiles are Taken as Test Factors

Table 6 shows the association of the swimming ability of the student-respondents to their profile. It can be inferred that there is a strong association when they are compared based on their sex and college affiliation but weak correlation when they are compared based on their age and grade level.

Table 6 appears to present data on the association between the swimming ability of student-respondents and various aspects of their profile, including sex, college affiliation, age, and grade level. The statement suggests that different factors exhibit varying levels of association with students' swimming

ability. Let's explore these implications in more detail:

Strong Association (Sex and College Affiliation):

Table 6. Significant difference/association on the level of swimming ability of the student-respondents when their profiles are taken as test factors.

Chi-Square						
Factors	Chi-Square	p-value	Ho	VI	Phi and Cramer's V	Level of Association
Sex	17.340	.001	Reject	Significant	.192	Strong Association
Age	4.512	.211	Do not Reject	Not Significant	.098	Weak Association
Grade Level	2.110	.550	Do not Reject	Not Significant	.067	Weak Association
College Affiliation	16.936	.323	Do not Reject	Not Significant	.190	Strong Association

Legend: Significance at 0.05

Sex: A strong association between swimming ability and sex implies that there is a clear and significant difference in swimming skills between male and female students. This could mean that one gender, on average, is more proficient at swimming than the other. Further analysis might reveal whether this difference is due to cultural or biological factors.

College Affiliation: A strong association with college affiliation suggests that students from different colleges exhibit significant differences in swimming ability. This could be due to various factors, such as the availability of swimming facilities or mandatory swimming courses in certain colleges.

Weak Correlation (Age and Grade Level):

Age: A weak correlation between swimming ability and age suggests that age alone is not a good predictor of a student's swimming skills. In other words, younger or older students do not necessarily have better or worse swimming abilities on average. This could mean that swimming skills are acquired independently of age.

Grade Level: Similarly, a weak correlation with grade level implies that a student's grade or academic year does not strongly influence their swimming ability. This could suggest that swimming proficiency is not related to the student's progress through their academic program.

The strength of association or correlation is often measured using statistical methods such as correlation coefficients or chi-squared tests. Strong associations indicate that changes in one variable are closely related to changes in another, while weak associations suggest that there is little or no relationship between the variables.

Practical implications of these findings might include:

Curriculum and Programs: If there is a strong association with college affiliation, educational institutions may consider tailoring their programs to address the varying swimming abilities of students in different colleges. For instance, they could offer additional swimming courses or resources to colleges with lower average swimming abilities.

Inclusion and Access: In the case of sex-related differences, institutions might want to ensure equal access to swimming facilities and opportunities for all students, regardless of their gender. This could include promoting gender-inclusive swimming programs.

Age and Grade-Level Neutrality: Institutions can take comfort in knowing that swimming ability is not strongly tied to age or grade level, which means that students of different ages and academic years can participate equally in swimming activities without concerns about major disparities in skill levels.

In conclusion, Table 6 suggests that there are strong associations between swimming ability and factors such as sex and college affiliation, while there is a weak correlation with age and grade level. These findings can guide educational institutions in tailoring their programs and resources to meet the specific needs of their student population in relation to swimming.

Table 7. Significant relationship between self-efficacy and physical exercise routine of the student-respondents

Pearson Correlations						
Variable 1	Variable 2	r-value	Level of Association	p-value	Ho	I
Self-Efficacy	Exercise Routine	.803	Very High Positive Correlation	.002	Reject	Significant

Legend: Significance at 0.05

Table7 shows the significant relationship between the self-efficacy of the student-respondents and their physical exercise routine. It can be inferred that there is a very high correlation between the 2 variables stated above. This could mean that the higher the self-efficacy of the student-respondents the higher is their level of physical fitness when they actively engage in the different exercise routines like flexibility, aerobics and strength training exercises. As the students perform their daily exercise routine as diligently as they can, then they can gain a higher level of fitness which is very important for them in performing the different swimming skills.

In Table 7, there is a significant relationship between the self-efficacy of student-respondents and their physical exercise routines. It also suggests a very high correlation between these two variables. Let's break down the implications of this relationship and how it may relate to students' physical fitness and swimming skills:

Significant Relationship:

The term "significant relationship" in the context of statistical analysis typically means that there is a strong and reliable connection between the two variables being studied. In this case, self-efficacy and physical exercise routines are closely linked in some way.

Very High Correlation:

A "very high correlation" implies that there is a strong and positive linear relationship between self-efficacy and engagement in various exercise routines, such as flexibility, aerobics, and strength training. In simpler terms, as self-efficacy increases, so does the level of participation in these exercise routines.

Higher Self-Efficacy and Higher Fitness:

If self-efficacy and exercise routines are indeed very highly correlated, as suggested, it implies that students with higher

self-efficacy are more likely to engage in physical exercises like flexibility, aerobics, and strength training.

This increased engagement in exercise routines is associated with a higher level of physical fitness. Students with greater self-belief in their ability to perform these exercises may be more motivated to do them regularly and effectively.

Importance for Swimming Skills:

The statement suggests that maintaining a high level of fitness through regular exercise routines is crucial for students' swimming skills. Swimming requires not only physical fitness but also stamina, strength, and flexibility. Therefore, students who diligently perform these exercises can potentially enhance their swimming abilities.

Implications for Educational Institutions:

Educational institutions may consider incorporating programs that focus on boosting students' self-efficacy in exercise and physical fitness. By promoting self-confidence and providing resources for various exercise routines, they can help students achieve and maintain higher levels of fitness, which can positively impact their overall well-being, including their swimming skills.

Holistic Approach to Student Wellness:

This information highlights the importance of a holistic approach to student wellness. Encouraging students not only to excel academically but also to prioritize their physical health and self-confidence can contribute to their overall success and development.

In summary, Table 7 suggests a significant and very high correlation between self-efficacy and engagement in exercise routines, with potential positive implications for students' physical fitness and, subsequently, their swimming skills. This information underscores the importance of fostering self-belief and promoting regular exercise as part of a comprehensive approach to student well-being.

4. Conclusion

Looking into the results and analyses of this study, the following conclusions can be inferred:

Research has found that male students show higher interest in sports like swimming. This finding is not surprising, as sports are predominantly played by men in the recreational and competitive realms. This reflects a general trend across gender in the choice of physical activity. Men's interest in sports such as swimming may stem from a variety of factors, including cultural background, social influences and personal preferences. However, this finding highlights the need for a deeper understanding of gender differences when it comes to encouraging sport participation and promoting diverse exercise options.

Research indicates that students' self-efficacy can influence their performance when performing different exercise programs. This means that students' confidence in their ability to successfully complete exercise tasks may have a direct impact on their fitness levels. This is an important finding because it reminds us that when educating and training athletes, we need to pay attention to their psychological quality and self-belief. By increasing students' sense of self-efficacy, we can help them better cope with the challenges of sport and achieve better results in improving their physical fitness levels.

The findings indicate that participation in swimming has a positive impact on students' physical fitness levels. This conclusion is crucial to highlight the benefits of physical activity and encourage students to participate in different types of sports. Students can continue to enjoy and benefit from different types of sports, whether in leisure time or competitive competition. As an aerobic exercise, swimming helps improve cardiorespiratory fitness, muscular endurance and overall fitness levels, so it can be considered a well-rounded form of exercise suitable for individuals of all ages and fitness levels.

In summary, this study provides us with important insights into gender differences, self-efficacy, and physical activity. These findings help guide us to better promote sports participation and improve physical fitness levels, and highlight the positive impact of physical activity on individual health and overall quality of life.

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