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Exploring Education Factors Affecting the Character Traits of TAEKWONDO Trainees

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Abstract

Purpose: *The study aims to clarify the educational myths that explored and explored the educational myths of the leader that affect the personalities of the trainees who practice taekwondo at the taekwondo stadium.*

Method: *The study conducted an open survey of 116 taekwondo instructors' of taekwondo centers located in Seoul and Gyeonggi Province with the aim of exploring the taekwondo instructors's educational belief factors that affect the personality of taekwondo trainees. In this study, the data collected through open questionnaires to the leaders who guide Taekwondo trainees was conducted an inductive content analysis, an analysis process that categorizes raw materials into detailed areas according to the similarity of semantics and categorizes common topics in detailed areas into general areas.*

Results: *An open questionnaire collected a total of 435 cases, and the collected data were obtained through inductive content analysis through expert meetings. As a result, the 435 cases of raw materials were classified into 15 detailed areas of manners, moral ethics, parent education, fighting spirit, self-confidence, attitude, communication, mindset, knowledge, education philosophy, humanity, interpersonal relationships, lifestyle, and community consciousness, and finally became four general categories of personal growth education, self-discipline, taekwondo instructors' quality and guidance on life learning emerged. The proportion of the general areas that were finally categorized was the highest in the education of personality growth(44.83%), followed by the fostering of self-worth(26.21%), the cultivation of taekwondo instructors' quality(19.54%), and the guidance of life learning(9.43%).*

Conclusion: *The educational principles of a leader who influences the personality of Taekwondo trainees have been shown in four general areas: character growth education, self-value fostering, leadership qualities development, and life-learning guidance.*

[Keywords] ***Taekwondo, Prsonality, Trainees, Taekwondo Instructors, Educational Beliefs***

1. Introduction

Leaders who train Taekwondo trainees at actual training sites instruct the trainees with their educational beliefs originated from their own holistic training or philosophical values. Depending on the philosophical values and educational beliefs that an individual Taekwondo instructor has, the words and actions, or the instruction contents through such verbal and physical communication methods, to the young trainees who practice Taekwondo will be different. The competency of a leader who instructs trainees has more weight in its educational aspect of developing personal character than the aspect of cultivating athletes to merely improve their skills[1][2].

*This Paper Summarizes Insoo Kim's Korea National Sport University Master's Thesis.

All human beings have beliefs, and they all build their own values, attitudes, and behaviors in line with one's own individual or comprehensive belief systems to make judgments and opinions[3]. In school, teachers' educational beliefs are defined as the educational view built by individual teachers based on various types of direct and indirect field experiences, including theories and educational practices that have been learned through lectures and textbooks in college and actual experiences obtained as a teacher[4]. In fact, teachers' educational beliefs, which are viewed as inherently owned by individual teachers, form the basis of decision-making and behaviors. In particular, experience, among all other factors, plays the most important role in constructing educational beliefs[5][6].

Educating children who practice Taekwondo at a Taekwondo studio should aim at developing a person, as a whole, who thinks and behaves reasonably through Taekwondo training and learning, rather than creating a person with professional skills and high knowledge. Thus, Taekwondo trainers need to guide and educate the children to cultivate personality, thoughts, attitudes, and behavioral characteristics, which can be collectively referred to as personality, enabling the individual trainees to expand their inner self. Taekwondo leaders, who have built their educational beliefs through individual experiences as a leader, approach trainees according to their own beliefs, while playing a variety of roles in designing programs, operating and managing daily activities related to classes and guidance, and interacting[7]. The existence of Taekwondo leaders who must promote the holistic growth and development of child trainees by playing their role in line with such educational beliefs and the importance of the educational beliefs of the leaders have been emphasized[8].

Prior studies related to Taekwondo personality include the study conducted by Son and Choi to investigate how the images of Taekwondo leaders influence the development of trainees' personality[9]. Similarly, Jung examined the contents of personality education in Taekwondo curriculum, and Jeon conducted research to analyze the perception of Taekwondo leaders regarding practice-oriented personality education[10][11]. In addition, Lim studied the concept of personality by developing a psychological change model for Taekwondo training and verifying the effectiveness of the model[12], Lee extracted the factors of personality and education recognized by Taekwondo leaders to identify the factors of Taekwondo personality perceived by the leaders, Jung and Kim conducted a study to conceptualize the practical virtues of Taekwondo personality, and Lee and Kim sought to understand the relationship between the beliefs that Taekwondo leaders have for personality education and their actual education practice[13][14][15]. In 2013, a study on Taekwondo personality education Kim et al. was conducted by the Korea Taekwondo Association, and a personality education instructor training program was held every year along with the publication of the book, 'Personality Education'[16]. Also, Choi & Park conducted a study to verify the effectiveness of Taekwondo personality education programs[17].

In recent years, Lim, Jang, Park, and Kwak proposed an integrated education method of learning and understanding 'personality virtues' by exploring the meaning and practical virtues of Taekwondo personality based on Eastern and Western perspectives on character[18]. As examined in previous studies, though both Taekwondo instructors, who teach taekwondo at actual sites, and researchers, who study theories related to Taekwondo, have a lot of interest in understanding the factors effectively affecting the character development and cultivation of child trainees of Taekwondo, most of the preceding studies were quantitative studies analyzing and verifying the relationship of quantitative numbers[19][20]. In fact, no in-depth research has been conducted on the educational beliefs of Taekwondo instructors that are important for the personality development of Taekwondo trainees, or how such beliefs are perceived and felt.

The educational beliefs that Taekwondo instructors have for philosophical values will have a major influence on the personality of the trainees who practice Taekwondo. When young

trainees experience their own sincerity and perseverance and achieve growth through Taekwondo training, the philosophical values and educational beliefs that the Taekwondo leaders use to guide the trainees have an important influence on the personality development of the trainees.

Therefore, an attempt has been made to explore the factors of educational beliefs of Taekwondo instructors that influence the personality development of Taekwondo trainees. Furthermore, it is highly expected that the results of this study will provide fundamental data necessary for personality education of Taekwondo trainees and become the basis for the development of education and training programs for Taekwondo leaders to effectively guide their trainees.

2. Research Method

2.1. Research participants

116 Taekwondo instructors working at Taekwondo stadiums located in Seoul and Gyeonggi area were selected for an open-ended questionnaire survey by random sampling to explore the factors of educational beliefs of the instructors that may influence the personality of child trainees. The characteristics of research participants are as shown in <Table 1>.

Table 1. Title. Research participants.

Type		Taekwondo instructor(116 person)	Ratio(%)
Gender	Male	96	82.76
	Female	20	17.24
Work Title	Director	65	56.03
	Master	51	43.97
Age		36.10	
Year of working experience		12.14	

2.2. Date collection

In this study, an open-ended questionnaire suitable for deriving subjective opinions of participants through qualitative research methods was developed based on previous studies for data collection in order to examine the factors of educational beliefs of instructors that influence the personality of child trainees practicing Taekwondo[21][22][23]. The question item developed for the questionnaire is shown in <Table 2>.

Table 2. Open-ended questionnaire question items.

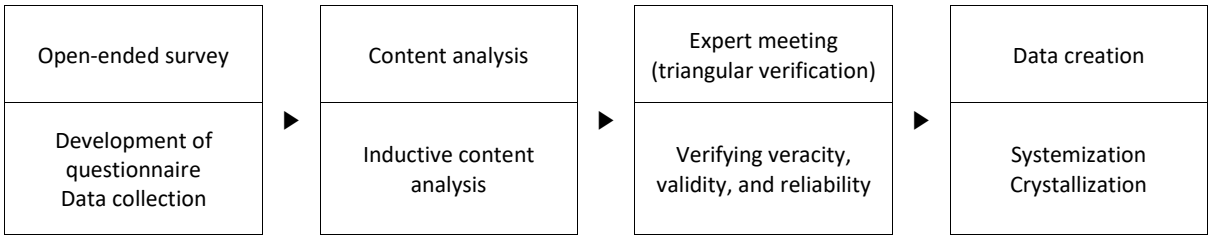
Type	Question item
Open-ended questionnaire	Think of your experience in teaching taekwondo. What do you think is most important for the personality development of the trainees when teaching taekwondo? Please write below.

2.3. Research procedure

In this study, an open-ended questionnaire was developed to explore the factors affecting the personality of child trainees practicing Taekwondo. The survey was conducted by selecting

116 Taekwondo instructors working at Taekwondo stadiums in Seoul and Gyeonggi area using a random sampling method. An inductive content analysis was performed on the original data collected through the survey before verifying the veracity, validity and reliability of the study by triangular verification at expert meetings in which sports psychology experts, Taekwondo instructors, and researchers participated. During the data creation process, the results of inductive categorization were analyzed by frequency and ratio, and the educational belief factors of the instructors that influence the personality of children who practice Taekwondo were organized in detail. Below <Figure 1> illustrates the procedure.

Figure 1. Research procedure.



2.4. Data analysis

In this study, the data from Taekwondo instructors collected through an open-ended questionnaire were categorized into sub-areas in accordance with the meaning and similarity of the content. Subsequently, an inductive content analysis, which is a categorizing analysis process classifying common subjects in sub-areas into general areas, was conducted. Inductive content analysis is a general data analysis method of qualitative research that can derive results by condensing a large amount of data[24][25].

Because the inductive categorization research poses a risk of biased evaluation by the researchers, triangular verification was conducted at expert meetings in which sports psychology experts with a lot of experiences in qualitative inductive categorization research, Taekwondo instructors with more than 15 years of experiences, and the researchers participated to verify the reliability and validity of the research.

3. Result and Discussion

3.1. Exploring the factors of educational beliefs of instructors that influence the personality of taekwondo trainees

116 Taekwondo instructors working at Taekwondo stadiums located in Seoul and Gyeonggi area were surveyed by developing an open-ended questionnaire to extract the educational belief factors of instructors that influence the personality development of child trainees who practice Taekwondo.

Prior to conducting the actual open-ended questionnaire survey, the final question item was selected based on the results of the preliminary survey. A visit was made to Taekwondo stadiums to survey the instructors, and e-mails were sent to those Taekwondo stadiums to which visits are somewhat restricted due to physical distance.

The final question item was “Think of your experience in teaching Taekwondo. What do you think is most important for the personality development of the trainees when teaching Taekwondo? Please write below.” The survey participants were informed of the purpose of this study and encouraged to freely fill out the questionnaire. As a result of conducting an open-ended questionnaire survey on 116 Taekwondo trainers, 435 cases of original data were collected.

The original data collected through the survey were analyzed by integrating similar and overlapping contents and reducing the 435 cases of original data to 92 cases through the integration process. Below <Table 3> shows the reduced original data.

Table 3. Reduced original data.

▪ Expression of gratitude(4)	▪ Right attitude(4)	▪ Conscience
▪ Health(3)	▪ Consideration(19)	▪ Respect for adults(5)
▪ Encouragement	▪ Impregnableness(3)	▪ Sense of honor(5)
▪ Modesty(4)	▪ Parent support	▪ Etiquette education(52)
▪ Listening	▪ Honor and filial piety toward parents (filial piety)(21)	▪ Correct thinking
▪ Using refined language(right words, words of instructors)(8)	▪ Parents' personality(family) education	▪ Patience(33)
▪ Empathy(empathic ability)(6)	▪ Parents' values of life	▪ Personnel etiquette education (courteousness)(27)
▪ Understanding and loving each other while living in community	▪ Parents' language	▪ Personality education(10)
▪ Community awareness	▪ Parents' behavior	▪ Improvement of confidence(19)
▪ Interest(3)	▪ Mentality	▪ Self-control(2)
▪ Friendship(10)	▪ Love(9)	▪ Building self-esteem(5)
▪ Educational subjectivity	▪ Lifestyle(2)	▪ Tidying and organizing(2)
▪ Self-control(4)	▪ Teaching a sense of seniority and caring for juniors and younger colleagues	▪ Justice(2)
▪ Positive language elements	▪ Attitudes toward teachers and seniors	▪ Honesty(7)
▪ Positive intention identification	▪ Senior and junior etiquette	▪ Respect(8)
▪ Positive thinking(3)	▪ Mind to serve others	▪ Instructors' beliefs
▪ Positive attitude	▪ Faithfulness(12)	▪ Instructors' personality
▪ Positive mind(2)	▪ Communication(3)	▪ Instructors' quality
▪ Emphasis on basic etiquette	▪ Leading by example(4)	▪ Instructors' acceptance
▪ Continuous training(2)	▪ Frankness	▪ Instructors' language(4)
▪ Persistence(11)	▪ Understanding trainees	▪ Instructors' passion(7)
▪ Education same as given to my child	▪ Sense of shame	▪ Instructors' right behavior(14)
▪ Consideration same as given to my child	▪ Interests with children	▪ Instructors' attitude
▪ Perspective of a parent to view own child(3)	▪ Understanding children's psychology (3)	▪ Exchange between instructors and trainees
▪ Effort(5)	▪ Knowledge of children	▪ Instruction philosophy
▪ Group life(2)	▪ Understanding children from their standpoint	▪ Order(5)
▪ Morality(4)	▪ Children's life attitude	▪ Responsibility(5)
▪ Moral intelligence	▪ Patriotism	▪ Talking about friends' strengths and weaknesses
▪ Challenge spirit (4)	▪ Concession(8)	▪ Trust with friends
▪ Demeanor(2)		▪ Chat with friends
▪ Correct teaching method		▪ Compliment(5)
		▪ Teamwork(7)

3.2. Inductive content analysis on factors of instructors' educational beliefs affecting the personality of taekwondo trainees

As a result of conducting an open-ended questionnaire survey on 116 instructors working at Taekwondo stadiums located in Seoul and Gyeonggi area to explore the factors of leaders' educational beliefs that influence the personality of Taekwondo trainees, a total of 435 cases were collected. The 435 of original cases were classified into 15 sub-areas of manners, moral ethics, parental education, determination, confidence, self-esteem, attitude, communication, mindset knowledge, educational philosophy, humanity, interpersonal relationship, lifestyle, and community consciousness. The 15 sub-areas were, then, categorized into 4 general areas

of personality growth education, self-worth cultivation, leader quality cultivation, and guidance on life-learning. Among the final general areas categorized, personality growth accounted for the largest ratio(44.83%), followed by self-worth cultivation(26.21%), leader quality cultivation(19.54%), and guidance on life-learning(9.43%). <Table 4> shows the educational belief factors of Taekwondo leaders structured as a result of the inductive categorization.

Table 4. Results of inductive content analysis of original data.

Original data(Frequency)		Sub-area (Frequency)	General area (Frequency)
Personnel etiquette education	52	Manner (158)	Personality growth education(195) 44.83%
Greeting etiquette education(courteousness)	27		
Honor and filial piety toward parents(filial piety education)	21		
Consideration	19		
Personality education	10		
Concession	8		
Respect for adults	5		
Sense of honor	5		
Expression of gratitude	4		
Modesty	4		
Emphasis on basic etiquette	1		
Mind to serve others	1		
Conscience	1		
Faithfulness	12	Moral ethics (32)	
Honesty	7		
Responsibility	5		
Morality	4		
Justice	2		
Moral intelligence	1		
Frankness	1		
Parent support	1	Parental education (5)	
Parents' personality(family) education	1		
Parents' value of life	1		
Parents' language	1		
Parents' behavior	1		
Patience	33	Determination (64)	Self-worth cultivation (114) 26.21%
Persistence	11		
Effort	5		
Self-restrain	4		
Challenge spirit	4		
Impregnableness	3		
Continuous training	2		
Self-control	2		
Confidence improvement	19	Confidence (25)	
Compliment	5		
Encouragement	1		
Love	9	Self-esteem (25)	
Respect	8		
Building self-esteem	5		
Attention	3		
Instructors' right behavior	14	Attitude	Leader quality cultivation

Instructors' passion	7	(30)	(85) 19.54%
Leading by example	4		
Demeanor	2		
Positive intention identification	1		
Positive attitude	1		
Instructors' attitude	1		
Using refined language(right words, words of instructors)	8	Communication (25)	
Empathy(empathic ability)	6		
Instructors' language	4		
Communication	3		
Listening	1		
Positive language element	1		
Understanding children from their standpoint	1		
Exchange between instructors and trainees	1		
Right attitude	4	Mindset (15)	
Positive thinking	3		
Perspective of a parent to view own child	3		
Positive mind	2		
Consideration same as given to my child	1		
Mentality	1		
Correct thinking	1		
Understanding children's psychology	3	Knowledge (7)	
Correct teaching method	1		
Understanding trainees	1		
Interests with children	1		
Knowledge in children	1		
Educational subjectivity	1	Educational philosophy (5)	
Education same as given to my child	1		
Instructors' acceptance	1		
Instructors' beliefs	1		
Instruction philosophy	1		
Sense of shame	1	Humanity (3)	
Instructors' personality	1		
Instructors' quality	1		
Friendship	10	Interpersonal relationship (16)	Guidance on life-learning (41) 9.43%
Sense of seniority(caring juniors and younger colleagues)	1		
Attitudes toward teachers and seniors	1		
Senior and junior etiquette	1		
Talking about friends' strengths and weaknesses	1		
Communication with friends	1		
Trust with friends	1		
Order	5	Lifestyle (13)	
Health	3		
Lifestyle	2		
Tidying and organizing	2		
Children's life attitude	1		
Teamwork	7	Community consciousness (12)	
Group life	2		
Community awareness	1		

Understanding and loving each other while living in community	1
Patriotism	1

4. Contribution and Suggestions

In this study, an open-ended questionnaire survey was conducted on 116 Taekwondo instructors working at Taekwondo stadiums located in Seoul and Gyeonggi area to explore the factors of educational beliefs of leaders that affect the personality of Taekwondo trainees. The data collected by the survey were inductively categorized through expert meetings, and the results are as follows:

The factors of educational beliefs of the instructors affecting the personality of Taekwondo trainees were found in four general areas: personality growth education, self-worth cultivation, leader quality cultivation, and guidance on life-learning.

First, personality growth education was found to be the most important factor of leaders' educational beliefs that influence the personality of Taekwondo trainees. Manners, moral ethics and parental education taught by Taekwondo instructors with an educational belief for personality growth will have a positive effect on the personality development of Taekwondo trainees.

Second, self-worth cultivation domain of the educational beliefs of instructors that affect the personality of Taekwondo trainees, which requires the educational beliefs of instructors, fosters the power of the trainees to cultivate themselves.

Third, leadership quality cultivation domain of the education beliefs of instructors that affect the personality of Taekwondo trainees was observed to require Taekwondo instructors' own endeavor to cultivate such quality. Striving as an instructor who teaches Taekwondo practitioners with the educational belief of cultivating the qualities of a leader will have an important influence on the healthy character development of Taekwondo trainees.

Fourth, guidance on life-learning domain of the educational beliefs of instructors that affect the personality of Taekwondo trainees was found to be capable of educating individuals of community consciousness and basic lifestyle. It is important for instructors to have proper educational beliefs for life-learning guidance in order to positively influence the personality of their trainees.

This study was conducted to explore the factors of educational beliefs of trainers that influence the personality of Taekwondo trainees. Based on the results of this study, following suggestions are made for future research.

First, the educational beliefs of Taekwondo instructors are diverse. Thus, it will be meaningful to carry out a study on developing educational belief programs which educate the participants to become aware of the educational beliefs they have and learn about correct educational beliefs.

Second, this study was conducted with the sole purpose of exploring the educational belief factors of instructors that influence the personality of Taekwondo trainees. Hence, the in-depth contents of the instructors were not analyzed. Therefore, conducting analytical research on the in-depth contents of Taekwondo instructors through in-depth interviews will carry a great significance.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	ISK	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑
Corresponding Author*	KJ	-Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Effect of Fun of Elderly Women Participating in HEALTH QIGONG on the Health Related Quality of Life

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Abstract

Purpose: *This study verified and conducted the effect of fun factor of the elderly who participated in oriental medicine Qigong exercise upon health related life quality.*

Method: *For the selection of study participants, the subjects of the study were sampled by convenience sampling and judgmental sampling for the elderly women participating in the Health Qigong held at public health centers in S and K cities in Korea. 212 valid copies of questionnaire were used for analysis. first, exploratory factor analysis was conducted to find out the validity of the variable of fun and the scale of health related quality of life, and the reliability verification was analyzed by calculating Cronbach's a coefficient that checks internal consistency between items. Second, to analyze the effect of fun on the health related quality of life, multiple regression analysis by enter method was conducted, and the statistical level was verified at p<.05.*

Results: *To confirm the multidimensional relationship between the fun factor and health related quality of life of elderly women participating in Health Qigong, this study conducted multiple regression analysis with five lower variables of the health related quality of life factor as the reference variable and fun factor as the predictor. As a result, all effects of fun on the health related quality of life were found at the statistical significance level, and in the standardization coefficients of the predictive variables, it was confirmed that they had influence in the order of pleasure, family support, physical strength and health, interpersonal relationship, and learning relation.*

Conclusion: *This study, it was found that the fun of Health Qigong has an influence on the overall health related quality of life of elderly women. These findings can be said to indirectly suggest that Health Qigong is fun and suitable for elderly women. The results of this study is significant in that they provided evidence that Health Qigong can be used as a positive health intervention program for the elderly women's exercise.*

[Keywords] ***Fun, Elderly Women, Health Qigong, Health Related Quality of Life, Oriental Medicine***

1. Introduction

Modern society is called an aging era or a silver era. This is the result of an increase in life expectancy due to the rise of living standards and the development of medical technology. From what age do we become an elderly person? It will be difficult to answer this question easily. In Korea, according to the Labor Standards Act and the Elderly Welfare Act, 65 years old is prescribed as an elderly person. However, for us living in the modern world, there are too many elderly people living young already around us to say that 65 years old is vaguely an old man based on only physical age.

In particular, in Korea, the age group born in the baby boom period immediately after the Korean War in 1950 from around 2020 entered the elderly generation in large numbers, and the population of the elderly aged 75 or older is increasing significantly. It is predicted that by 2026,

20.6% of the Korean population will become aging and reach a super aging society. If the current trend persists, the ratio of the elderly population is expected to reach 40% in 2050, surpassing Japan to become the world's oldest country[1].

From this point of view, to realize a successful aging and welfare society, the provision of an environment for the elderly to participate in leisure sports should be implemented as a national policy, and the justification for the elderly to protect their health emerges. Recently, in Korea, the government has adopted leisure sports for the elderly as a major policy task as a comprehensive measure for the elderly, and in particular, it is operating the Elderly Health Promotion Project, a detailed project to increase health life. Specifically, the elderly health college and home visiting exercise program, the elderly health expansion project, and the elderly sports class project using the elderly welfare center are being developed[2][3][4].

In addition, the Korean government announced a 'health investment strategy' by the Ministry of Health and Welfare to solve the elderly health problems and secure a sustainable future growth engine at the national level[5]. In previous studies, the research on living sports for the elderly has expanded quantitatively, and various contents on exercise effect and program verification have been presented[6][7][8]. However, it is very difficult to practice continuous exercise for the elderly, and it is urgent to present a program that can overcome both external and internal factors that interfere with exercise.

Thus, the elderly exercise program applied to female elderly participants in this study is Health Qigong. Health Qigong can be said to be a traditional sports activity in the Orient that trains the body to live a healthy long life without getting sick by cultivating mind and body based on the Oriental life nurturing health method[9][10]. Looking at previous studies, it is revealed that the Health Qigong program can have positive physiological and psychological effects on the elderly's health promotion[11][12]. Therefore, this study aims to investigate how the fun factor of elderly women participating in Health Qigong affects the health related quality of life. The results of these efforts and research will serve as an opportunity to verify whether Health Qigong is a program suitable for elderly exercise.

2. Methods

2.1. Participant

For the selection of study participants, the subjects of the study were sampled by convenience sampling and judgmental sampling for the elderly women participating in the Health Qigong held at public health centers in S and K cities in Korea. 212 valid copies of questionnaire were used for analysis, and of the 212 participants, the age of the participants consists of 65-74(121), 57.1%, 75-84(75), 35.4%, and 85 or older(16) 7.5%. In terms of the duration of participation in Oriental Medicine Health Qigong, there are 55 people for less than 1 year, 25.9%, 80 people for less than 2 years, 37.7%, 48 people for less than 3 years, 22.6%, and 29 people for less than 4 years, 13.7%, respectively.

2.2. Instruments

The tool for measuring fun, which was set as an independent variable in this study, consists of five sub-factors such as physical strength and health, praise and pleasure, family support, interpersonal relationship, and learning-related, etc., and it was modified and supplemented for use according to the actual condition of the elderly women who practice Health Qigong. The items of each factor are composed of physical strength and health 5 items, praise and pleasure 5 items, family support 4 items, interpersonal relationship 4 items, and learning-related 4 items, and the reliability of these factors was found to be Cronbach's α 0.938, 0.883, 0.861, 0.878, and 0.921, indicating reliable levels.

In addition, the measurement tool of health related quality of life, which was set as a dependent variable, was modified and supplemented for this study by using the short form 36-item(SF-36)[13]. Among the eight factors of health related quality of life, health status change factor, social health factor, and pain factor were excluded[14]. The items of each factor consisted of 10 items for physical function, 7 items for role limitations due to physical problems, 5 items for general health, 4 items for mental health, and 2 items for vitality, and the reliability of these factors was found to be Cronbach's α 0.601, 0.931, 0.712, 0.712, and 0.601, indicating reliable levels.

2.3. Data analysis

As the final analysis data, 212 copies of questionnaire were empirically analyzed using the SPSS statistical package program for Windows. Specifically, first, exploratory factor analysis was conducted to find out the validity of the variable of fun and the scale of health related quality of life, and the reliability verification was analyzed by calculating Cronbach's α coefficient that checks internal consistency between items. Second, to analyze the effect of fun on the health related quality of life, multiple regression analysis by enter method was conducted, and the statistical level was verified at p<.05.

3. Results

3.1. Analysis of correlation between fun and health related quality of life

The results of the correlation analysis to confirm the direction of the fun and health-related quality of life of the elderly women participating in the Health Qigong program are shown in <Table 1>.

Table 1. Analysis of correlation between fun and health related quality of life.

Division		1	2	3	4	5	6	7	8	9	10
Fun	Physical strength and health	1									
	Pleasure	.817**	1								
	Family support	.704**	.829**	1							
	Interpersonal relationship	.708**	.762**	.715**	1						
	Learning-related	.678**	.779**	.745**	.788**	1					
Health-related quality of life	Physical function	-.118	-.081	-.040	.030	-.063	1				
	Role limitations due to physical problem	.003	.072	.070	.161*	.064	.825**	1			
	General health	-.405**	-.385**	-.338**	-.286**	-.283**	.299**	.198	1		
	Mental health	-.162*	-.105	-.096	-.084	-.096	.342**	.505**	.406**	1	
	Vitality	-.095	-.026	.000	.011	-.005	.336**	.292**	.336**	.468**	1

Note: **p<.01, *p<.05.

The relationship between fun and sub-factors of the variable, health related quality of life shows a negative(-) correlation, and the physiological domain factor of fun and the resting domain factor(r=.655**) showed the highest correlation. Looking at the results of this correlation analysis, it can be said that there is no problem in multicollinearity.

3.2. Influencing relationship between fun and physical function

Looking at the results of testing the statistical significance of fun for physical function, the independent variables that significantly affect the significance level of .05 are physical strength and health factor(t=-2.276, p=0.24), pleasure factor(t=2.706, p=.007), and family support factor(t=-5.013, p=.000), and according to the standardization coefficient representing the relative contribution of the independent variable, the family support(β=-.365), pleasure(β=.346), and physical strength and health(β=-.276) were found to show influence in that order. <Table 2> below is the results of multiple regression analysis of fun for physical functions.

Table 2. Results of multiple regression analysis of participation fun on physical function.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
Physical function	Constant	5.301	.237		22.321	.000
	Physical strength and health	-.172	.076	-.276	-2.276	.024
	Pleasure	.222	.082	.346	2.706	.007
	Family support	-.347	.069	-.365	-5.013	.000
	Interpersonal relationship	-.137	.090	-.131	-1.518	.131
	Learning-related	.085	.078	.080	1.086	.279

Note: F=9.973, R2=.441, Durbin-Wason=1.553, p<0.5.

3.3. Influencing relationship between fun and role limitations due to physical problems

Looking at the results of testing the statistical significance of fun for role limitations due to physical problems, the independent variables that significantly affect the significance level of .05 are physical strength and health factor(t=-2.999, p=.003), pleasure factor(t=3.701, p=.000), and family support factor(t=-5.030, p=.000), and according to the standardization coefficient representing the relative contribution of the independent variable, it was found that the influence was shown in the order of pleasure(β=.467), family support(β=-.362), and physical strength and health(β=-.359). <Table 3> below is the results of multiple regression analysis of fun for role limitations due to physical problems.

Table 3. Results of multiple regression analysis of participation fun on role limitations due to physical problems.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
Role limitations due to physical problems	Constant	5.031	.247		20.394	.000
	Physical strength and health	-.235	.079	-.359	-2.999	.003
	Pleasure	.315	.085	.467	3.701	.000
	Family support	-.362	.072	-.362	-5.030	.000

	Interpersonal relationship	-.153	.094	-.140	-1.633	.104
	Learning-related	.161	.081	.145	1.990	.048

Note: F= 11.129, R2=.461, Durbin-Wason=1.334, p<0.5.

3.4. Influencing relationship between fun and general health

Looking at the results of testing the statistical significance of multiple regression analysis of fun on general health, the independent variables that significantly affect the significance level of .05 are pleasure factor(t=2.688, p=.008), family support factor(t=-4.513, p=.000), and learning-related factor(t=1.961, p=.051), and according to the standardization coefficient representing the relative contribution of the independent variable, it was found that the influence was shown in the order of pleasure(β=.351), family support(β=-.336), and learning-related(β=.148). <Table 4> below is the results of multiple regression analysis of fun for general health.

Table 4. Results of multiple regression analysis of participation fun on general health.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
General health	Constant	4.881	.258		18.929	.000
	Physical strength and health	-.156	.082	-.236	-1.903	.058
	Pleasure	.239	.089	.351	2.688	.008
	Family support	-.340	.075	-.336	-4.513	.000
	Interpersonal relationship	-.140	.098	-.126	-1.426	.155
	Learning-related	.166	.084	.148	1.961	.051

Note: F=7.811, R2=.399, Durbin-Wason=1.224, p<0.5.

3.5. Influencing relationship between fun and mental health

Looking at the results of testing the statistical significance of fun on mental health, the independent variables that significantly affect the significance level of .05 are physical strength and health factor(t=-2.418, p=.016), pleasure factor(t=4.005, p=.000), and family support factor(t=-3.585, p=.000), and an interpersonal relationship factor(t=-2.322, p=.021), and according to the standardization coefficient representing the relative contribution of the independent variable, it was found that the influence was shown in the order of pleasure(β=.520), physical strength and health(β=-.298), family support(β=-.265), and interpersonal relationship(β=-.204). <Table 5> below is the results of multiple regression analysis of fun on mental health.

Table 5. Results of multiple regression analysis of participation fun on mental health.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
Mental health	Constant	4.757	.219		21.708	.000
	Physical strength and health	-.169	.070	-.298	-2.418	.016
	Pleasure	.303	.076	.520	4.005	.000

	Family support	-.229	.064	-.265	-3.585	.000
	Interpersonal relationship	-.193	.083	-.204	-2.322	.021
	Learning-related	.137	.072	.143	1.911	.057

Note: F=8.374, R2=.411, Durbin-Wason=1.424, p<0.5.

3.6. Influencing relationship between fun and health-related life

Looking at the results of testing the statistical significance of individual independent variables for the dependent variable, the independent variables that significantly affect the significance level of .05 are five independent variables such as physical strength and health factor(t=-2.802, p=.006), pleasure factor(t=3.716, p=.000), family support factor(t=-4.898, p=.000), interpersonal relationship factor(t=-1.978, p=.049), and learning-related factor(t=2.015, p=.045), and they were found to be significant in all of these. According to the standardization coefficient representing the relative contribution of the independent variable, it was found that the influence was shown in the order of pleasure(β=.470), family support(β=-.353), physical strength and health(β=-.336), interpersonal relationship(β=-.169), and learning-related(β=.147). <Table 6> below is the results of multiple regression analysis of health related quality of life for fun.

Table 6. Results of multiple regression analysis of participation fun on health-related quality of life.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
Health-related quality of life	Constant	4.971	.213		23.369	.000
	Physical strength and health	-.190	.068	-.336	-2.802	.006
	Pleasure	.272	.073	.470	3.716	.000
	Family support	-.304	.062	-.353	-4.898	.000
	Interpersonal relationship	-.160	.081	-.169	-1.978	.049
	Learning-related	.140	.070	.147	2.015	.045

Note: F=10.933, R2=.458, Durbin-Wason=1.200, p<0.5.

4. Discussion

In this study, Health Qigong, which was used as an exercise program for the elderly, is a traditional exercise program based on the principles of studies of oriental medicine[15][16]. Accordingly, under the hypothesis that Health Qigong is a program that can act on the health intervention of the elderly, this study identified the fun of the participants, and investigated the relationship between fun and health related quality of life. Fun is a positive emotional response that you feel during an activity, and it is a very comprehensive concept that includes both internal and external motivations, which eliminates mental and physical stress, and it feels as if it is very light and spreads to the whole body and mind, making it easier to feel the movement, and it can be said that it becomes fun by itself[17]. In the participation of all physical activities, the fun factor is a large factor that induces internal motivation and is a positive and rewarding variable[18].

This study attempts to confirm the fitness of Health Qigong as an elderly exercise, fun and health effects based on objective facts. From this point of view, the discussion of the research results is as follows. To confirm the multidimensional relationship between the fun factor and health related quality of life of elderly women participating in Health Qigong, this study conducted multiple regression analysis with five lower variables of the health related quality of life factor as the reference variable and fun factor as the predictor. As a result, all effects of fun on the health related quality of life were found at the statistical significance level, and in the standardization coefficients of the predictive variables, it was confirmed that they had influence in the order of pleasure, family support, physical strength and health, interpersonal relationship, and learning relation.

These results suggest that the first reason for the elderly women participating in Health Qigong was that pleasure functioned, subsequently, after participating in Health Qigong, they gained family support for health change, and that changes are coming in the health related quality of life as well as learning new things while hanging out with others and exercising. In the contents of studies[19][20] that investigated fun and leisure satisfaction, it was confirmed that fun had a positive effect on leisure satisfaction, which are shown to be similar to the content of this study results.

However, considering the specificity of the elderly, the results of this study are partially contradictory to the study of participants with different background variables. Looking at the previous studies on the health related quality of life, it was found that men perceived higher than women[21], and in a study on college students' qigong commitment and health related quality of life, it was found that it only had an effect on the vitality factor and mental health factor [22]. However, in this study, it was found that the fun of Health Qigong has an influence on the overall health related quality of life of elderly women. These findings can be said to indirectly suggest that Health Qigong is fun and suitable for elderly women.

Compared with previous studies[23][24] that investigated the physiological effects of Health Qigong, this study confirmed the differentiated result that fun, a psychological state, can lead to health-related quality of life. The health of the elderly needs interventions, not for enhancement. In other words, health intervention refers to preventing and maintaining worsening than the current state of health. The results of this study is significant in that they provided evidence that Health Qigong can be used as a positive health intervention program for the elderly women's exercise.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	YSC	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	JBL	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	DL	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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The Effects of University TAEKWONDO Demonstration Team's Self-Management on Exercise Commitment and Perceived Performance

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Abstract

Purpose: *The purpose of this study is to investigate the relationship between self-management of college taekwondo demonstration team members and their exercise commitment and perceived athletic performance. This study is highly anticipated to provide fundamental data to enable psychological understanding of the exercise commitment found among college Taekwondo demonstration team members in a competition and improving performance through the positive role of self-management.*

Method: *The population of college Taekwondo demonstration team members nationwide was selected as the subject of the study. 600 copies were collected using the convenience sampling method and 555 of the collected copies, excluding those with inconsistent or unfaithful responses, were used for the analysis. Frequency analysis was performed to examine the general characteristics of the research subject, and exploratory factor analysis and Cronbach' α coefficient, or an internal consistency test, were used to verify the validity and reliability of the research tool. In addition, correlation analysis and multiple regression analysis were performed to investigate the relationship among the variables of self-management, exercise commitment, and perceived performance with a significance level set to .05.*

Results: *As a result of verifying each of the factors of self-management, exercise commitment, and perceived performance of Taekwondo demonstration team members through the Pearson correlation coefficient showed that all variables have a statistically significant correlation. The lowest correlation was found in body management and perceived performance(r=.213), whereas the highest correlation was found in cognitive commitment and behavioral commitment(r=.730).*

Conclusion: *First, interpersonal management, training management, and mental management among the self-management factors of college Taekwondo demonstration team members were found to have a statistically significant effect on exercise commitment, though body management showed no statistically significant effect. Second, training management and mental management among the self-management factors of college Taekwondo demonstration team members were found to have a statistically significant effect on perceived performance, whereas no statistically significant effect was found from body management and interpersonal management. Third, among the factors of exercise commitment of college Taekwondo Demonstration team members across the nation, cognitive commitment was observed to have a statistically significant effect on perceived performance, whereas behavioral commitment showed no statistically significant effect.*

[Keywords] ***Taekwondo, Demonstration, Self-Management, Exercise Commitment, Perceived Performance***

1. Introduction

Taekwondo is largely divided into sparring, poomsae, and breaking[1]. With the founding of the Kukkiwon Demonstration Team in 1974, taekwondo demonstration played a significant role in promoting and disseminating taekwondo not only in Korea but also around the world[2].

Taekwondo plays a significant role in improving the strength of mental and physical health of often make inadequate rational judgment thorough etiquette, leadership[3].

The degree of self-management among elite athletes may seem stricter than that of the general public, but cases of poor self-management among those athletes, due to internal and external factors, adversely affecting their performance can also be found. In fact, argue that those with thorough self-management and strong willpower are more likely to become an excellent player[4]. Similarly, emphasize that self-management has a significant impact on players by reducing negative psychological factors of stress and anxiety while improving the ability to concentrate[5]. In other words, thorough self-management is a basic quality of a player that leads to best performance and prolongs athletic career. mentions that self-management has an important effect when becoming a member of a Taekwondo demonstration team[6]. Also, reveal that college Taekwondo athletes who tend to pursue perfection show an influential relationship with the self-management sub-factors of mental management, life management, intrinsic behavior management, training management, interpersonal management, and body management. In addition, identify the five factors of gender, affiliation, received awards, athlete career, and exercise time as the elements of athletic performance affecting the exercise commitment of high school and college Taekwondo athletes[7][8]. In particular, skills, physical strength, and psychological skills are important for Taekwondo demonstration, as well as gymnastics and figure skating, which is a sport requiring creative skills and delicate and accurate expression skills[9]. As the number of Taekwondo demonstration competition increases, the number of athletes also increases as the performance from such competition affects college admission, and high-level techniques are constantly emerging with the selection of Taekwondo demonstration team members, such as the Kukkiwon Demonstration Team, Korea Taekwondo Association Demonstration Team, and World Taekwondo Federation Demonstration Team. There are also taekwondo demonstration teams to promote schools and departments and the excellence of taekwondo[10]. Also, as most of the movement is done in the air and requires the use of the entire body, self-management, such as focusing and injury management, is of vital importance[11]. With such characteristics of the sport, systematic and continuous self-management of athletes is recognized as an important measure of success as an athlete and athletic career. In addition, in competitive sports, commitment and concentration are psychological factors that lead to the best athletic performance by playing the role of committing oneself to become a different self when performing sports and serving as a momentum for growth.

States that athletes with a higher commitment level are more likely to experience a perfectly controlled condition, feel as if the time flows slowly during their performance, and make the best performance with strong mental ability. In other words, exercise commitment is not only an important psychological factor that enables athletes to devote themselves to training, but also an essential factor for the athletes to give their best performance[12][13][14].

Makes an attempt to analyze and explain the structure and components of the mind in the state of 'flow' from a cognitive perspective[15]. He indicates that it is important to study the concept of commitment, in which emotion and cognition coexist, considering the circumstances in Korea, and it is meaningful to understand the sports scenes by showing the psychological characteristics of athletes, including commitment experiences, commitment interferences, and commitment mechanisms[15][16]. In other words, perceived performance is the concept that represents and expresses the psychological confidence in individual players' performance, signifying the confidence of achieving the best performance and winning in any situation[17].

Examining previous studies on self-management, exercise commitment, and perceived performance, stress that improving the performance of perfectionist athletes must be accompanied by self-management and argue that perfect self-management enables reaching one's

maximum potential[7][18]. Similarly, demonstrate that athletes' own self-management and habits more effectively affect exercise commitment than coercive training, and reveal that martial arts athletes' exercise commitment affects their perceived athletic performance, in terms of performance and willingness to win, and the higher their commitment, the more they can concentrate on the match, leading to an optimal awakening state and playing a positive role in fully showing their ability[19][20].

In fact, studies on the relationship among self-management, exercise commitment, and perceived performance were also conducted in other sports such as wrestling , fencing , and Judo[21][22][23]. Previous studies show that self-management is closely related to exercise commitment and perceived performance. However, though the Taekwondo demonstration presented above is becoming an event and performing arts, research on Taekwondo demonstration to improve the athletes' ability and performance is insufficient.

Psychological skills training has such limitations because it focuses on solving the apparent psychological problems without making a problem-solving approach that controls and regulates the psychological problems that athletes experience in specific situations[24].

Therefore, the purpose of this study is to investigate the relationship between self-management of college taekwondo demonstration team members and their exercise commitment and perceived athletic performance. This study is highly anticipated to provide fundamental data to enable psychological understanding of the exercise commitment found among college Taekwondo demonstration team members in a competition and improving performance through the positive role of self-management.

2. Research Method

2.1. Research subject

The population of college Taekwondo demonstration team members nationwide was selected as the subject of the study. 600 copies were collected using the convenience sampling method and 555 of the collected copies, excluding those with inconsistent or unfaithful responses, were used for the analysis. Below <Table 1> shows the general characteristics of the research subject.

Table 1. General characteristics of the research subject.

Item		# Of cases(person)	Percentage(%)
Gender	Male	441	79.5
	Female	114	20.5
Age	20 years old	244	44.0
	21 years old	140	25.2
	22 years old	90	16.2
	23 years old	51	9.2
	24 or older	30	5.4
Years of experience	1~3 years	344	62.0
	4~6 years	135	24.3
	7~9 years	49	8.8
	10 or above	27	4.9

2.2. Research tool

Questionnaires were used as the research tool of this study to investigate the effects of self-management of college Taekwondo demonstration team members on exercise commitment and perceived performance[25][26][27]. A self-management behavior questionnaire, of which validity has been verified based on Athletes` Self-Management Questionnaire(ASMQ) developed by , was modified and supplemented for the use of this study[28]. Specifically, it consists of 18 questions for the 4 factors of body management, interpersonal management, training management, and mental management with a 5-point Likert scale ranging from 1-point 'Not at all' to 5-points "Absolutely." Also, a questionnaire that has been validated by the measure developed by based on expansion of the sport commitment model(ESCM) was used for exercise commitment[29][30]. Specifically, it consists of 12 questions for the 2 factors of cognitive commitment and behavioral commitment with a 5-point Likert scale ranging from 1-point 'Not at all' to 5-points "Absolutely." The questionnaire developed by for tennis players was modified and supplemented for the use of this study[31]. Specifically, it consists of physical feeling, quality, timing and rhythm of technique, concentration, amount of effort, mental attitude and thinking, level of confidence during a match, and comparison of expected and actual performance. It has a total of 8 questions with a 5-point Likert scale ranging from 1-point 'Not at all' to 5-points "Absolutely."

2.3. Validity and reliability of the survey tool

In order to verify the validity of the survey tool used in this study, exploratory factor analysis of the principal component analysis method and Varimax method, among other factor extraction methods, was conducted. Factor extraction was carried out based on an eigenvalue of 1.0 or higher, and question items with a factor loading of .5 or higher were selected.

The results of analyzing the validity and reliability of self-management, exercise commitment, and perceived performance showed that the cumulative variance rate of each factor was 64.122%(self-management), 66.168%(exercise commitment) and 50.230%(perceived performance). In fact, self-management, exercise commitment, and perceived performance all were found to have a high level of reliability with a score of .655~.912, .678~.930, and 855, respectively.

2.4. Data processing

In this study, the data collected through the questionnaires were analyzed using SPSS 26.0. Frequency analysis was performed to examine the general characteristics of the research subject, and exploratory factor analysis and Cronbach' α coefficient, or an internal consistency test, were used to verify the validity and reliability of the research tool. In addition, correlation analysis and multiple regression analysis were performed to investigate the relationship among the variables of self-management, exercise commitment, and perceived performance with a significance level set to .05.

3. Results

3.1. Correlation analysis

As a result of verifying each of the factors of self-management, exercise commitment, and perceived performance of Taekwondo demonstration team members through the Pearson correlation coefficient showed that all variables have a statistically significant correlation. The lowest correlation was found in body management and perceived performance(r=.213), whereas the highest correlation was found in cognitive commitment and behavioral commitment(r=.730). The results of the correlation analysis are shown in <Table 2>.

Table 2. Results of correlation analysis between variables.

Item	1	2	3	4	5	6	7
1. Body management	1						
2. Interpersonal management	.393**	1					
3. Training management	.439**	.495**	1				
4. Mental management	.318**	.527**	.604**	1			
5. Cognitive commitment	.270**	.498**	.594**	.569**	1		
6. Behavioral commitment	.290**	.515**	.532**	.503**	.730**	1	
7. Perceived performance	.213**	.248**	.458**	.504**	.490**	.407**	1

Note: *p<.05, **p<.01.

3.2. The effect of taekwondo demonstration team members' self-management on exercise commitment

<Table 3> shows the results of a multiple regression analysis on the effects of self-management of college Taekwondo demonstration team members on exercise commitment.

First, as a result of conducting a regression analysis on the effects of self-management of taekwondo demonstration team members on cognitive commitment, it was found that the three factors of interpersonal management, training management, and mental management have a statistically significant positive effect on academic adaptation.

In addition, the regression model showed an F value of 111.775 at p<.001 with R^2=.444 or 44.4% explanatory power of the total variance. However, among the sub-factors of self-management, no statistically significant effect was found from body management.

Second, the regression analysis conducted on the effect of self-management of university Taekwondo demonstration team members on behavioral commitment revealed that the three factors of interpersonal management, training management, and mental management have a statistically significant positive effect on academic adaptation.

In addition, the regression model showed an F value of 86.622 at p<.001 with R^2=.386 or 38.6% explanatory power of the total variance. However, among the sub-factors of self-management, no statistically significant effect was found from body management.

Table 3. Effects of self-management on exercise commitment.

	Cognitive commitment				Behavioral commitment		
	B	Beta	t		B	Beta	t
(Constant)	.725		4.073	(Constant)	1.017		5.719
Body management	-.052	-.049	-1.367	Body management	-.003	-.003	-.072
Interpersonal management	.226	.202	5.124***	Interpersonal management	.294	.278	6.668***
Training management	.360	.357	8.341***	Training management	.270	.283	6.262***

Mental management	.256	.262	6.224***	Mental management	.172	.187	4.204***
R^2	.444			R^2	.386		
F	111.775***			F	86.622***		

Note: *p<.05, **p<.01, ***p<.001.

3.3. The effect of taekwondo demonstration team members' self-management on perceived performance

The results of multiple regression analysis on the effects of self-management of college Taekwondo demonstration team members on perceived performance are as shown in below <Table 4>.

The results of the regression analysis on the effects of self-management of taekwondo demonstration team members on perceived performance revealed that the three factors of interpersonal management, training management, and mental management have a statistically significant positive effect on academic adaptation.

In addition, the regression model showed an F value of 57.852 at p<.001 with R^2=.296 or 29.6% explanatory power of the total variance. However, among the sub-factors of self-management, no statistically significant effect was found from body management.

Table 4. Effects of self-management on perceived performance.

	Perceived performance		
	B	Beta	t
(Constant)	1.423		7.624
Body management	.009	.009	.224
Interpersonal management	-.095	-.092	-2.060*
Training management	.247	.263	5.448***
Mental management	.353	.390	8.202***
R^2	.296		
F	57.852***		

Note: *p<.05, **p<.01, ***p<.001.

3.4. The effect of exercise commitment on perceived performance

The results of multiple regression analysis on the effects of exercise commitment on perceived performance are as shown in below <Table 5>.

The results of the regression analysis on the effects of exercise commitment on perceived performance indicated that both of cognitive commitment and behavioral commitment factors have a statistically significant positive effect on academic adaptation.

In addition, the regression model showed an F value of 89.647 at p<.001 with R^2=.245 or 24.5% explanatory power of the total variance.

Table 5. Effects of exercise commitment on perceived performance.

	Perceived performance		
	B	Beta	t
(Constant)	1.513		9.669***
Cognitive Commitment	.383	.412	7.613***
Behavioral Commitment	.104	.106	1.961*
R^2	.245		
F	89.647***		

Note: *p<.05, **p<.01, ***p<.001.

4. Discussion

The purpose of this study is to investigate the relationship between self-management of college Taekwondo demonstration team members and their exercise commitment and perceived performance. In order to achieve the goal of the study, data was analyzed by conducting a questionnaire survey on 555 research subjects from college Taekwondo demonstration team nationwide. An attempt to have a discussion based on the results of the study has been made as follows:

4.1. The effect of taekwondo demonstration team members' self-management on exercise commitment

Points out that self-management of Taekwondo demonstration team members influences their exercise commitment, and training management, among other factors of self-management, has the most significant effect on exercise commitment[18][21][22][32][33][34][35]. Similarly, this study found that training management has the greatest statistically significant effect on exercise commitment, followed by interpersonal management and mental management, though body management has no significant impact on exercise commitment.

Show that training management and mental management have a significant effect on exercise commitment, while interpersonal management and physical management do not affect exercise commitment, showing an inconsistent result compared to the result of this study[35]. The difference may arise from the difference in number of study subjects which is more than twice larger than the number of the subjects in this study.

4.2. The effect of taekwondo demonstration team members' self-management on perceived performance

It was found that self-management of Taekwondo demonstration team members has a statistically significant effect on their performance. In fact, mental management, among other sub-factors of self-management, showed the greatest effect. Reports that self-management of athletes has an impact on their performance[36]. Also, self-management is a factor positively affecting the performance of Taekwondo athletes, and those athletes who efficiently control self-management are more likely to improve their performance[27]. By the same token, mental management has the greatest impact on Taekwondo demonstration team members who perform high-level techniques which have a high risk of injury, such as anterior cruciate ligament rupture. Also, mental management to cultivate positive mind and confidence improves the performance, and training environment and time need to be constantly managed[37]. A study by conducted on high school Taekwondo athletes indicates that physical

management, in addition to mental management and training management, affects the performance[38]. This can be due to the characteristics as a combat sport, and body management of the demonstration teams, who are not related to a combat sport, does not affect their performance. Also found that training management and mental management have a significant impact on athletes' performance, and thorough self-management leads to a better performance[39][40].

4.3. The effect of taekwondo demonstration team members' exercise commitment on perceived performance

Exercise commitment influences perceived performance of Taekwondo as well as that of other sports[41][42][43]. This study also found that exercise commitment affects perceived performance. More specifically, cognitive commitments showed a significant impact on perceived performance.

In sports, exercise commitment refers to individual athlete's psychological state, which affects the improvement of performance as one of the most important factors for athletes [44].

State that qualitative commitment, as a part of cognitive commitment, to learn knowledge or skills has a positive effect on performance by strengthening cognitive ability[43].

Taekwondo demonstration team members also showed the same results as previous studies that cognitive commitment of the exercise commitment has a positive effect on improving performance[35][45][46].

5. Conclusion

The purpose of this study is to investigate the relationship between self-management of college Taekwondo demonstration team members and their exercise commitment and perceived performance. In order to achieve the goal of this study, data from 501 college demonstration team members nationwide were analyzed using SPSS 26.0. The results deduced from the analysis are as follows:

First, interpersonal management, training management, and mental management among the self-management factors of college Taekwondo demonstration team members were found to have a statistically significant effect on exercise commitment, though body management showed no statistically significant effect.

Second, training management and mental management among the self-management factors of college Taekwondo demonstration team members were found to have a statistically significant effect on perceived performance, whereas no statistically significant effect was found from body management and interpersonal management.

Third, among the factors of exercise commitment of college Taekwondo Demonstration team members across the nation, cognitive commitment was observed to have a statistically significant effect on perceived performance, whereas behavioral commitment showed no statistically significant effect.

This study found that self-management has a great influence on exercise commitment and performance improvement of Taekwondo demonstration team members, showing the biggest impact on the psychological stability of mental management and training management. Therefore, it seems necessary to understand the importance of self-management and develop effective training programs for self-management to improve exercise commitment and athletic performance.

Most of the current Taekwondo demonstration techniques are of high-level, often leading to injury. Thus, in order to avoid such injury, psychological training and effective physical training programs, in terms of self-management, must be continuously studied.

Additional research to help numerous Taekwondo demonstration team members to improve their performance through efficient self-management and exercise commitment needs to be conducted.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Lead Author	HCS	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑
Corresponding Author*	JSK	-Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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CHINESE HEALTH QIGONG's Healing Principle and Kinematic Discourse

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Abstract

Purpose: *The purpose of this study was to investigate the composition principle of China Health Qigong and the kinematic effect of China Health Qigong. For this purpose, this study conducted a literature survey on Health Qigong published by Health Qigong Management Center of General Administration of Sport of China and examined the kinematic effect by confirming domestic research trends related to Health Qigong*

Method: *The principles of Health Qigong were confirmed through an interpretation of the publication of the Chinese Health Qigong published by the China Olympic Committee, and a literature survey on the Health Qigong published by the Korea Physical Education Bureau. In addition, in order to investigate the clinical application of the health Qigong exercise, the procedure of confirming the research studied in Korea through the triangulation of three specialists in the field of kinetic studies was carried out.*

Results: *Chinese Health Qigong is the part of Chinese medicine and takes the form of an exercise system that harmonizes body and mind through the control of Qi. Therefore, the principle of the Health Qigong is on a basis of Yin-yang and the five elements theory of chines medicine, and the meridian so called oriental physiology, and is based on the control and preservation of three elements of body, mind and breath, which is the most important principle and emphasizes the three control methods of body control, mind control and breath control as the ultimate practice method. From the perspective of kinematics, in terms of the clinical application part of Health Qigong's exercise effect, physiological effect, psychotherapeutic effect and rehabilitative medical effect were found to be effective through previous studies. Especially, Health Qigong was found to be suitable for elderly exercise as a slow exercise and it could be a new health exercise alternative in the super aging society.*

Conclusion: *This study, Results of precisely examining the previous studies on Health Qigong showed that the healing principle of Health Qigong could be examined, and that there is a positive kinematic effect.*

[Keywords] ***Health Qigong, Healing, Yin-Yang, Meridian, Kinematic, Slow Exercise***

1. Introduction

The modern era is actively exchanging through the value of various cultures as an era of culture, and is making an effort to inform about the culture in which its traditions are spread. The value of these cultures can enhance the quality of life of individual people through pleasure, communication, sharing and exchanges, creating healthy communities, and inspiring national pride. Therefore, the adoption of traditional culture as a sport for Olympic or international events has become an important channel to disseminate its culture[1][2]. In other words, culture is linked to the content industry and leads to the culture industry, which is an important industry in which the success or failure of each country is determined in the 21st century[3].

Health Qigong, a traditional physical education in China, is a cultural product combined with Qigong, which has all the spiritual, historical and intellectual characteristics of Chinese people. It is a modernized health exercise method based on cultural elements based on oriental thought. On September 11, 2001, the Chinese government announced the 4th national physical education of General Administration for Health Qigong, by newly organizing Ancient Qigong, a part of traditional culture[4]. Currently, Health Qigong is registered as the 62nd official physical education event in China and has a lot of people interested in the same subject in China. And in August 2012, the World Health Qigong League was established and is an international term, Health Qigong, a traditional sports event currently being held in 45 countries.

In the Chines government, Health Qigong's behavior is composed of soft, slow and comfortable movement, and at the same time, it is a combination exercise with breathing and mentality. It promotes physical and mental health and it is introduced as an optimal exercise method that anyone can easily learn. This is because the characteristic of the Qi circulation movement can be performed in a gymnastic form without distinction of time and place[5][6].

Recently, Qigong movement has been actively studied in the field of exercise science. In particular, the results of studies showing that health behaviors are positively affecting the elderly are also being reported. The results of these studies show that health Qigong participants have positive effects on psychological, physical, emotional and social health, and it can be deduced that clinical applications are possible[7][8]. The beginning of the scientific paper on Qigong in Korea has been around for about 30 years. However, the history and effect of Qigong movement and its role in modern society have been steadily progressing[9][10].

Health Qigong has all the social, cultural and physical education values of China, and it is understood that it has a unique method of mind and body training and composition[11]. Therefore, this study confirms the form of the constitution of Health Qigong and confirms the part of the kinetic effect of Health Qigong through literature review and thesis search. These efforts will logically confirm the healing principle of Health Qigong and analyze the scientific effects of Health Qigong, which will provide a positive direction for the spread of Health Qigong.

2. Research Methods

This study was conducted to review the literature and to conduct a preliminary study to ascertain the Healing principles of Chinese Health Qigong and its clinical application. For this, the principles of Health Qigong were confirmed through an interpretation of the publication of the Chinese Health Qigong published by the China Olympic Committee and a literature survey on the Health Qigong published by the Chinese Physical Education Bureau. In addition, in order to investigate the clinical application of the health Qigong exercise, the procedure of confirming the research studied in Korea through the triangulation of three specialists in the field of kinetic studies was carried out.

3. Characteristics of Chinese Qigong

Originally Qigong(气功), literally means to put gong(efforts) into Qi, the word Qi means 'breath' and refers to the driving force of life activity, and 'gong' means to pay attention to one thing. In other words, it can be said that it is a mind and body training method that learns how to fully supplement Qi and circulate Qi smoothly, to drive out bad Qi, to strengthen good Qi, and to operate the enhanced Qi effectively[12]. The name, Qigong, commonly used today, is from Dangsan Qigong Nursing Home, the first medical institution in Qigong, China, founded in 1954 by Liu Guizhen, establishing the theoretical foundation of Qigong, and it is now accepted as a classic of Qigong[13]. As for the Qigong sects of China, there are Confucianism Qigong(儒

家气功), Taoism Qigong(道家气功), Buddhism Qigong(佛家气功), martial arts Qigong(武术气功), Medic Qigong(医家气功) which are distinguished from China Health Qigong Association and China Olympic Association[14].

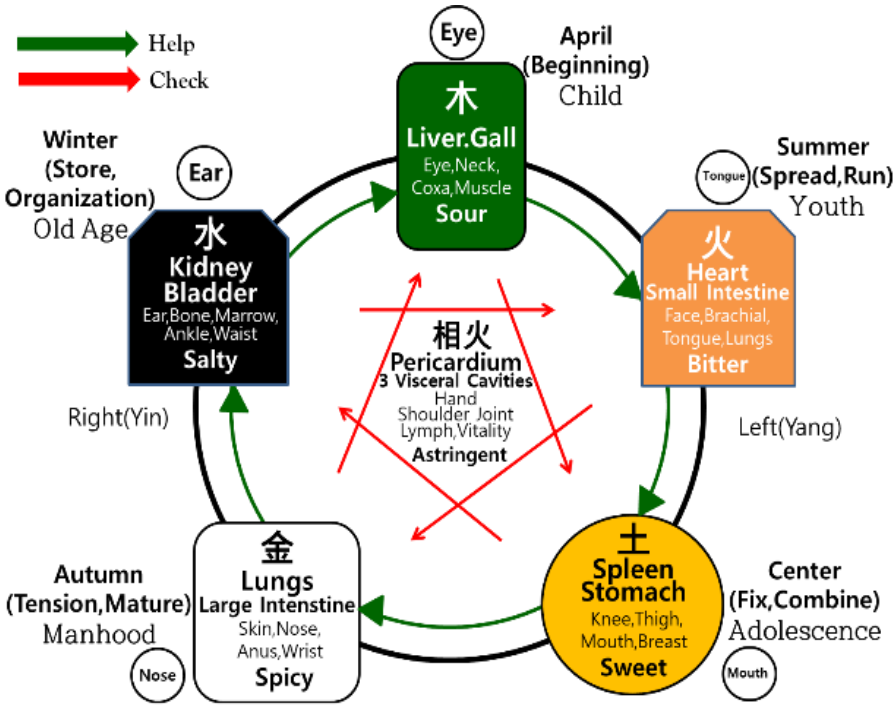
4. Health Qigong's Healing Principle

4.1. Principle of yin-yang and five-elements theory

In this study, Health Qigong's is based on the principles of TCM(Traditional Chinese Medicine). Chinese medicine is a traditional medicine of China as a representative characteristic, and it is a characteristic of human beings rather than disease, watching the whole rather than the part, and interested in harmony and balance. The reason why traditional medicine such as Chinese medicine is reconsidered in modern medicine is that efficiency, accessibility, cost effectiveness, relatively safe, less side effect, and excellent effect of prevention and health promotion[15].

Health Qigong's healing principle is a theory of Yin-yang and five elements as the methodology of observing the human body in Chinese medicine. Yin-yang and five elements theory is a worldview that emphasizes harmony and unification. It has influenced the entire Asian culture from astronomy, geography, law, weather, medicine, tone[16]. Figure1 below compares the human body to the Yin-yang and five element theory[17].

Figure 1. The yin-yang and five elements theory.



4.2. Principle of meridian system

In Health Qigong, it is based on the studies of meridian system including Yin-yang and five elements theory. The meridian system has been described in detail in Huangdi Neijing(黄帝内经: Yellow Emperor's Inner Cannon), China's leading medicine book in the Pre-Chinese era, and has been the foundation of man-made science for thousands of years, medicine, martial arts

and curing liquor. According to Huangdi Neijing's rumor meridian system, Suwen chapter 7, Gyeong(经) is the empty line and Lak(絡) is the human context. In other words, Gyeong refers to a large basic stem that runs straight through the meridian system, and Lak refers to a small branch that runs from Gyeong to the side, meaning a network. It is connected to the inside of the book, and the outside covers the entire body of the human body as well as the epidermis, hair, and muscles. Therefore, when a lesion occurs in a human body, symptoms appear in the system[18][19].

4.3. Principle the triple unity of qigong practice

Curing of Qigong is set as a compositional principle which is important enough to regard Jeong(精), Qi(气), and Shin(神) as three elements of life activities. Huangdi Neijing, the origin of oriental medicine, said Jeong, Qi, and Shin were the three-treasures of the human body. Qi is the power to move the body alive, Shin is the spiritual and private activity, Jeong, Qi, Shin is the source of life, and the balance of these three is the secret of Curing[20].

It is the principle of the triple unify of Qigong practicing Joshin(調身: relax body), Joshik(調息: breathe easy) and Joshim(調心: mind easy). Health Qigong improves his health through the training of Joshin, Joshik, and Joshim, and makes his body and mind harmoniously. Health Qigong distinguishes itself from other physical education activities not only by Joshim and Joshik's activities but also by Joshin, Joshik, and Joshim's to emphasize the harmonious state of mind and body. Joshin refers to reaching the goal of training his mind and body by maintaining his body in a certain posture or by performing certain actions. The difference between general physical education therapy and physical education movement is that Joshik and Joshim combine[12][21].

5. Kinematic Discourse of Health Qigong

The purpose of training Qigong is to train excellent Qi, to nurture a new genius, and to make good circulation through the meridian system. Yin-yang balance is maintained, organism homogeneity is maintained, vitality becomes vigorous, and health is maintained by blocking vicious Qi when the glioma is not stagnant and circulates smoothly through the meridian system[3][22]. Qigong is a mind and body training method that improves body and mind by stabilizing body, improving Qi, communicating smoothly through movement, breathing, and mental training, and maximizing the natural healing ability of the human body. Qi practice in Health Qigong training is inherent in our traditional practice and is an oriental feature not found in other western sports[23].

Studies of Health Qigong can be largely divided into physiological and psychological aspects. physiological aspects of health Qigong showed that strength, flexibility, equilibrium, basic physical fitness and vital capacity of elderly women were improved through the exercise. In addition, it has been shown that the symptoms of chronic low back pain can be reduced. Also Health Qigong program is an elderly exercise program that improves the body composition and physical fitness of elderly people and improves physiological functioning and geriatric chronic diseases by giving ideal changes to blood factors[8][12][24]. In other studies, Health Qigong training in elderly women affects the physiological changes such as blood pressure and flexibility, which was confirmed that Qigong training had a significant effect on body composition and physical fitness[25].

Although the effect of physical fitness such as muscle strength and flexibility is proved through the health Qigong exercise effect, research results are being continuously sought to find the answer to the effect on the mental side. Psychological aspects reported that Health

Qigong practiced as an intervention regulator of stress tolerance and had an influence on exercise and posture of life by gender and training period[26]. Reported that Health Qigong Yijinjing and Liuzijue programs contributed to psychological stability by positively affecting the aged women in pain self-awareness and depression reduction[27]. The relationship between the level of commitment of web-based Qigong practitioners and the quality of health-related quality of life. Recent research on social research has shown that the more successful the elderly are in the health Qigong exercise, the more they are affected by the background variables[9][28].

The life expectancy of Koreans has increased faster than that of other countries due to the rapid development of the economy. Korea's Statistics data show that the average life expectancy in 2019 is 82.7 years, and the expected life expectancy is increasing every year. In modern society, where the life span of health is increasing, maintaining a healthy state of physical, mental, social, intellectual, and emotional through successful aging, rather than simple life extension, is a cornerstone for creating a welfare society by raising the quality of life[8][29].

In the meantime, there are many studies on the elderly health movement that it is very difficult to present a program for exercising. In view of this, Health Qigong exercise can be carried out in a small space without being bound by time and place. And that they had a better understanding of intimacy and health than sports. The Health Qigong movement, which has been operating for a long time, is characterized by the fact that it is easy to learn, easy to learn, and excellent in the effect of health promotion. In particular, it overcomes the negative factors for the elderly movement, pursues stability, And that it can be used as a new slow exercise that is being tested[30][31].

Chinese Health Qigong is composed of 9 methods, each of which consists of a movement system that has rhythmic and smooth movements in accordance with the unique music according to each construction method, repeating right and left or up and down. It also has the advantage of being able to exercise according to his or her health condition without being limited by time, place and season. Therefore, the use of clinical applications of physiological and psychological effects and rehabilitation exercises in terms of kinematics can be a subject of continuous research. In this study, a close examination of previous studies on Health Qigong showed positive results about the exercise effect and it was confirmed that Health Qigong could be applied as a clinical program of health promotion and health intervention.

6. Conclusion and Suggestion

In this study, the results of precisely examining the previous studies on Health Qigong showed that the healing principle of Health Qigong could be examined, and that there is a positive kinematic effect. This was the moment to confirm that Health Qigong could be applied as a clinical program for health intervention. China Health Qigong is part of Chinese medicine and takes the form of an exercise system that harmonizes body and mind through the control of Qi. From the perspective of kinematics, in terms of the clinical application part of Health Qigong's exercise effect, physiological effect, psychotherapeutic effect and rehabilitative medical effect were found to be effective through previous studies. Especially, Health Qigong was found to be suitable for elderly exercise as a slow exercise and it could be a new health exercise alternative in the super aging society. As for other research questions that have been made during this study and suggestions for subsequent research, a follow-up study that can be used as a manual to understand the Health Qigong of the field leaders is needed and the clinical efficacy of Health Qigong should be studied at the same time in terms of kinetic and studies of meridian system.

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8. Appendix

8.1. Authors contribution

	Initial name	Contribution
Lead Author	YSB	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Corresponding Author*	JBL	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Comparison of Physical Fitness Factors of High School and College TAEKWONDO Athletes with Anaerobic Exercise and Isokinetic Muscle Function

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Abstract

Purpose: *Considering the development curve, there may be individual differences, but in the 2nd and 3rd grades of high school, it can be seen that there is no significant difference from that of adults in form. Therefore, this study aims to investigate the differences in body composition and physical strength factors of Taekwondo Gyeorugi players who are attending morphological similar high school and university in form, and provide basic data for physical fitness training of athletes based on the results of this study.*

Method: *The subjects of this study were 13 competition players attending G high school in D city and 13 competition players attending K University, and body composition, physical factors, anaerobic exercise ability, and knee joint isokinetic muscle function were tested. For data processing, the mean and standard deviation of the measured items were calculated using the SPSS 25.0 statistical program. An independent t-test was conducted to find out the difference between high school taekwondo players and college students taekwondo players.*

Results: *University Taekwondo competition players were statistically significantly higher in height, lean body weight, and lower extremity than high school competition players, and their body fat percentage was lower. In terms of physical strength, college competition players were superior to high school athletes in terms of strength, endurance, quickness, agility, coordination, and flexibility. The anaerobic exercise ability was significantly higher in college athletes than high school athletes in Peak Power(W), Average Power(W), and Total Energy(J). It was also found that college athletes were superior to high school athletes in knee joint isokinetic muscle function measured at an angular velocity of 60 degrees.*

Conclusion: *The statistically significant difference in the height and lower extremities, which are the physique factors, is judged as the result of not considering weight class in the selection of subjects for this study. The difference in physical strength factors is thought to be a result of the higher athlete experience and training amount of college players than the difference in shape development.*

[Keywords] ***Competition Players, Physical Fitness, Lsokinetic Muscle Function, Anaerobic Capacity, Wingate Test***

1. Introduction

Taekwondo sparring has evolved into a global sport in name and substance since it was adopted as an official sport at the 2000 Sydney Olympics[1]. The World Taekwondo Federation currently has 210 member countries[2] and is constantly striving to have Taekwondo poomsae(form) adopted as an official Olympic sport as well. Various factors may affect the performance of sports, but the impact of physical fitness is very important[3]. Taekwondo sparring competitions began in the early 1960s and established the foundation for globalization by holding the first World Taekwondo Championships in May 1973 with 200 male athletes

and officials from 19 countries at Kukkiwon. However, there was a big difference in the rules of the game as well as the equipment worn by the athletes compared to the sparring events these days. Unlike Japan's karate, Taekwondo succeeded in globalization through a process of constant change in the rules of the game, which can evaluate the superiority of the sparring techniques and the development of various equipment to protect athletes in order to revitalize the sparring competition. Recently, the electronic protective gear and video review system were introduced to secure the fairness of scoring, and the revision of the multi-score inducing game rules has promoted the interest of spectators through more dynamic games. Unlike games in the past in which grabbing the opponent was a foul and both body and face attacks were unified into one point, the game has been changed to allow kick and fist attacks while pushing the opponent and give more points for skills involving rotation and attacks on higher parts of the body. As a result, the physique and physical fitness factors of the athletes greatly affect the winning and losing of the game, which further emphasizes the importance of physique in finding athletes and physical fitness factors in the training process. Physical fitness is emphasized as a very important factor for improving the performance of Taekwondo sparring athletes, and from another point of view, Taekwondo training is known to help improve their physical fitness factors. Kim Yeong-wuk, Choi Ji-ah, and Oh Su-hak(2018)[4] report in a meta-analysis of the effects of Taekwondo training on physical development and fitness that Taekwondo training helps improve agility, muscle endurance, and balance and that repetitive training in sparring, which must respond quickly to the opponent's movements, is effective in improving agility[5]. Also, the kick training of Taekwondo can increase the muscle strength and muscular endurance of the lower limbs[6].

As the physique and physical fitness factors of Taekwondo sparring athletes are considered important factors for improving their performance, various prior studies provide basic data on systematic physical training optimized for Taekwondo athletes through a comparative analysis of physique[7][8][9] and physical fitness[10][11][12][13][14][15][16][17][18][19]. Considering the development curve of Scammoo (1930)[20], which is most commonly cited in the development of the body, there may be individual differences, but by the time of the second and third years of high school, it can be seen that there is not much difference in form from adults. Therefore, this study aims to find out the differences in physical composition and physical fitness of Taekwondo athletes attending high schools and colleges that are similar in form and to provide basic data for the athletes' physical training based on the results of this study.

2. Research Method

2.1. Research subject

The subjects of this study were 13 competition players attending G High School in D Metropolitan City and 13 competition players attending K University. The purpose and contents of the experiment were clearly explained in advance, and all studies were conducted after writing consent I did. The general characteristics of the study subjects are shown in <Table 1>.

Table 1. General characteristics of study participants(n=26).

Division	Age (years)	Career (years)	Heigh (cm)	Weight (kg)	BMI (kg/m2)
High school (n=13)	16.46 ±0.78	4.77 ±1.36	176.02 ±6.05	69.03 ±10.34	21.99 ±2.04
University (n=13)	20.46 ±1.27	10.08 ±2.25	181.63 ±3.23	75.13 ±8.00	22.67 ±1.94

Note: Values are mean±SD, ** p<.01, **p<.01, ***p<.001.

2.2. Measurement items and methods

2.2.1. Body composition

Height was measured in cm using BSM 370(Biospace. Korea), and body weight, lean body weight, body fat mass, body fat percentage, and BMI were measured using InBody 770(Biospace, Korea)[18][21]. The lower extremities and thigh circumference were additionally measured in consideration of the characteristics of the Taekwondo Gyeorugi competition, which mainly uses the lower extremities.

2.2.2. Physical fitness factors

To check the difference in fitness factors between groups, muscle strength(back muscle strength), muscle endurance(sit-up, repeated jump), muscle power(long jump, sargent jump), systemic reaction(light, sound), agility(side step), balance(eyes closed and one leg standing), coordination(visual perception) flexibility(bend in front of the body, and bent back of the body) were measured. All measurements were performed twice and better values were used as actual values[22].

2.2.3. Anaerobic exercise test(wingate test)

Anaerobic exercise ability was measured with a Wingate test. It was measured for 30 seconds using a bicycle ergometer(Monark 818E, Sweden). Taking into account the characteristics of this measurement, prior training was conducted on the measurement procedures to reduce the decrease of will and power output in the second half of the test. As a result of the Wingate test, the values for peak power, average power, total energy, and peak drop were calculated[13][14].

2.2.4. Isokinetic muscle function test of the knee joint

For the isokinetic muscle function test, the isokinetic muscle function measurement system(CSMI, USA) was used to measure the muscle function of the knee joint according to the manual. The muscle strength of the knee joint was measured by performing flexion and extension movements of the knee joint three times at an angular velocity of 60°/sec and five times of the muscle power at 180°/sec. After performing three preliminary exercises, measurements were made, and peak torque, average power, total work, ratio of left and right(%), flexion and extensor ratio were calculated through the measurement results.

2.3. Statistics processing

For statistical processing, the average and standard deviation of each measurement item were calculated using the SPSS 25.0 statistical program. An independent t-test was conducted to verify the difference between physical strength factors, anaerobic exercise capacity and isokinetic muscle function of Taekwondo athletes in high school and university. The significance level was set based on $p<.05$.

3. Results

3.1. Change in body composition

The changes in body composition of high school and university Taekwondo competition players are as shown in <Table 2>.

Table 2. Change in body composition.

Items	High school	University	t	p
Height(cm)	176.02±6.05	181.63±3.23	-2.952	.007**
Weight(kg)	69.03±10.34	75.13±8.00	-1.682	.106
Lean mass(kg)	55.10±6.34	62.48±5.97	-3.058	.005**
Fat mass(kg)	9.85±4.14	8.62±1.99	.967	.347
%fat(%)	13.93±3.88	11.37±1.67	2.186	.044*
BMI(kg/m2)	21.99±2.04	22.67±1.94	-.866	.395
Leg length(cm)	96.77±3.69	99.81±2.90	-2.335	.028*
Thigh circumference(cm)	55.78±4.02	57.32±3.42	-1.051	.304

Note: Values are mean±SD, *p<.05, **p<.01.

3.2. Changes in physical strength factors

The changes in physical strength factors of high school and university Taekwondo competition players are as shown in <Table 3>.

Table 3. Changes in physical strength factors.

Items		High school	University	t	p
Strength(kg)	Back strength	101.96±18.16	151.96±13.63	-7.940	.000***
Muscle endurance(reps)	Sit-ups	50.00±4.55	55.23±3.65	-3.233	.004**
	Repeated jump	48.15±7.49	56.08±3.55	-3.446	.002**
Power(㎝)	Long jumpi	224.06±17.69	248.65±6.28	-4.725	.000***
	Sargent jump	49.54±7.68	57.77±1.83	-3.760	.001**
Full body response(sec)	Sound	0.26±0.03	0.27±0.03	-1.009	.323
	Light	0.28±0.03	0.26±0.03	1.785	.087
Agility(reps)	Side step	49.62±3.45	52.85±4.26	-2.124	.044*
Balance(sec)	Eyes closed and one leg standing	36.67±23.44	32.47±23.10	.460	.650
Coordination(point)	Visual perception	48.62±2.61	44.44±2.17	4.434	.000***
Flexibility(cm)	Trunk flexion	16.08±7.87	18.19±3.36	-.888	.387
	Trunk extension	56.48±3.60	61.61±7.57	-2.207	.037*

Note: Values are mean±SD, *p<.05, **p<.01, ***p<.001.

3.3. Changes in anaerobic exercise capacity

The changes in anaerobic exercise capacity of high school and university Taekwondo competition players are as shown in <Table 4>.

Table 4. Changes in anaerobic exercise capacity.

Items	High school	University	t	p
Peak Power(W)	609.49±87.73	709.31±118.42	-2.442	.022*
Peak Power(W/kg)	8.86±0.77	9.17±0.76	-1.029	.314
Average Power(W)	446.44±67.58	521.37±73.06	-2.714	.012*
Total Energy(J)	12652.69±2063.21	14654.00±2001.29	-2.510	.019*
Peak Drop(%)	57.02±6.32	57.12±4.62	-.047	.963

Note: Values are mean±SD, *p<.05.

3.4. Change in isokinetic muscle function

The changes in isokinetic muscle function of high school and university Taekwondo competition players are as shown in <Table 5>.

Table 5. Change in isokinetic muscle function.

Items	High school	University	t	p
Right extensor(%BW)	260.31±53.30	306.77±40.33	-2.506	.019*
Left extensor(%BW)	263.38±40.75	297.15±38.84	-2.163	.041*
Right extensor(Nm)	180.62±47.43	227.69±32.58	-2.950	.007**
Left extensor(Nm)	165.92±56.31	220.69±34.38	-2.993	.006**
Left/right extensor(deficit)	7.54±8.49	5.31±5.27	.805	.429
Right flexor(%BW)	129.62±25.00	161.00±27.41	-3.050	.006**
Left flexor(%BW)	128.69±25.75	162.85±25.68	-3.386	.002**
Right flexor(Nm)	89.00±18.83	119.38±21.97	-3.787	.001*
Left flexor(Nm)	89.00±22.68	120.54±19.05	-3.840	.001*
Left/right flexor(deficit)	10.38±7.87	7.31±8.84	.938	.358
Flexor/extensor left ratio(%)	49.15±8.60	54.92±6.79	-1.898	.070
Flexor/extensor right ratio(%)	50.77±7.00	52.69±6.17	-.743	.465

Note: Values are mean±SD, *p<.05, **p<.01, ***p<.001.

4. Discussion

This study measured and analyzed the physical composition and physical fitness factors of Taekwondo sparring athletes attending high schools and colleges. Studies have shown statistically significant differences in all measurement items except weight, body fat, BMI, and femoral circumference. College athletes showed higher numbers in height, lean body mass, BMI, and the length of lower limbs and lower number in body fat percentage. Park Gwang-dong(2010)[23] reported that there was no difference in the physical characteristics of high school and college Taekwondo athletes in the prior study, which analyzed weight classes separately for high school and college Taekwondo athletes, so the statistical significance of this

study is judged to be the difference due to simple comparison without considering weight classes. Considering the age of high school and college athletes, as shown in the development curve of Scammoo(1930)[20], it is judged that there is no real form difference.

The results of the measurement of the physical fitness factors showed statistically significant differences in all measurement items except for the response time to sound and light, standing on one foot with the eyes closed, which a balance measurement, and trunk forward flexion, which is a flexibility measurement. While all physical fitness factors were statistically higher for college athletes, but high school athletes were statistically significantly higher in the visual perception response alone. In addition, high school athletes showed a high tendency in the sound reaction time and standing on one foot with the eyes closed. These results were somewhat different from Park Gwang-dong(2010)[24]'s prior study that high school Taekwondo athletes showed high results in sit-ups, which is a measure of muscular endurance, but this prior study also showed that the physical fitness factors of college athletes were excellent in most of the measurement items, which was consistent with this study. Jeong Jinseong(2015)[24] reported that the national athletes were excellent in most measurement categories as a result of a prior study comparing the basic physical fitness and isokinetic exercise ability of male Taekwondo college athletes and the national athletes. The results of these prior studies and this study show that the physical fitness factor is closely related to the performance of Taekwondo athletes[3].

Measurements of anaerobic exercise ability showed that college athletes were statistically significantly higher than high school athletes in peak power(W), average power(W), and total energy(J). Looking at the results of a prior study on anaerobic athletic ability, Jang Jeong-eun and Park Eun-hee(2020)[25] reported that peak power(W) of poomsae(form) athletes were higher than that of sparring athletes while Hong Chang-bae(2020)[19] reported that good athletes showed statistically significant higher numbers in peak power, peak power(W/kg), average power, and total energy than not-so-good athletes. Although it would be difficult to directly compare the results of the prior study with the results of this study, it is believed that the anaerobic ability of Taekwondo sparring and poomsae athletes will affect their performance[8][17][26].

As a result of measuring the isokinetic muscle strength of the knee joint at 60 degrees of angular velocity, college athletes showed statistically higher than high school players in the strength of left and right extensor and flexor vs. weight ratio and the strength of left and right extensor and flexor. The results of measurement of isokinetic muscular function provide reliable information in evaluating muscle function[27][28][29], and the results of measurement of maximum muscle strength are used to assess the maximum exercise capacity of the muscles used[30]. According to the results of a prior study analyzing the isokinetic muscular function, Song Jong-guk, Jeong Hyeon-cheol, Gang Hyo-jeong, and Kim Hyeon-bae(2010)[31] reported that male athletes were 30% superior in terms of isokinetic muscular strength measured at 60 degrees of angular velocity and 40% at 180 degrees of angular velocity than female athletes. In addition, it has been reported that high school[32] and college[33] Taekwondo sparring athletes mainly used right extensor force and that long-term repetitive kick motions have developed muscles that are mobilized for extensor force. The results of this study also showed higher extensor strength than flexor strength in both high school and college athletes, partly in line with the results of the preceding study. According to the results of this study, the comparison of physique and physical fitness factors of high school and college Taekwondo sparring athletes showed that college athletes showed higher numbers in most of the measured items. However, considering the results of a prior study[22] considering the weight classes of high school and college athletes, it is believed that the condition of form development is similar, and the difference in physical fitness factor is thought that the difference between athletic experience and training is greater than that of form development due to age increase.

5. Conclusion

This study compared and analyzed the differences between physical composition and physical fitness factors of 26 Taekwondo sparring athletes attending high schools and colleges. The study has shown that both physical composition and physical fitness factors of college athletes are better than those of high school athletes. The statistically significant difference between the height and the length of lower limbs corresponding to the physique factor is estimated to be the result of the failure to consider the weight classes in the selection of the subjects for this study, and the difference in the physical fitness factor is the result of more experience and training than the difference in form development. Additional research will require for more general information, but judging from this study, as the physical fitness factor is important in improving the performance of the sparring athletes, plans for more scientific and systematic physical training programs are required based on the evaluation of the frequency and amount of training for the high school athletes.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Lead Author	WKC	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	JSP	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	CBH	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Verification of Difference in the Level of Career Decisiveness Depending on the Activities of University TAEKWONDO Demonstration Teams

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Abstract

Purpose: *The purpose of this study is to verify the difference in the level of career decisiveness depending on the activities of university Taekwondo demonstration teams. The research hypothesis to achieve the purpose of this study is as follows. The level of career decisiveness will differ depending on the demographic characteristics such as gender, grade, experience in Taekwondo demonstration, and level/degree in Taekwondo.*

Method: *In this study, students who belong to a Taekwondo demonstration team at universities nationwide were selected as the purposive quota sampling group, and a survey was conducted on 232 students from the group. Data collected through the questionnaire in this study were analyzed for frequencies, t-test, and one-way ANOVA using SPSS 26.0 to investigate the general characteristics of the study participants. The significance level of all statistics was set to .05.*

Results & Conclusion: *First, as a result of verifying the difference in the level of career decisiveness by the gender of college students who are a member of a university Taekwondo demonstration team, no significant difference was found in any of the variables. Second, verifying the difference in the level of career decisiveness depending on the grade of the students who are a member of a university Taekwondo demonstration team revealed no significant difference in any of the variables. Third, as a result of verifying the difference in the level of career decisiveness in accordance with the experience in Taekwondo demonstration of the students who are a member of a university Taekwondo demonstration team, no significant difference was found in any of the variables. Fourth, as a result of verifying the difference in the level of career decisiveness per the level/degree in Taekwondo of the students who are a member of a university Taekwondo demonstration team, no significant difference was found in any of the variables.*

[Keywords] ***Taekwondo, Demonstration, Level of Career, Decisiveness, University***

1. Introduction

Taekwondo demonstration includes all elements of Taekwondo, such as sparring, Poomsae, and breaking[1]. Taekwondo demonstrations started in 1959[2] with relatively simple techniques[3]. However, as various Taekwondo demonstration competitions are in place nowadays, it has become necessary to express highly difficult techniques[4].

Taekwondo demonstration, in its early phase, was consisted of simple basic techniques[3]. However, with the change of time, efforts have been made to further highlight Taekwondo by showing the splendor and fun of Taekwondo to the audience through high-level kicks, various techniques and acting, and dances[4]. In addition, the Taekwondo demonstration team members must maintain the best skills and teamwork required by the times.

Taekwondo has built a global infrastructure in which more than 10,000 people, including the members of the international sports development cooperation, from 210 countries are training. University demonstration teams, the demonstration teams of the three major institutions(Kukkiwon, Korea Taekwondo Association, and WT), and other demonstration teams have been making a great contribution to such globalization thorough numerous diplomatic activities, including national promotion and national prestige enhancement via Taekwondo demonstrations. As the capacity and role of Taekwondo demonstrations has attracted the public attention in Korea, Taekwondo demonstrations teams have also become the focus of the public attention[5][6][7][8].

In the early 1980s, the Taekwondo department was established in a university in Korea for the first time in the world, and about 50 universities are currently running departments related to Taekwondo. This greatly contributed to the qualitative and quantitative development of Taekwondo[9][10]. For this reason, many trainees in adolescence continue to practice Taekwondo for the purpose of college entrance. Universities select excellent athletes as their students and provide opportunities for the students to improve the practical skills by organizing major clubs for Sparring, Poomsae and Taekwondo Demonstration and applying systematic extracurricular training programs of such clubs as an effort to cultivate competent social talents. In particular, college students get opportunities to fully unleash their physical skills through scientific theories and trainings specific to their major sport. However, it has the ambiguity of causing problems, such as lots of stress and maladjustment, for those who choose to live both as a student and an athlete[11].

Those who perform Taekwondo demonstration as a university student are in a transition phase in which they move from the university sites to the professional world; they are at a critical phase of life in which they prepare for a career and choose a career for social advancement[12][13]. From their perspective, contemplating and deciding a career is undoubtedly important. Most of Taekwondo athletes major in Taekwondo-related discipline, and they are most likely to have decided their career path as a Taekwondo instructor, Taekwondo-related business owner, or professional Taekwondo athlete at the time of entering the university. Furthermore, choosing career as a member of permanent demonstration teams or performer are affecting the level of career decisiveness[14]. In modern society, understanding athletes' own value through participation in sports is playing a major role in finding a successful life direction[15]. In order to ensure accurate approach and guidance on such limited career paths, it is important to first deduce the level of decision-making related to career and the level of each individual for required actions before improving career exploration behaviors and inducing decisions based on the deduction[16][17].

Taekwondo is the national sport of Korea and is transforming from the form of martial arts sports to the form of performance. University Taekwondo demonstration teams are playing a vital role in researching and developing Taekwondo demonstration performances, while making a great contribution to the development of Taekwondo. Therefore, this study investigates the effect of the activities of Taekwondo demonstration teams, which have the largest number of students among other clubs of Taekwondo major in universities, on the level of career decisiveness.

The purpose of this study is to verify the difference in the level of career decisiveness depending on the activities of university Taekwondo demonstration teams. The research hypothesis to achieve the purpose of this study is as follows. The level of career decisiveness will differ depending on the demographic characteristics such as gender, grade, experience in Taekwondo demonstration, and level/degree in Taekwondo.

2. Research Method

2.1. Research participants

In this study, students who belong to a Taekwondo demonstration team at universities nationwide were selected as the purposive quota sampling group, and a survey was conducted on 232 students from the group. The characteristics of the study participants were classified into gender, grade, experience in Taekwondo demonstration, and level/degree in Taekwondo. <Table 1> shows the results of the frequency analysis conducted on the general characteristics of the research participants.

Table 1. General characteristics of the research participants.

Type	Type	Frequency	Percentage %
Gender	Male	174	45.9
	Female	45	11.9
Grade	Freshmen	46	12.1
	Sophomore	75	19.8
	Junior	63	16.6
	Senior	35	9.2
Experience(in years) in taekwondo demonstration	Less than 1 year	17	4.5
	1~2 years	74	19.5
	3~4 years	81	21.4
	5 years or more	47	12.4
Level/degree in taekwondo	2^{nd}	5	1.3
	3^{rd}	31	8.2
	4^{th}	177	46.7
	5^{th}	6	1.6
	Total	219	100.0

2.2. Date collection

In order to measure how the activities of university Taekwondo demonstration teams affect the level of career decisiveness, the Career Decision Scale(CDS) developed by Osipow et al.[18] and revised by Go[19] was used. This scale, consisted of a total of 19 questions, can measure the level of career indecisiveness. In this study, 16 items that measure the level of career indecisiveness, among the 19 items, were used for inverse scoring. A higher measurement score indicates a higher level of career decisiveness.

2.3. Data analysis

In this study, the data collected through the questionnaire were analyzed for frequencies using SPSS 26.0 to examine the general characteristics of the study participants. T-test and One-way ANOVA were conducted to understand the difference in the level of career decisiveness in accordance with the activities of the Taekwondo demonstration teams. The significance level of all statistics was set to .05.

3. Result and Discussion

3.1. Differences in the level of career decisiveness by the gender of the member participated in the activities of taekwondo demonstration teams

The results of the t-test conducted to analyze the difference in the level of career decisiveness by the gender of the member participated in the activities of Taekwondo demonstration teams are shown in <Table 2>. Analyzing the difference in the level of career decisiveness by the gender of the member participated in the activities of university Taekwondo demonstration teams showed no statistically significant difference, and the level of career decisiveness was found to be t=1.452 and p=.139. These results are different from the results of the study conducted by Shin, Kim, and Cha[20] which found that environmental satisfaction with the activities of university demonstration teams influence career decisions. However, they are consistent with the findings of Cha, Park, and Lee[21], who stated that the gender of the member participated in the activities of Taekwondo demonstration teams plays no significant role in adapting to college life. In other words, the difference in the level of career decisiveness depending on the activities of the Taekwondo demonstration teams does not vary much with gender.

Table 2. Differences in the level of career decisiveness by gender.

Domain	Gender	*n*	*M*	*SD*	*t*	*p*
Career decisiveness	Male	174	4.1139	.90248	1.452	.139
	Female	45	3.9014	.75701		

3.2. Differences in the level of career decisiveness by the grade of the member participated in the activities of taekwondo demonstration team

<Table 3> below shows the results of One-way ANOVA conducted to analyze the difference in the level of career decisiveness by the grade of the member participated in the activities of Taekwondo demonstration teams. As a result of analyzing the differences in the level of career decisiveness by the gender of the member participated in the activities of university Taekwondo demonstration teams, no statistically significant difference was observed. The level of career decisiveness was found to be *F*=1.376 and p=.251. This is consistent with the results of the study conducted by Park & Kwon[22] which support the results from the current study by showing that the grade of students who major in Taekwondo demonstration does not have an impact on the level of career decisiveness.

Though freshmen and sophomores showed a higher average value of career decisiveness compared to that of the juniors and seniors, the results were not statistically significant.

Table 3. Differences in the level of career decisiveness by grade.

Domain	Grade	*n*	*M*	*SD*	*F*	*post-hoc*
Career decisiveness	Freshman	46	4.2215	.82923	1.376	.251
	Sophomore	75	4.1425	.84988		
	Junior	63	3.9732	.88465		
	Senior	35	3.8911	.96496		

3.3. Differences in the level of career decisiveness by the experience in taekwondo demonstration of the member participated in the activities of taekwondo demonstration teams

<Table 4> below shows the results of One-way ANOVA conducted to analyze the difference in the level of career decisiveness by the experience in Taekwondo demonstration of the member participated in the activities of Taekwondo demonstration teams. The results of analyzing the differences in the level of career decisiveness by the experience in Taekwondo demonstration of the member participated in the activities of university Taekwondo demonstration teams showed no statistically significant difference. The level of career decisiveness was analyzed to

be *F*=1.940 and p=.124. It is consistent with the results of the study conducted by Park[20] that showed a difference in the level of career decisiveness depending on the number of years in Taekwondo training, but not depending on the number of years majoring in Taekwondo demonstration. The results indicate that there is a difference between the experience in Taekwondo training and the experience in majoring and carrying out Taekwondo demonstration.

Table 4. Differences in the level of career decisiveness by experience in taekwondo demonstration.

Domain	Experience(in years) in taekwondo demonstration	n	*M*	*SD*	*F*	*p*
Career decisiveness	Less than 1 year	17	3.9963	.82841	1.940	.124
	1~2 years	74	4.0929	.76156		
	3~4 years	81	3.9275	.92642		
	5 years or more	47	4.3072	.94793		

3.4. Differences in the level of career decisiveness by the level/degree in taekwondo of the member participated in the activities of taekwondo demonstration teams

The results of One-way ANOVA conducted to analyze the difference in the level of career decisiveness by the level/degree in Taekwondo of the member participated in the activities of Taekwondo demonstration teams are as shown in below <Table 5>. As a result of analyzing the differences in the level of career decisiveness by the level/degree in Taekwondo of the member participated in the activities of university Taekwondo demonstration teams, no statistically significant difference was observed. The level of career decisiveness was found to be *F*=1.940 and p=.124. It can be interpreted as that the level/degree in Taekwondo, which is related to the experience in Taekwondo training, has no correlation with the activities of Taekwondo demonstration teams.

Table 5. Differences in the level of career decisiveness by the level/degree in taekwondo.

Domain	Level/degree	n	*M*	*SD*	*F*	*p*
Level/degree in taekwondo	2nd	5	4.1250	.65102	1.730	.162
	3rd	31	3.9516	.75824		
	4th	177	4.0636	.89301		
	5th	6	4.8333	.94676		

4. Conclusion and Suggestions

This study was conducted on the students belong to a university Taekwondo demonstration team nationwide in order to verify the difference in the level of career decisiveness depending on the activities of Taekwondo demonstration teams. For the purpose of this study, a questionnaire survey was conducted on 219 students, who are a member of a university Taekwondo demonstration team, in order to collect and analyze data. The results obtained from the analysis are as follows.

First, as a result of verifying the difference in the level of career decisiveness by the gender of college students who are a member of a university Taekwondo demonstration team, no statistically significant difference was found.

Second, verifying the difference in the level of career decisiveness depending on the grade of the students who are a member of a university Taekwondo demonstration team revealed no statistically significant difference.

Third, as a result of verifying the difference in the level of career decisiveness in accordance with the experience in Taekwondo demonstration of the students who are a member of a university Taekwondo demonstration team, no statistically significant difference was found.

Fourth, as a result of verifying the difference in the level of career decisiveness per the level/degree in Taekwondo of the students who are a member of a university Taekwondo demonstration team, no statistically significant difference was found.

Based on the results of this study, suggestions for future studies are made as follows.

First, this study was conducted only on university students. It will be meaningful to conduct research on adolescents, rather than on university students.

Second, this study was conducted solely to examine the differences in the level of career decisiveness by the activities of Taekwondo demonstration teams. Therefore, it is necessary to carry out future research to identify the correlations between various variables and make an attempt to conduct qualitative research.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	JSK	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	HCS	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	SJL	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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The Study on the Service Quality of JUDO Gym Using Importance-Performance Analysis(IPA)

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Abstract

Purpose: *This study has the purpose of providing basic data for efficient operation of service quality of Judo gym by analyzing and evaluating the importance degree and satisfaction degree of Judo gym's service quality factors by IPA technique*

Method: *This study set up a population of members who were training at Judo gyms, and from September 2019 to March 2020, 7 Judo gyms located in Seoul and Gyeonggi-do were invited to explain the purpose of the study to the director of the gym and to conduct the survey in-person visiting during the exercise time. A total of 370 questionnaires were distributed and the effective sample of 349(94.3%) was used in the analysis, except for 21 questionnaires that were omitted or were written insincerely, such as double entry.*

Results: *The analysis result is as follows. First, in the importance degree, the environmental support were the highest ones. The next ones are program, physical environment price, facility, coach, if it was put in order and, in the satisfaction degree, the environmental support were the highest ones. The next ones are program satisfaction, physical environmental satisfaction, price satisfaction, facility satisfaction, coach satisfaction, if it was put in order. Second, IPA matrix analysis result shows that 1 quadrant(concentration and improvement tendency) don't includes service quality items. 2 quadrant(area for maintaining current situation) includes 14 items such as how to Judo gym's service quality, program quality, vehicles in operation, KATA coaching program, program diversity, program interest, cleanliness around the gym, discount system, outdoor activity cost, promotion test fee, interior design, Registration fee, floor location of the gym. 3 quadrant(inferior order) includes 7 items such as how to Judo gum's service quality, the size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, communication skill. 4 quadrant(rejecting excessive effort) includes 3 items such as how to ventilation, air-conditioning, amenities.*

Conclusion: *Judo gym operator should actively use totally service quality factors. So they will have to work to increase Judo gym's membership people.*

[Keywords] ***Serviced Quality, Judo Gym, Importance, Performance, Analysis***

1. Introduction

1.1. Necessity and purpose of the research

Judo in Korea is a representative sport that has been raising the national prestige by performing well in leading competitions such as the Olympics and the World Championships, one of the key reasons being the expansion of the base of Judo trainees.

The number of Judo gyms began to increase steadily from the 1988 Seoul Olympics, with the number of registered ones reaching 716 in 2004. However, with the development of economic growth, increased leisure time has prompted people to participate in various sports

activities, which has led to the departure of Judo trainees to other sports[1]. Eventually, the number of Judo gyms across the country dropped sharply to 407 in 2011[2], and even they are facing difficulties in operation due to the decrease in the number of trainees. On the other hand, Taekwondo and Kendo gyms are constantly increasing although the number of trainees is fluctuating.

In the case of Taekwondo, they are striving for the development of Taekwondo gyms by introducing a franchise system to establish strategies tailored to the characteristics of each region, identifying the management status of the gyms concerned, discovering problems, and sharing education and management for successful gym management. And in the case of Kendo, famous trainees are constantly exposed to the public, and by holding a nationwide Kendo competition, they help the quantitative growth of Kendo[3].

In order for Judo gyms to be vitalized in competition with other martial arts sports, it is necessary to improve the service factors that satisfy the trainees' needs. In other words, a modern concept of a Judo gym should be provided, not just a place to acquire Judo skills, but a place to work for one's health. It is important to develop the factors by analyzing why trainees practice Judo and by revealing what they are satisfied with. In particular, the study of how the quality of service in Judo gyms is perceived and how it affects satisfaction is of great importance.

If you look at the research related to the management of Judo gyms, there have been studies such as measures to revitalize management through environmental analysis(SWOT analysis)[4], analysis of operation awareness of private Judo coaches[5], operation status and activation of private Judo gyms[6], and measures to revitalize Judo[7]. However, most of these studies mainly deal with improving the quality of programs and coaches, but none of them deal with the quality of service in Judo gyms. Therefore, it is very important to study the quality of service applicable to Judo gyms.

The IPA(Importance-Performance Analysis) technique is mainly used to determine the quality of service. IPA has been used in many studies since[8] first used it to identify the attributes of goods or services that should be focused on customer satisfaction[9]. IPA is often used to establish marketing strategies as it provides a closer look at consumer perceptions, along with advantages such as visual excellence, clear implications, and simple statistics, by simultaneously comparing the assessment factors, importance, and satisfaction[10].

Therefore, the purpose of this study is to evaluate the quality of service of judo gyms using IPA to identify which factors are considered important and satisfactory to the judo trainees and to seek improvements and solutions for the efficient operation of judo gyms.

1.2. Theoretical background

1.2.1. IPA(importance-performance analysis)

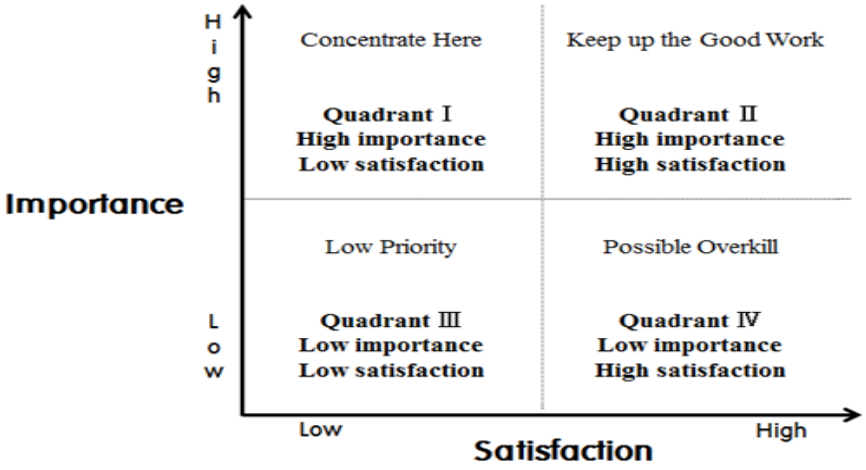
IPA is an evaluation method that compares and analyzes the relative importance and satisfaction of each property simultaneously by requiring users to evaluate the importance and satisfaction of each property before using the target services and goods[11][12].

The IPA analysis method developed by[8] assumed that the importance and satisfaction of the attribute were independent, and that importance and satisfaction achieved a linear relationship of symmetry[13]. IPA analysis is used in a variety of areas, including education, sports, marketing, and psychology[14].

If you look at the fourth quarter of IPA Matrix, it is recommended that the operator maintain the current service because the quadrant Ⅰ is recognized as important to the consumer but the satisfaction level is very low, and the quadrant Ⅱ is recognized as an important

attribute to the consumer. The quadrant Ⅲ is also low in satisfaction, with factors that consumers do not consider very important. Operators do not need to prioritize the factors in this area. Finally, the quadrant Ⅳ is a relatively high level of satisfaction for consumers, although it is perceived as low importance[15]. As such, the IPA analysis method is useful for finding improvement measures from a strategic perspective by allowing an understanding of which factors are over-investment or under-investment in the factors causing the differences and is useful for using average values and matrices of the valuation attributes to easily produce results[15].

Figure 1. IPA matrix.



2. Research Method

2.1. Research subjects

This study set up a population of members who were training at Judo gyms, and from September 2019 to March 2020, 7 Judo gyms located in Seoul and Gyeonggi-do were invited to explain the purpose of the study to the director of the gym and to conduct the survey in-person visiting during the exercise time. Upon arrival at the gym, the coaches were asked to be excused, then the trainees were informed of the purpose of the study and were asked to complete the questionnaire in self-evaluation form, and the completed questionnaire was retrieved directly from the place. A total of 370 questionnaires were distributed and the effective sample of 349(94.3%) was used in the analysis, except for 21 questionnaires that were omitted or were written insincerely, such as double entry. The demographic characteristics of this study are shown in <Table 1> below.

Table 1. Demographic characteristics.

Variables	Description	Frequency(people)	Percentage(%)
Gender	Men	237	67.9
	Women	112	32.1
	20's or younger	120	34.4

Age	30’s	102	29.2
	40’s	78	22.3
	50’s or older	49	14.0
Occupation	Student	118	33.8
	Employee	80	22.9
	Self-employed	67	19.2
	Professional	63	18.1
	Other	21	6.0
Average training days	1	11	3.2
	2	73	20.9
	3	155	44.4
	4	46	13.2
	5	64	18.3
Path to join the gym	Recommended by acquaintances	155	44.4
	Inquiry by phone	68	19.5
	Direct visit	42	12.0
	Internet	37	10.6
	Pamphlet(brochure)	36	10.3
	Other	11	3.2
Education	High school or less	36	11.2
	2, 3-year college	119	34.1
	4 year college	173	49.5
	Graduate school or more	18	5.2

Total	349	100

2.2. Survey tools

This study used the questionnaire to analyze the importance of service quality and the degree of satisfaction of the quality of service in Judo gyms using the IPA method. The survey questions used in the research by[16][17][18] regarding the quality of service of Judo gyms were modified and supplemented to suit the purpose of this study. Overall, a total of 54 questions were included, including 6 questions of demographic characteristics, 48 questions of importance and satisfaction of the quality of service in Judo gyms, and specifically 6 questions of facility factors, 5 questions of program factors, 5 questions of coach factors, 4 questions of price factors, and 4 questions of physical environment factors, all of which were used the 7-point Likert scale.

2.3. Validation of validity and reliability of the survey tools

In this study, exploratory factor analysis and Cronbach's α coefficient were calculated for the validity and reliability of the survey tools. The exploratory factor analysis was based on varimax, the eigenvalue of 1 or higher, and factor load of 0.5 or higher.

The results of the exploratory factor analysis of service quality factor importance are as shown in <Table 2> and consist of 5 sub-factors: facility, program, coach, price, and physical environment. The eigenvalue was shown to be from 3.171 to 4.704 to account for 78.278% of the total factors, with the factor load being found to be .756-.879 for facility, .770-.838 for program, .762-.879 for coach, .775-.875 for price, and .726-.866 for physical environment, and Cronbach's α coefficient was found to meet the criteria with .901-.941.

Table 2. Results of exploratory factor analysis and reliability verification of service quality importance factors.

Item	Facility	Program	Coach	Price	Physical environment	h^2
The size of the gym	.856	.128	.134	.149	.159	.815
Safety assurance	.847	.178	.123	.150	.147	.808
Ventilation	.845	.144	.020	.168	.129	.798
Amenities	.840	.105	.069	.148	.233	.780
Interior design	.830	.232	.022	.138	.075	.769
Air-conditioning	.765	.249	.132	.128	.213	.726
Interest level of the program	.226	.838	.018	.219	.210	.782
KATA coaching program	.178	.835	.001	.039	.205	.838
Program quality	.259	.823	.035	.108	.221	.846

Program diversity	.179	.812	.015	.257	.240	.695
Program contents	.147	.770	.098	.244	.266	.638
Coaching career	.094	.005	.879	.152	.024	.794
Communication skill	.050	.087	.871	.037	.048	.805
Diligence	.149	.027	.870	.043	.111	.773
Coaching ability	.053	.115	.816	.003	.040	.683
Professionalism	.003	.102	.762	.215	.020	755
Promotion test fee	.194	.149	.089	.875	.069	.846
Outdoor activity cost	.134	.205	.133	.872	.088	.816
Registration fee	.210	.220	.102	.822	.054	.806
Discount system	.184	.108	.120	.775	.184	.772
Safety around the gym	.221	.228	.059	.146	.866	.705
Cleanliness around the gym	.164	.209	.101	.101	.850	.855
Floor location of the gym	.211	.363	.036	.076	.820	.872
Vehicles in operation	.257	.318	.016	.100	.726	.813
Rotation sums of squared loadings	4.704	4.004	3.667	3.241	3.171	
% of variance	19.598	16.684	15.279	13.504	13.212	
Cumulative %	19.598	36.283	51.562	65.065	78.278	
KMO=.881, x^2=7576.955, *df*=276, *p*<.001						
Cronbach's α	.941	.932	.901	.910	.918	

In addition, the results of the exploratory factor analysis of the service quality satisfaction were shown in <Table 3> and the eigenvalue was shown from 3.219 to 4.599 to explain 80.031% of the total factors. The factor loadings were shown to be facility satisfaction .751-.859, coach satisfaction .790-888, program satisfaction .739-869, physical environment satisfaction .785-.836, and price satisfaction .697-.888, and Cronbach's α coefficient was shown to meet the criteria, which was shown to be .916-.943.

Table 3. Results of exploratory factor analysis and reliability verification of service quality satisfaction factors.

Item	Facility satisfaction	Coach satisfaction	Program satisfaction	Physical environment satisfaction	Price satisfaction	h^2
Safety assurance	.859	.144	.188	.201	.041	.747
The size of the gym	.836	.087	.168	.028	.108	.836
Ventilation	.815	.127	.180	.243	.128	.801
Amenities	.810	.108	.271	.204	.135	.788
Interior design	.753	.187	.183	.332	.167	.774
Air-conditioning	.751	.169	.101	.166	.228	.681
Communication skill	.100	.888	.098	.128	.176	.815
Practical skills	.076	.817	.133	.299	.148	.890
Diligence	.173	.815	.153	.176	.217	.856
Coaching career	.145	.809	.148	.051	.254	.699
Professionalism	.230	.790	.047	.100	.293	.775
Program interest	.205	.060	.869	.101	.065	.795
Program contents	.144	.183	.841	.060	.092	.765
Program diversity	.116	.100	.801	.330	.075	.855
Program quality	.269	.067	.797	.266	.032	.803
KATA coaching program	.269	.060	.739	.378	.036	.775
Cleanliness around the gym	.211	.156	.214	.836	.182	.815

Floor location of the gym	.270	.163	.226	.835	.155	.779
Safety around the gym	.222	.105	.343	.813	.160	.784
Vehicles in operation	.307	.197	.261	.785	.092	.766
Promotion test fee	.125	.245	.071	.143	.888	.825
Registration fee	.136	.184	.075	.099	.865	.871
Outdoor activity cost	.185	.328	.053	.062	.841	.864
Discount system	.204	.298	.084	.276	.697	.846
Rotation sums of squared loadings	4.599	3.965	3.878	3.547	3.219	
% of variance	19.161	16.520	16.158	14.780	13.412	
Cumulative %	19.161	35.681	51.839	66.620	80.031	
KMO=.900, x^2=8106.474, *df*=276, *p*<.001						
Cronbach's α	.934	.925	.922	.943	.916	

2.4. Data processing

In order to analyze the quality of service of judo gyms using the IPA method, 7 judo gyms located in Seoul and Gyeonggi-do were selected and explained the purpose of the study to the coaches and trainees, and a total of 370 questionnaires were distributed to use a total of 349 questionnaires(94.3%) as valid samples, excluding 21 questionnaires that were missing or were insincere. These collected data were analyzed using frequency analysis, exploratory factor analysis, Cronbach's α, response sample t-test, and finally, analysis with IPA using average values of importance and satisfaction.

3. Research Results

The results of the response sample t-test and IPA analysis after averaging each item are as follows to find out the importance and satisfaction analysis of the service quality factors of Judo gyms.

3.1. Priorities of importance and satisfaction of the service quality sub-factor of judo gyms

As shown in <Table 4>, the program(M=5.88) showed the highest importance, followed by physical environment(M=5.83), price(M=5.69), facility(M=5.49), and coach(M=5.15). Specifically, program quality(M=5.94) was the highest in the program variable, vehicles in operation(M=5.92) in the physical environment variable, discount system(M=5.71) in the price variable, interior design(M=5.61) in the facility variable, and practical skills(M=5.25) in the coach variable were recognized as the most important items.

Similarly, program satisfaction(M=5.54) was the highest, followed by physical environment satisfaction(M=5.44), price satisfaction(M=5.37), facility satisfaction(M=5.33), and coach satisfaction(5.04). Specifically, program quality(M=5.58) in the program satisfaction, vehicles in operation(M=5.46) in the physical environment satisfaction, outdoor activity cost(M=5.41) in the price satisfaction, interior design(M=5.42) for the facility satisfaction, and coach career(M=5.09) in the coach satisfaction were found to be the most satisfactory.

Table 4. Priorities on the importance and satisfaction of the service quality sub-factor of judo gyms.

Priority	Service quality	Importance	Service quality	Satisfaction
1	Program	5.88	Program satisfaction	5.54
2	Physical environment	5.83	Physical environment satisfaction	5.44
3	Price	5.69	Price satisfaction	5.37
4	Facility	5.49	Facility satisfaction	5.33
5	Coach	5.15	Coach satisfaction	5.04

3.2. Priorities of importance and satisfaction of service quality items

The results of the overall priority analysis of the importance and satisfaction of the service quality factors of judo gyms are as shown in <Table 5>.

Importance priorities for the service quality factors of judo gyms are the program quality, vehicles in operation, KATA coating program, program delivery, program interest, cleanliness around the gym, floor location of the gym, program contents, safety around the gym, discount system, registration fee in that order with the average of 5.7 or higher. It was shown that the trainees perceived the program and physical environmental factors as relatively more important compared to other factors. Also, in the satisfaction, program quality, program interest, KATA coaching program, program contents, program diversity, vehicles in operation, safety around the gym, cleanliness around the gym, interior design, outdoor activity cost, air-conditioning were shown to be average of 5.4, indicating they tend to be satisfied with program and physical environment more than other factors.

Table 5. Priorities of importance and satisfaction on the overall factors of the service quality of judo gyms.

Priority	Service quality	Importance	Service quality	Satisfaction
1	Program quality	5.94	Program quality	5.58
2	Vehicles in operation	5.92	Program interest	5.56
3	KATA coaching program	5.92	KATA coaching program	5.53
4	Program diversity	5.90	Program contents	5.52
5	Program interest	5.86	Program diversity	5.49

6	Cleanliness around the gym	5.82	Vehicles in operation	5.46
7	Floor location of the gym	5.81	Safety around the gym	5.46
8	Program contents	5.79	Cleanliness around the gym	5.45
9	Safety around the gym	5.77	Interior design	5.42
10	Discount system	5.71	Outdoor activity cost	5.41
11	Registration fee	5.71	Air-conditioning	5.41
12	Outdoor activity cost	5.66	Promotion test fee	5.38
13	Promotion test fee	5.66	Floor location of the gym	5.38
14	Interior design	5.61	Discount system	5.36
15	Ventilation	5.58	Ventilation	5.36
16	Air-conditioning	5.53	Amenities	5.36
17	Amenities	5.47	Registration fee	5.34
18	The size of the gym	5.38	The size of the gym	5.22
19	Safety assurance	5.35	Safety assurance	5.21
20	Practical skills	5.25	Coach career	5.09
21	Diligence	5.15	Communication skill	5.08
22	Professionalism	5.14	Diligence	5.02
23	Coach career	5.12	Professionalism	5.01
24	Communication skill	5.11	Practical skills	4.99

3.3. Verification of differences between importance and satisfaction of the service quality factors of judo gyms

The results of verifying the differences between importance and satisfaction for the entire items of the service quality of Judo gyms showed that most items, such as facility, program, coach, price, and physical environment, had statistically significant differences, as shown in <Table 6>.

Specific results related to the service quality factors of Judo gyms are as follows. Significant differences were found in the size of the gym, safety assurance, amenities, ventilation, interior design, air-conditioning, etc. in the facility and program contents, program quality, program diversity, KATA coaching program in the program. There were significant differences in the coach factor in professionalism, diligence, coach career, communication skill, practical skills. For the price factor, registration fee, promotion test fee, outdoor activity cost, and discount system showed the significant differences, and in physical environment, there were also significant differences in vehicles in operation, floor location of the gym, safety around the gym, and cleanliness around the gym. Overall, there has been a difference in perception between the importance and satisfaction of the service quality of Judo gyms, and the perception of satisfaction is lower than that of importance in all items, so from the perspective of Judo gyms, it is necessary to make efforts to increase the satisfaction for items with such differences in order to be competitive. In addition, both the program and the physical environmental factors have been high in both importance and satisfaction, which will require the continuous development of the program and the improvement of the physical environment other than the facility.

Table 6. Matching sample t-test of the importance and satisfaction of the overall factors of the service quality of judo gyms.

	Items	Importance	Satisfaction	*t*
Facility	The size of the gym	5.38	5.22	2.375*
	Safety assurance	5.35	5.21	2.669**
	Amenities	5.47	5.36	2.200*
	Ventilation	5.58	5.36	4.210***
	Interior design	5.61	5.42	3.180**
	Air-conditioning	5.53	5.41	2.054*
Program	Program contents	5.79	5.52	4.840***
	Program interest	5.86	5.56	6.130***
	Program diversity	5.90	5.49	7.672***
	Program quality	5.94	5.58	6.869***
	KATA coaching program	5.92	5.53	7.088***
Coach	Professionalism	5.14	5.01	1.945
	Diligence	5.15	5.02	2.144*
	Coach career	5.12	5.09	.566
	Communication skill	5.11	5.08	.477
	Practical skills	5.25	4.99	3.947***
Price	Registration fee	5.71	5.34	6.366***
	Promotion test fee	5.66	5.38	5.154***
	Outdoor activity cost	5.66	5.41	4.533***
	Discount system	5.71	5.36	6.594***
Physical environment	Vehicles in operation	5.92	5.46	8.10***
	Floor location of the gym	5.81	5.38	6.913***
	Safety around the gym	5.77	5.46	5.610***
	Cleanliness around the gym	5.82	5.45	5.684***

Note: *p<.05, **p<.01, ***p<.001.

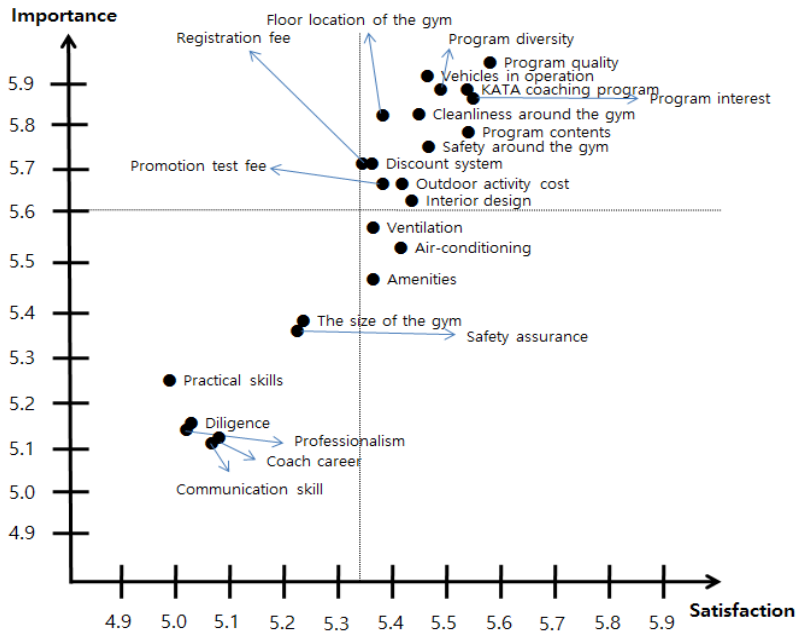
3.4. Analysis of IPA matrix for the service quality factor of judo gyms

The relative importance and satisfaction of each factor were compared and analyzed at the same time through the importance and satisfaction survey of the service quality of Judo gyms[19][20]. used the criteria of quadrants as the average value of importance and satisfaction when producing results using the matrix in a study using the IPA analysis method. There are four methods of setting the criteria for quadrants: median, standard deviation, arbitrary criteria, and average, of which average values are most widely used. In this study, IPA analysis through quadrants was performed based on the average value of importance and satisfaction, using the average value of the X-axis and the Y-axis. The results are shown in <Table 7>, and the schematic is shown in <Figure 2>.

Table 7. Results of the service quality IPA matrix analysis of judo gyms.

Description	Factor distribution
Quadrant Ⅰ	-
Quadrant Ⅱ	Program quality, vehicles in operation, KATA coaching program, program diversity, program interest, cleanliness around the gym, program contents, safety around the gym, discount system, outdoor activity cost, promotion test fee, interior design, registration fee, floor location of the gym
Quadrant Ⅲ	The size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, communication skill
Quadrant Ⅳ	Ventilation, air-conditioning, amenities

Figure 2. Service quality's IPA matrix result of judo gym.



If you look at the content, first of all, the importance was high for the service quality of Judo gyms, but quadrant Ⅰ where the satisfaction was low(caution improvement item) did not include all items of service quality.

In quadrant Ⅱ, where both importance and satisfaction are high, program quality, vehicles in operation, KATA coaching program, program diversity, program interest, cleanliness around the gym, program contents, safety around the gym, discount system, outdoor activity cost, promotion test fee, interior design, registration fee, floor location of the gym were included.

Quadrant Ⅲ(strength maintain items), in which both importance and satisfaction appeared low, included seven factors, the size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, communication skill.

Finally, quadrant Ⅳ with low importance but high satisfaction(avoid over-effort) included three factors, ventilation, air-conditioning, and amenities.

4. Discussion

The purpose of this study is to analyze the importance and satisfaction of the service quality of Judo gyms using IPA method. Judo has played a major role in promoting Korea's national prestige in international competitions such as the Olympics. In addition, Judo is a comprehensive sport that appears as performance because not only agility but also muscle strength is important as a whole-body exercise, and all the abilities of all parts such as flexibility and balance are combined. Therefore, Judo is a sport with a relatively large exercise effect at a set time. However, Judo has a strong image of elite sports, so from the perspective of a gym coach, the supply and demand of trainees for the operation is relatively less active than other martial arts sports. With Judo becoming more popular as a sports-for-all and more media exposure and inflow into the gym, analyzing what factors are important and satisfying to the potential customers and existing trainees who are interested in judo will increase the popularity of Judo as a martial arts sport. Therefore, we would like to discuss based on the results from this study.

First of all, as a result of analyzing the importance and satisfaction of the service quality factors of Judo gyms, it shows, in the order of, program quality, vehicles in operation, KATA coaching program, program diversity, program interest, cleanliness around the gym, floor location of the gym, program contents, safety around the gym, discount system, Registration fee, outdoor activity cost, promotion test fee, interior design, ventilation, air-conditioning, amenities, the size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, and communication skill. For the satisfaction factor, it shows in the order of program quality, program interest, KATA coaching program, program contents, program diversity, vehicles in operation, safety around the gym, cleanliness around the gym, interior design, outdoor activity cost, air-conditioning, promotion test fee, floor location of the gym, discount system, ventilation, amenities, registration fee, the size of the gym, safety assurance, coach career, communication skill, diligence, professionalism, and practical skill. Looking at the importance and satisfaction for the sub-variables, the order is found to be program, physical environment, price, facility, and coach in the importance, and also program, physical environment, price, facility, and coach satisfaction for the satisfaction factor. A study on the effect of service quality on service satisfaction and repurchase by[21] said that the overall factors of Judo service quality have a significant effect on satisfaction and re-registration. In a study by[22] on the effect of service quality on adult training satisfaction and affection, the service quality of Judo gyms was said to have a significant effect on training satisfaction and affection. In the study on how to improve the quality of education service in school sports club Judo classes through IPA techniques by[23][24], the program-related factors of Judo classes were high in the subordinate factors, partly supporting the findings.

Currently, most gyms, as well as Judo gyms, have similar systems in terms of training fees, facilities, and coaches. Thus, in order to gain a relative advantage in these conditions, efforts should be made to develop special programs unique to the gym and create a positive physical environment around the gym, and it should be recognized that these efforts have a positive impact on community development through gyms.

Second, the service quality factor corresponding to the quadrant Ⅰ(caution improvement item) was not included as a result of classifying into four quadrants based on the average of 5.60 for importance and 5.34 for the purpose of analyzing service quality through the IPA method. As Judo gyms are still operated on a small scale and are being franchised around coaches from the national team, it is believed that it was not aware of the importance and satisfaction of the service quality items proposed in this study. However, gym operators should regularly ask and listen to trainees' opinions and try to apply them to the direction of the development of the gym.

Next, the service quality factors of Judo gyms corresponding to quadrant Ⅱ(strength maintain items) are program quality, vehicles in operation, KATA coaching program, program diversity, program interest, cleanliness around the gym, program contents, safety around the gym, discount system, outdoor activity cost, promotion test fee, interior design, registration fee, and floor location of the gym. A study on the effect of satisfaction with the service quality of private Judo trainees on re-participation and recommendation by[16] found that the program and facility factors of service quality significantly affect the re-participation and recommendation, and[25] also considered the program and physical environment important in the study on how to improve education service quality of school sports club Judo classes to middle school students. Also, the study on the effect of service quality on service satisfaction and re-participation of Judo gym of[21] supports this research result because items in the program and physical environment have significant effects. The program and the positive surroundings are important factors for regular trainees in operating Judo gyms. Thus, the operator of a Judo gym will have to make efforts to clean up the environment around the gym.

The service quality items of Judo gym corresponding to quadrant Ⅲ(lower ranking items) included seven items, including the size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, communication skill. Research by[26] on the impact of service quality on one-person media in Judo on viewers' receptivity shows that the facilities and safety of the gym are relatively lower than other factors, partly supporting the findings. Regardless of the size of the gym, the operator of the Judo gym should be shown to install protective devices, communicate with the trainees and keep the gym diligently so that the trainees does not get injured while exercising.

The service quality items of Judo gyms corresponding to quadrant Ⅳ(avoid overkill) included three items, ventilation, air-conditioning, and amenities. In a study on the influence of optional attributes of Judo gyms on the emotional evaluation and trainee satisfaction by[17], it supports this research result by reporting that the annexing facilities and amenities of Judo gyms were mostly required and thus were taken for granted by the trainees, resulting in a low impact but high relative satisfaction. Since most of the Judo gyms are located in underground floors, ventilation and heating and cooling facilities are essential due to the nature of the sport. Such a physical environment is essential to the operator, but it can be seen as a natural factor for the trainees. However, these factors are essential to building a gym, so installation and management should not be neglected.

5. Conclusion

The purpose of this study is to analyze importance and satisfaction using IPA method and to derive a complex priority, which is meaningful in providing empirical basic data on which of the factors experienced by the Judo trainees are considered important and which are satisfied. Based on these results and discussions, the conclusions were drawn as follows.

First, the service quality of Judo gyms are shown in importance as, in the order of, program quality, vehicles in operation, KATA coaching program, program diversity, program interest,

cleanliness around the gym, floor location of the gym, program contents, safety around the gym, discount system, registration fee, outdoor activity cost, promotion test fee, interior design, ventilation, air-conditioning, amenities, the size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, and communication skill. For satisfaction, the order is, program quality, program interest, KATA coaching program, program contents, program diversity, vehicles in operation, safety around the gym, cleanliness around the gym, interior design, outdoor activity cost, air-conditioning, promotion test fee, floor location of the gym, discount system, ventilation, amenities, Registration fee, the size of the gym, safety assurance, coach career, communication skill, diligence, professionalism, and practical skills.

Second, the results from the IPA analysis method for the service quality factor of Judo gym did not include any items in the quadrant Ⅰ. This suggests that even for a small scale gym operator, it is necessary to understand the minds of the trainees properly.

The service quality factors of Judo gyms in quadrant Ⅱ include the size of the gym, vehicles in operation, KATA coaching program, program diversity, program interest, cleanliness around the gym, program contents, discount system, outdoor activity cost, promotion test fee, interior design, registration fee, and floor location of the gym. To this end, the operator of a Judo gym should be able to supplement the gym by making efforts to maintain these strength and regularly asking the trainees for their opinions.

Items included in the quadrants Ⅲ were found to be the size of the gym, safety assurance, practical skills, diligence, professionalism, coach career, and communication skills. This is an important factor in the basic ability of the gym operator and the background of the gym, but it is also a natural factor in running the gym. This is also recognized by the trainees and will have to be thoroughly maintained to be satisfied, regardless of the comparison between importance and satisfaction.

Items included in quadrant Ⅳ include ventilation, air-conditioning, and amenities. For these items, the gym operator should continue to worry about the satisfaction of the trainees while making efforts to raise awareness further.

This study is for the analysis of the importance and satisfaction of the service quality of Judo gyms, and for further research, the research team would like to make the following suggestions. First, the study targets were gym trainees in Seoul and parts of Gyeonggi-do, so it requires caution to generalize the results nationwide. Subsequent studies may be more relevant if they are locally allocated appropriately.

Second, IPA analysis may vary depending on the location and method of the reference point. This would be a more relevant study if the assessment methods for items were applied in various ways.

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6.1. Journal articles

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	JHK	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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The Relationship between Elementary School Students' Perception, Fun, and Self-Directed Learning of HAPKIDO TRAINING

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Abstract

Purpose: *The purpose of this study is to verify the structural relationship and influence relationship between participation perception, fun factors and self-directed learning attitude of elementary students through our traditional martial art, Hapkido, and provide a theoretical background.*

Method: *To analyze the relationship between elementary school students' perception, fun, and self-directed learning of Hapkido training, empirical analysis was conducted for a total of 352 questionnaires as final analysis data. Specifically, first, to investigate the structural relationship between each variable, the structural equation model was constructed, and the path coefficient of the variable and the fitness of the model were evaluated. Second, multiple regression analysis was conducted to analyze the effect of Hapkido training awareness and fun on self-directed learning, a dependent variable. All statistical levels were verified at p<.05.*

Results: *First, Looking at the path coefficient analysis results of the research model, among the latent variables of the structural equation model, the perception variable and the fun variable of the path coefficient were 0.711(t=3.135, p<.001), and the fun factor variable and the self-directed learning attitude variable were 0.702(t=6.979, p<.001), confirming statistically significant results. Second, In addition, in the results of multiple regression analysis with fun as the independent variable and self-directed learning as the dependent variable, the function improvement factor, the free time factor, the explanation and demonstration factor, and the friend relationship factor were found to be significant, but it was found that the factors of competition and emotional transformation had no statistical significance.*

Conclusion: *These findings identify structural causal relationships between participation perception, fun factors, and self-directed learning attitude in Hapkido training and suggest the influencing factors, and this study is meaningful in that it contributes to the improvement of the quality of elementary students' health education and provides a theoretical background required for the transition of learning.*

[Keywords] ***Elementary School Student, Perception, Fun, Self-Directed Learning, Hapkido***

1. Introduction

This regulation is Recently, Korea is undergoing changes in the educational structure along with a rapid decline in the school-age population. In addition, due to the development of the 4th industrial revolution, the learning environment and educational method are changing in a different direction from the previous methods[1]. This can be seen as an opinion that an individual's active and independent problem-solving ability and learning ability are needed, and as subjects using information, learners must choose and plan their own learning. It is argued that this learning attitude is the basis for achieving the quality of lifelong learning and academic achievement[2].

It can be said that the attitude of actively planned learning stems from self-directed learning. The dictionary meaning for self-directed learning can be said to be a concept that unifies similar concepts such as self-teaching, self-direction in learning, self-planned learning, auto-didaxy, and self-education[3][4]. Although there is informal learning as a concept similar to self-directed learning, this also refers to the learner's initiative and voluntary learning without participating in any institution other than formal education or non-formal education, or learning from instructors or teachers[5][6].

Among these self-directed learning, physical activities performed outside of school life of elementary school students have been confirmed to have very important social and cultural significance. These physical activities are to enjoy and experience by yourselves, and this is because it can be established as a lifelong physical education process beyond the health promotion and healthy sports culture experience of growing students[7].

Therefore, in this study, we look at Hapkido, a traditional Korean martial art, as a field of sports activities, and attempt to examine what relationship there is between elementary school students' perception and fun of Hapkido training with self-directed learning. Hapkido is a traditional martial art that achieves character completion through mental and physical performance, rather than setting goals for the game itself like a general sport[8][9]. This study began with the fact that when examining the research results[10][11][12], demonstrating that as an elementary school student's art of self-defense, it has a positive effect on character development, physical development, and social cultivation, Hapkido can be used as a program of self-directed learning beyond the fragmentary view of traditional martial arts.

Perception set as an independent variable in this study refers to knowing things clearly and understanding and discriminating their meaning correctly. In psychology, perception refers to the process of consciousness from the senses and perceptions of sensing objects to memory and thoughts that discern and judge them[2][13]. Fun, set as a parameter, is a very comprehensive concept that includes both internal and external motivations as positive emotional reactions felt during task activities[14][15]. Mental and physical stress is eliminated by the fun, and a very light sensation spreads to the whole body and mind, making the movement easier to feel, and making it enjoyable as it is[16].

This study was conducted to provide a theoretical basis by verifying the relationship between the perception, fun and self-directed learning of elementary school students practicing Hapkido. Through the results of the study, it is expected that Hapkido's training course, which is being implemented as a physical activity, provides elementary school students with information on new learning attitudes and becomes a new model necessary for physical and psychological health education.

2. Methods

2.1. Participants

For the selection of participants in the study, 352 effective response copies were analyzed for elementary school students training at 20 Hapkido gymnasiums located in Seoul, Korea. As for sex, male and female students were 233(66.2%) and 119(33.8%), respectively. Student grades are composed of 1st grade 47 students(13.4%), 2nd grade 57 students(16.2), 3rd grade 42 students(11.9%), 4th grade 47 students(13.4%), 5th grade 61 students(17.3%), and 6th grade 98 students(27.8%), respectively. In terms of Hapkido Dan, there 121 people(34.3%) were black belt, 105 people(29.8%) in the 1st Dan, 96 people(27.3%) in the 2nd Dan, and 30 people(8.5%) in the 3rd Dan, respectively.

2.2. Instruments

The measurement tool for independent variables set as elementary school students' perception of participation in Hapkido training consists of 10 questions for 3 factors, such as 4 questions for physical and psychological perception, 3 questions for social perception, and 3 questions for educational perception. In this study, the contents of the questionnaire of previous studies were modified and supplemented to suit the participants[17]. Cronbach's α value, which is the reliability coefficient between each item, showed a reliable level of physical and psychological factor .792, social awareness .805, and educational awareness .832, demonstrating reliable levels.

As for the measuring tool of the parameter set for fun of Hapkido training for elementary school students, the items of each factor are composed of 24 questions of 6 factors such as 4 questions for skill improvement, 6 questions for free time, 3 questions for competition, 4 questions for explanation and demonstration, 3 questions for friend relations, and 4 questions for emotional change. In this study, the contents of the questionnaire of previous studies were modified and supplemented to suit the participants[17]. The values of Cronbach's α, the reliability coefficient between each item, are composed of functional improvement .826, free time .865, competition .795, explanation and demonstration .752, friendship relationship .835, and emotion change .790, which were confirmed to be reliable level.

As for the tool for measuring dependent variables set for self-directed learning of Hapkido training of elementary school students, the items of each factor are composed of 13 questions of 4 factors such as 4 questions for openness of learning opportunities, 3 questions for initiatives for learning, 3 questions for attachments to learning, and 3 questions for problem-solving skills. In this study, the contents of the questionnaire of previous studies were modified and supplemented to suit the participants[2]. The values of Cronbach's α, the reliability coefficient between each item, are composed of openness of learning opportunities .868, 3 questions of initiatives in learning .865, attachment to learning .728, and problem-solving skills .799, was confirmed to be at a reliable level.

2.3. Data analysis

To analyze the relationship between elementary school students' perception, fun, and self-directed learning of Hapkido training, empirical analysis was conducted for a total of 352 questionnaires as final analysis data. Specifically, first, correlation Analysis was conducted to analyze the intensity and direction between the Hapkido training perception variable and the fun and self-directed learning variables. Second, to investigate the structural relationship between each variable, the structural equation model was constructed, and the path coefficient of the variable and the fitness of the model were evaluated. Third, multiple regression analysis was conducted to analyze the effect of Hapkido training awareness and fun on self-directed learning, a dependent variable. All statistical levels were verified at $p<.05$.

3. Results

3.1. Correlation analysis of measurement variables

<Table 1> shows the results of the correlation analysis to confirm the direction of the perception, fun, and self-directed learning variables of Hapkido training of elementary school students. All of the perception variable, the fun variable, and the self-directed learning variable have positive(+) correlations, indicating that each variable is consistent with the direction of this study. Looking at the results of this correlation analysis, it can be said that there is no problem in multicollinearity.

3.2. Structural model analysis between measurement variables

In this study, path analysis using structural equation modeling(SEM) was conducted to verify the research model. The structural equation model used in the study consists of a structural model and a measurement model.

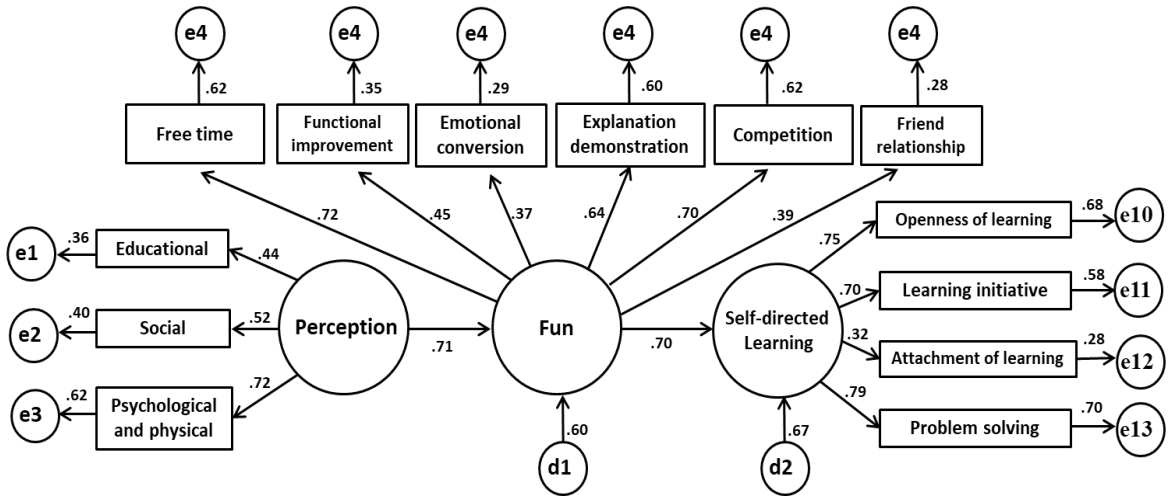
Table 1. Correlation analysis of measurement variables.

Division		1	2	3	4	5	6	7	8	9	10	11	12	13
Perception	Psychological and physical	1												
	Social	.359**	1											
	Educational	.249**	.224**	1										
Fun	Functional improvement	.391**	.482**	.404*	1									
	Free time	.201*	.238*	.163**	.678*	1								
	Competition	.204**	.178**	.214**	.237**	.204*	1							
	Explanation and demonstration	.282**	.456**	.138**	.630**	.390*	.268**	1						
	Friend relationship	.200**	.333**	.392*	.349**	.270**	.230**	.415**	1					
	Emotional conversion	.424**	.387**	.203*	.598**	.240*	.179**	.526**	.324**	1				
Self-directed Learning	openness of learning	.242*	.284**	.340**	.139**	.242*	.415**	.130**	.166**	.597*	1			
	Learning initiative	.240*	.255**	.207*	.150**	.335*	.249*	.190**	.362*	.301*	.675**	1		
	Attachment of learning	.263*	.347*	.357*	.335*	.426*	.307*	.305*	.455*	.459*	.505**	.513**	1	
	Problem solving	.345**	.236**	.220*	.201**	.323*	.202*	.138**	.355**	.226**	.600**	.601**	.476**	1

Note: *p<.05, **p<.01.

While it represents the causal relationship between latent variables in the case of the structural model, in the case of the measurement model, it can be said to be a model that represents the relationship between the latent variables and the observed variables that measure them.

Figure 1. Results of structual model analysis.



Looking at the path coefficient analysis results of the research model, among the latent variables of the structural equation model, the perception variable and the fun variable of the path coefficient were 0.711(t=3.135, p<.001), and the fun factor variable and the self-directed learning attitude variable were 0.702(t=6.979, p<.001), confirming statistically significant results. The results of this study are to clarify that the structural relationship between perception, fun, and self-directed learning according to Hapkido training for elementary school students has a valid and positive path. <Figure 1> presented above is the analysis results of the structural equation model using the AMOS statistical program.

Looking at the model fit of the structural model, it was found that x2=449.7(d.f.=10), and the values of GFI and AGFI such as P=0.001, GFI=0.941, AGFI=0.882, RMR=0.026, CFI=0.854, RMSEA=0.076, etc. show good levels, so it can be said that it is an appropriate model fit. <Table 2> presented below is the results of the fit of the study model.

Table 2. Goodness of fit of structural model.

d.f.	P-value	x2	GFI	AGFI	RMR	CFI	RMSEA
10	0.001	449.7	0.941	0.882	0.026	0.854	0.076

3.3. Analysis of influence relationship between perception and fun

Multiple regression analysis was conducted to investigate the relationship between the perception and fun variables of elementary school students participating in Hapkido training. The regression model fit was found to be at a good level(p<0.5, F=33.831, R2=.475). The specific analysis results showed that the psychological and physical perception factors(β=.189, p<.000) and social perception factors(β=.325, p<.000) were significant for the fun variable, and that educational perception factors(β=.114, p<.056) had no statistical significance. <Table 3> below shows the results of multiple regression analysis on the perception for the fun variable.

Table 3. Results of multiple regression analysis of participation perception on fun.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
Fun	Psychological and physical perception	.167	.046	.189	3.669	.000
	Social perception	.200	.031	.325	6.368	.000
	Educational perception	.074	.032	.114	2.306	.056

Note: p<0.5, F=33.831, R^2=.475.

3.4. Analysis of influence relationship between fun and self-directed learning

Multiple regression analysis was conducted to investigate the relationship between the fun and the self-directed learning of elementary school students participating in Hapkido training. The regression model fit was found to be good(p<0.5, F=45.739, R2= .557). The specific analysis results showed that for self-directed learning variables, function improvement factors(β=.146, p<.050), free time factors(β=.452, p<.000), explanation and demonstration factors(β=.350, p<.003)), and friend relationship factors(β=.180, p<.017) were significant, and that the competition factor(β=-.113, p<.304) and the emotion conversion factor(β=.059, p<.293) were statistically insignificant. <Table 4> below shows the results of multiple regression analysis of fun for self-directed learning.

Table 4. Results of multiple regression analysis of participation fun on self-directed learning.

Dependent variable	Independent variable	B	SE	β	t	Probability of significance
Self-directed learning	Improvement	.147	.067	.146	1.559	.050
	Free time	.699	.112	.452	5.126	.000
	Competition	-.132	.077	-.113	-.669	.304
	Explanation and demonstration	.332	.061	.350	2.038	.003
	Friend relationship	.177	.072	.180	3.321	.017
	Emotional conversion	.073	.085	.059	.856	.293

Note: p<0.5, F=45.739, R^2=.557.

4. Discussion

This study attempts to confirm the effect of elementary school students' perception of Hapkido on self-directed learning through fun, based on objective and scientific facts, and from this point of view, the discussion of the research results is as follows.

First, in the multidimensional influence relationship between elementary school students' perception, fun, and self-directed learning of Hapkido training, the path coefficient evaluation using structural equation modeling(SEM) and the fitness of the model, which were conducted to verify the structural validity, were found to be acceptable. Looking at the research results, the structural relationship between perception, fun, and self-directed learning according to Hapkido training for elementary school students is valid, confirming that they have a positive

path. Even when looking at other previous studies, they argued that the perception of participation of physical activity participants consistently had a high correlation and influence with fun. Considering the result that fun has a significant effect on satisfaction, the establishment of structural relationships in this study can be persuasive[12][18].

Second, looking at the results of multiple regression analysis of perception of independent variables for the fun, the dependent variable, psychological and physical perception and social perception were found to be significant, but educational perception was found to have no statistical significance. It can be seen that Hapkido training perceived by elementary school students is perceived as a form of physical education, such as play, which is performed outside of school classes, rather than as an educational part. Such results of this study have some similarities with the study confirming the motivation of Hapkido practitioners to participate in training and the study of the effect of Hapkido training on the life attitudes of elementary school children[15][19]. And when looking at other previous studies that the perception of the value of exercise is influencing the exercise behavior and participation intention, it can be seen that they indirectly supported the results of this study[20][21].

In addition, in the results of multiple regression analysis with fun as the independent variable and self-directed learning as the dependent variable, the function improvement factor, the free time factor, the explanation and demonstration factor, and the friend relationship factor were found to be significant, but it was found that the factors of competition and emotional transformation had no statistical significance. The results showing that there was no significant difference between the competition factor and the emotional shift factor are conjectured as a result of the unique characteristics of the training method inherent in Hapkido.

Even in previous studies, Hapkido places importance on harmony, not competition, and it is argued that they choose a training method that requires consideration and respect so as not to hurt each other even when practicing skills[8][22]. Therefore, it was found that Hapkido training has a different form of exercise than other physical activities.

As above, this study provided a perspective that could comprehensively illuminate the influence among the variables of Hapkido training elementary school students' perception, fun, and self-directed learning. In addition, it was an opportunity to confirm the relationship that Hapkido has positively influenced the development of self-directed learning of elementary school students.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	CKH	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	JBL	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	JYK	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Kinematic Analysis of Reverse Rotation DOLGAECHAGI in TAEKWONDO

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Abstract

Purpose: *The purpose of this study is to provide basic data for technical performance by analyzing and presenting differences in major kinematic factors in the take-off and flying phase and finally hitting phase with the national and non-national male demonstration team members as subjects.*

Method: *The subjects of this study were six members of the national team and six members of the non-national team with more than three years of experience in the demonstration. Prior to the experiment, consent was obtained from each subject, and the Kinematic data was collected using 14 digital cameras. The statistical processing of this study used Excel 2018 to calculate the mean and standard deviation(M±SD) and statistical programs to verify the differences in kinematic variables of the reverse rotation dolgaechagi. Shapiro-Wilk verification was performed to verify the normality of the collected data, and independent t-test and Mann-Whitney U test were performed to analyze the effect on kinematic parameters of the reverse rotation dolgaechagi of the national and non-national demonstration team members. The significance level of all statistics is set to α=.05.*

Results: *Experiments have shown that in order to increase the completeness of reverse rotation dolgaechagi, the timing and momentum of the takeoff are required due to the nature of the motion in the takeoff and flying phases and that the maximum body center vertical direction, left and right direction, and forward-and-frontal COM must be balanced to contribute to the overall stability of the body after rapid rotation. Force ankle joint and knee joint and maximum bend on hip joint are needed to move upward and complete a perfect reverse rotation dolgaechagi.*

Conclusion: *we found that, due to the nature of the reverse rotating dolgaechagi, the timing and momentum of the takeoff are needed to accurately secure the target position, and the role of balancing the body after a quick rotation and keeping the balance of the maximum body center vertical, left and right, and front and back are important factors to contribute to the stability of the entire body. We believe that further research is needed on the instantaneous speed of the body center, muscle activity needed, and analysis on the differences of the success and failure when reverse rotation is performed, which will greatly contribute to the improvement of the performance of the Taekwondo demonstration.*

[Keywords] ***Taekwondo, Reverse Rotation Dolgaechagi, Kick, Kinematic Analysis, Taekwondo Demonstration***

1. Introduction

Taekwondo represents a unique Korean martial art and currently has over 80 million people in 211 countries practicing it while growing into a physical culture loved by people across the world beyond race, ideology and religion[1][2].

The Taekwondo is a form of martial arts training that involves a series of attacks and defensive moves with various purposes. Taekwondo is largely divided into sparring, poomsae, and breaking[3]. The necessity of the research Taekwondo demonstration is a comprehensive

Taekwondo art that encourages people to learn Taekwondo by conveying the meaning and value of Taekwondo to the viewers by showing Taekwondo skills and tricks[4].

The early Taekwondo demonstrations began with demonstrations such as the relatively simple form of power breaking, leaping breaking, and self-defense, which emphasized practicality in critical situations, in order to achieve the secondary purpose of promoting Taekwondo. Later, with the changes of the times and the development of the social environment, it changed from traditional demonstrations of basic movements, poomsae, breaking, sparring, self-defense, etc. to a performance culture, such as thematic demonstration performances, to pursue and develop the artistic sublimation of Taekwondo demonstrations[5]. The demonstration was the origin of the early Korean Wave culture, and it is now recognized beyond a promotion event as a representative sport of Taekwondo along with poomsae and sparring[6]. Starting with the World Taekwondo Hanmadang hosted by the Kukkiwon in 1999, the demonstration has been gradually gaining recognition as a competition event and is moving toward development since 2014 with the creation of demonstration events at Taekwondo competitions under the supervision of universities such as the Korea National Sport University, Kyunghee University, and Yongin University[7]. In the early days of Taekwondo demonstration, the power breaking that breaks thick pine boards and tiles was dominant, but as the techniques advances, the high-level breaking techniques, such as rotation breaking, flying multi-hit breaking, and multi-directional breaking, have become more prominent[8].

The development of Taekwondo techniques caused variations in Taekwondo moves and the complexity of technique[9]. Among them, 360-degree reverse rotation dolgaechagi has been established as a breaking technology that represents the high-level breaking, just like the 540-degree back spin kick, which surprised people with its groundbreaking technique, surpassing the 360-degree rotation kicks(dolgae kick and back spin kick) that was first introduced in mid- to late 1980[10]. Understanding the correct technique is essential because 360-degree reverse rotation dolgaechagi is carried out in a different form from the existing dolgaechagi and has a complex technical system in which one leap is required to carry out the opposite rotation and kick, not the existing direction of rotation. Looking at the prior study on dolgaechagi to improve the performance[11], they said that the speed of the center of the body should be moved forward quickly during the movement, and in particular, shortening the preparation time would be an important factor. [12]reported that the hip joint is an important factor in applying the force of the ankle and knee joints to jump high in the vertical phase to hit targets[13], 13 evaluated the performance of outstanding and not-so-outstanding performers in order to enhance the completeness of dolgaechagi technique, while[14] presented an ideal kinematic model of dolgaechagi between sparring, poomsae, and breaking performers and reported on the major methods of performing the techniques used. As such, prior research is actively carried out to improve the technique, and various solutions for problems have been proposed to identify important kinematic factors. However, as the difficulty of the demonstration has developed, there is still a lack of theoretical research as the research on reverse rotation dolgaechagi has not been carried out properly, and it is expected to be a very meaningful study to find out the causes of ground and air movements that are different from the existing dolgaechagi. Therefore, the purpose of this study is to provide basic data for the performance by analyzing and presenting differences in major kinematic factors in the take-off phase, the flying phase, and the final hitting phase to the national and non-national male demonstration team members.

2. Method

The subjects of this study were six national team members with more than three years of experience in demonstration and six non-national team members to conduct the experiment. The general characteristics of the study subjects are as shown in <Table 1> and measuring tools and analysis equipment used in this study are as shown in <Table 2>. This study was conducted

in K University's exercise room, 14 digital cameras were used, installed at left, right, front, rear at 45° at intervals of 5m from the position where the subject performed the motion, and each camera height was fixed at 180cm. The speed of the camera was 300 frames/sec, and the shutter speed was 1/250sec prior to implementing the experiment, consent was sought from each subject and how to proceed with the experiment was explained. In order to reduce errors between shoots, the subjects took off their tops and wore black tights, and 37 reflective markers were attached to the left and right body joint points and segmented surfaces. In order to adapt to the experimental environment, the subjects were allowed to perform warm-up and practice sufficiently so that the correct movement could be performed[15]. The kicks were performed five times for each subject, and the most accurate and complete kick was selected and analyzed. The reverse rotation kick was set to a total of five phases and six events, each of which is defined as <Figure 1>. The statistical processing of this study used Excel 2018 to calculate the mean and standard deviation(M±SD) and statistical programs(SPSS 22.0, SPSS Inc., Chicago, IL, USA) to verify the differences in kinematic variables of the reverse rotation dolgaechagi. Shapiro-Wilk verification was performed to verify the normality of the collected data, and independent t-test and Mann-Whitney U test were performed to analyze the effect on kinematic parameters of the reverse rotation dolgaechagi of the national and non-national demonstration team members. The significance level of all statistics is set to α=.05.

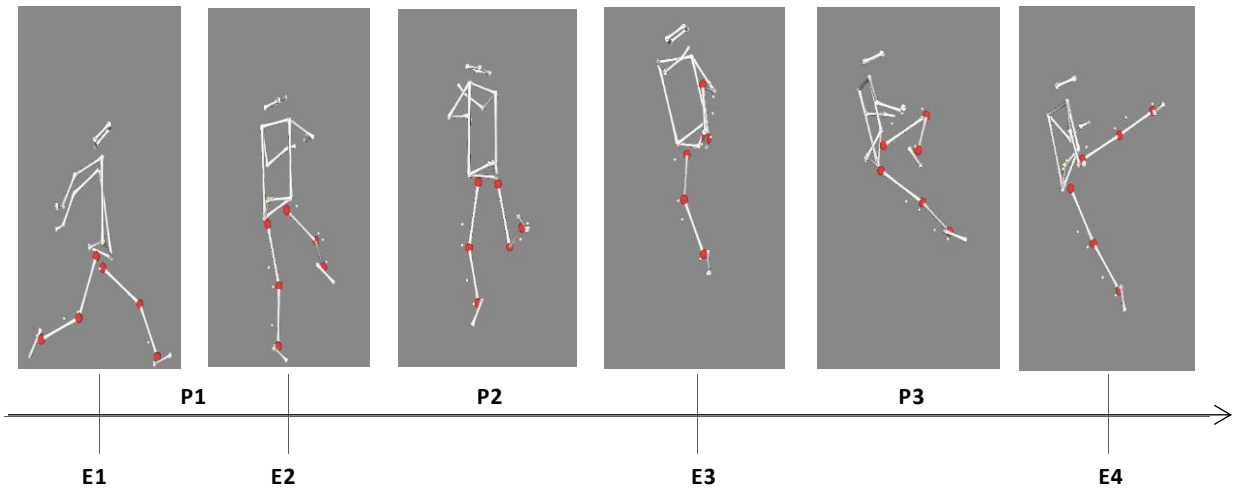
Table 1. Participantscharacteristic. (N =12)

N	Age	Height	Weight	Career
Skilled(6)	25.00 ±2.60	170.00±1.89	64.50±4.80	13.33±5.13
Unskilled(6)	22.50±1.38	169.17±5.07	63.16±4.83	11.00±2.37

Table 2. Measuring tools.

Instrument	Model	Company	Technique
Camera	Ventag v16 vero v2.2	VICON	3D Motion capture
Soft ware	KWON3D	VISOL	Analyze process

Figure 1. 5 Defined phase and event.



Event 1: The moment the left foot touches the ground after one initiates the motion
Event 2: The moment the left foot takes off from the ground
Event 3: The moment one reaches the highest vertical position after takeoff
Event 4: The moment one hits the target position

3. Result

3.1. Time variable analysis

The time required for Phase 1(P1), skilled performers showed a higher time than unskilled performers, but there was no statistically significant difference. The time required for Phase 2(P2) was higher for unskilled performers than for skilled performers and there was a significant difference between them($p < .05$). The time required for Phase 3(P3) was higher for skilled performers than for unskilled performers, but there was no statistically significant difference. Looking at the total performance time by phase, the national demonstration team showed a higher time than the non-national demonstration team, but there was no statistically significant difference. [12]reported that due to the nature of the Taekwondo events, it takes a faster time for sparring because they were supposed to hit the target fast, while the demonstration takes a longer time because they were supposed to jump high on the ground and hit the target with more accurate movements. In light of these results, it was found that the time required was more delayed than the previous study of standing jump dolgaechagi. The reverse rotation dolgaechagi exhibits a difference in flying time due to its rotating nature, which reduces the initial velocity to give a strong ground force on the takeoff and rotates at a high speed at the same time as the takeoff, resulting in an accurate target position <Table 3>.

Table 3. Lead time by each phase. (sec)

	Skilled	Unskilled	*t/Z*	*p*
P1§	0.20±0.02	0.19±0.02	1.190	.262
P2§	0.46±0.04	0.56±0.09	-2.475	.033*
P3§	0.54±0.04	0.45±0.11	2.051	.086
M±SD §	1.20±0.07	1.19±0.10	-.806	.420

Note: Mean±SD, #: Mann-Whitney U-test, §: Independent t-test, p-value: *$p<.05$.

3.2. Body center displacement

The results of the analysis of the body center displacement of reverse rotation dolgaechagi are as shown in <Table 4>. If you look at the shift displacement of the front and back of the body center(X), the knee position of the national demonstration team members was higher than the non-national demonstration team members at E1 in which the left foot touches the ground after the start and showed a statistically significant difference($p < 0.05$). In E2, where the left foot takes off from the ground, the national team members were higher than the non-national team members and showed a statistically significant difference($p<.05$). In E3, which is the highest vertical after takeoff, the national demonstration team members were higher than the non-national demonstration team members and showed statistically significant differences($p<.05$). In E4, where hitting the target position, there were some differences between the two groups, but no statistically significant differences. Body center left and right(Y) displacement showed statistically significant differences in E1 with the left foot touching the ground after initiation, with the knees of the national team members higher than those of the non-national team($p<.05$). In E2, the non-national team members showed statistically significant differences($p<.05$), and at E3, the national team members showed statistically significant differences($p<.05$). In E4, there were some differences between the groups, but no statistically significant differences. Body center up and down(Z) displacement showed a statistically significant difference at E3 with the national team members higher than those of the unskilled($p<.05$). In E1, E2, and E4, there

were numerical differences between the national and non-national groups, but there were no statistically significant differences. In light of these results, the national team members appear to have moved the body center displacement rapidly to the left and right in order to perform efficient movements, and in the front and back directions, the upper body moved backward to find stability in proportion to its height. As a result, it is believed that the height of the center of the body was lowered and the stability was increased at the moment the highest vertical position was achieved after takeoff. In the case of non-national team members, it is believed that the rotation radius was reduced due to missed timing of reverse rotation and the upper body was erected, resulting in high-center and low-stability movements. [11]reported that the reason why the skilled group could increase the speed of rotation by taking off the body quickly from the ground is because of the fast crossing of the landing foot and the kicking foot, which is to hit the target accurately. According to a study conducted by[16], the high body position in the air affects hitting the target, and it showed similar results to this study in which there were differences in front and back, left and right, and up and down movements between the two groups.

Table 4. Center of mass. (m)

		Group	Mean±SD	*t/Z*	*p*
X	E1#	Skilled	0.42±0.06	-2.562	.010*
		Unskilled	0.11±0.39		
	E2#	Skilled	0.29±0.09	-2.402	.016*
		Unskilled	0.03±0.26		
	E3#	Skilled	0.14±0.12	-2.242	.025*
		Unskilled	-0.08±0.12		
	E4§	Skilled	-0.10±0.21	.896	.391
		Unskilled	-0.20±0.20		
Y	E1§	Skilled	-1.66±0.30	-3.737	.004*
		Unskilled	-1.08±0.24		
	E2§	Skilled	-1.02±0.28	-3.347	.007*
		Unskilled	-0.57±0.19		
	E3§	Skilled	-0.49±0.26	-3.302	.013*
		Unskilled	-0.11±0.12		
	E4§	Skilled	0.21±0.32	-.951	.364
		Unskilled	0.36±0.22		
Z	E1§	Skilled	0.80±0.03	1.312	.219
		Unskilled	0.78±0.02		
	E2§	Skilled	1.11±0.02	1.539	.175
		Unskilled	1.06±0.07		
	E3#	Skilled	1.59±064	-2.242	.025*
		Unskilled	1.47±0.07		
	E4§	Skilled	1.27±0.08	.458	.657
		Unskilled	1.24±0.09		

Note: Mean±SD, #: Mann-Whitney U-test, §: Independent t-test, p-value: *p<.05.

3.3. Analysis of the angles of lower extremities

The result of the analysis of change of the hip joint angle for reverse rotation dolgaechagi are as shown in <Table 5>. Looking at the hip angle, in E1, the national team was higher than that of the non-national team and showed a statistically significant difference(p<.05). In E2, there was a numerical difference between the two groups, but there was no statistically significant difference. In E3, there was a statistically significant difference between the two groups(p<.05), and in E4, the national team were higher than those of the non-national team and showed a statistically significant difference(p< .05). These results are believed to have kept the hip angle

as extended as possible with the center of the gravity back at takeoff to receive ground reaction compared to the unskilled performers and to perform a perfect kick at the correct target point by raising the knee as fast as possible vertically for a high vertical jump. The unskilled performers are judged to have failed to secure the target position precisely because they performed the kick in a rotating state that did not reach the target point. According to a study by[17], the lifting foot will land from the heel, so keeping the hip angle as extended as possible has a significant impact on raising the body center. [11]'s study showed similar results to the results of the study, as it reported that performers were able to perform powerful movements at the target position by rotating the hip to the center of the body with the proper flexion of the hip joint until the impact was applied to the target with a maximum angle of the hip joint after take-off. The result of the analysis of change of the knee joint angle for reverse rotation dolgaechagi are as shown in <Table 5>. Looking at the knee angle, in E3, the national team was higher than that of the non-national team and showed a statistically significant difference($p < .05$). In E1, E2, E4, there was a numerical difference between the two groups, but there was no statistically significant difference. [14]reports that a high knee position of the crossing legs to raise the body center affects the high hitting point and hitting power. In light of these results, it is believed that the national team performers extended the knee joint to enhance the stability of the body center at the moment when the maximum vertical position is achieved after takeoff. The result of the analysis of change of the ankle joint angle for reverse rotation dolgaechagi are as shown in <Table 7>. Looking at the ankle joint angle, in E1, E2, E3, and E4, there was a numerical difference between the two groups, but there was no statistically significant difference.

Table 5. Lower limb joint angle. (deg)

			Group	Mean±SD	*t/Z*	*p*
Hip	E1	R#	Skilled	144.22±6.28	-2.242	.025*
			Unskilled	132.57±11.44		
		L§	Skilled	87.49±8.72	1.287	.227
			Unskilled	81.98±5.80		
	E2	R#	Skilled	87.21±11.91	.773	.463
			Unskilled	82.99±6.01		
		L#	Skilled	115.92±8.03	.227	.825
			Unskilled	115.12±3.14		
	E3	R§	Skilled	126.89±12.61	2.532	.030*
			Unskilled	104.04±18.17		
		L#	Skilled	54.48±19.28	-2.242	.025*
			Unskilled	92.59±18.51		
	E4	R§	Skilled	79.09±9.38	2.548	.029*
			Unskilled	66.59±7.499		
		L§	Skilled	94.54±7.84	-1.238	.244
			Unskilled	103.51±15.93		
Knee	E1	R§	Skilled	128.18±9.36	1.963	.078
			Unskilled	118.13±8.35		
		L#	Skilled	152.31±5.78	1.748	.111
			Unskilled	141.35±14.23		
	E2	R#	Skilled	69.10±5.07	-1.873	.091
			Unskilled	77.81±10.20		
		L#	Skilled	161.01±2.64	-1.417	.187
			Unskilled	163.24±2.81		
	E3	R§	Skilled	138.90±17.28	2.868	.017*
			Unskilled	90.50±37.55		
		L§	Skilled	66.17±10.94	-2.291	.058
			Unskilled	92.99±26.51		
	E4	R	Skilled	146.68±34.09	-.320	.749
			Unskilled	143.51±47.12		
		L§	Skilled	163.09±7.45	.421	.683

			Unskilled	160.97±9.81		
Ankle	E1	R§	Skilled	132.94±10.71	1.587	.144
			Unskilled	117.82±20.74		
		L§	Skilled	98.38±4.69	-.355	.730
			Unskilled	99.96±9.90		
	E2	R#	Skilled	118.17±15.71	.406	.693
			Unskilled	114.69±13.83		
		L§	Skilled	124.51±3.63	1.341	.210
			Unskilled	121.40±4.37		
	E3	R§	Skilled	126.20±20.96	1.008	.347
			Unskilled	116.68±9.78		
		L§	Skilled	105.95±7.06	-.815	.434
			Unskilled	110.14±10.41		
	E4	R§	Skilled	140.17±5.52	1.709	.130
			Unskilled	131.41±11.28		
		L§	Skilled	126.40±14.54	.271	.792
			Unskilled	124.37±11.22		

Note: Mean±SD, #: Mann-Whitney U-test, §: Independent t-test, *p*-value: **p*<.05.

4. Conclusion

We found that, due to the nature of the reverse rotating dolgaechagi, the timing and momentum of the takeoff are needed to accurately secure the target position, and the role of balancing the body after a quick rotation and keeping the balance of the maximum body center vertical, left and right, and front and back are important factors to contribute to the stability of the entire body. In order to jump high in the vertical phase to hit the target as the national performers do, it is important to apply force to the ankle joint and the knee joint and to fold the hip joint. We believe that further research is needed on the instantaneous speed of the body center, muscle activity needed, and analysis on the differences of the success and failure when reverse rotation is performed, which will greatly contribute to the improvement of the performance of the Taekwondo demonstration.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	BSH	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	HTL	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	JKL	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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