ORIGINAL ARTICLE

Structural relationship among resilience, psychological skills and performance of taekwondo sparring athletes

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Abstract

Background and Study Aim: As levels of athletes (players') skills and physical strength have been standardized, more and more studies have stressed the importance of social and psychological. This study is aimed at understanding the structural relationship among resilience, psychological skills and performance of high school taekwondo sparring athletes.

Material and Methods: For the study, 400 high school athletes were selected. For measurement, question papers for testing their resilience, psychological skills and performance were used as tools. Excluding 31 papers considered as improper due to unfaithfulattention replies, the questionnaires of 359 respondents were used for statistical processing. Descriptive statistics, a correlation analysis and a structural equation model analysis were executed for treating data.

Results: In this study, all of four hypotheses were adopted. The structural relation model about resilience, psychological skills and performance established in this study is adequate.

Conclusions: Meanings of hypotheses were interpreted as follows. Resilience of high school taekwondo sparring athletes improves their ability to utilize psychological skills and has positive effects on performance improvement. In addition, psychological skills work positively between resilience and performance.

Keywords: anxiety control • confidence • martial arts

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Game – *noun* 1. a sporting or other activity in which players compete against each Rother by following a fixed set of rules **2.** an occasion when a competitive game is played **3.** in sports such as tennis, a subsection of play that goes towards making up a set or match **4.** the total number of points needed to win a contest [90].

Match – *noun* 1. a contest between opponents, especially a sporting contest **2.** somebody or something capable of competing equally with another person or thing [90].

Performance – ***noun*** the level at which a player or athlete is carrying out their activity, either in relation to others or in relation to personal goals or standards [90].

Ability – *noun* 1. a natural tendency to do something successfully or well **2.** a high degree of intelligence or competence **3.** a particular gift for doing something well [90].

Capacity – *noun* 1. The ability to do something easily **2.** the amount of something that a container or organ can hold **3.** the amount of something that can be produced or the amount of work that can be done [90].

Stress – ***noun* 1.** physical pressure on an object or part of the body **2.** a factor or combination of factors in a person's life that make him or her feel tired and anxious **3.** a condition in which an outside influence such as overwork or a mental or emotional state such as anxiety changes the working of the body and can affect the hormone balance [90].

Sports psychology – ***noun*** the scientific study of the mental state of sportspeople, looking at issues such as motivation, concentration, stress and self-confidence [90].

Technique– ***noun*** a way of performing an action [90].

Competition training – ***noun*** athletic training that specifically prepares the athlete for the competition situation [90].

Anxiety – ***noun*** the state of being very worried and afraid [90].

INTRODUCTION

Necessity of the study

As levels of athletes (players') skills and physical strength have been standardized, more and more studies have stressed the importance of social and psychological factors [1-4]. Studies in the past mostly talked about performance with reference to just skills. The argument that athletes' performance can be improved not only through factors related to skills and physical strength but also when the factor of psychology to overcome hardships is added has been widely acknowledged [5]. With this, resilience has attracted the keen interest of athletes in sports psychology as an alternative to overcome negative situations or hardships and to control mental pressure.

Resilience, which refers to 'mental resistance', is the power to overcome individual hardships and to successfully adapt to them [6-10]. Resilience, in particular, means an ability to overcome physical and psychological difficulties and successfully adapt to a new environment when people are suffering from those difficult situations [11]. Therefore, a focus is placed on individual abilities and resources to properly and flexibly handle circumstances, instead of faults and weak points [12].

Resilience is used as a key factor for improving individual achievements and capacity [13]. As a result, taekwondo sparring athletes with high-level resilience can improve their performance through improving their individual athletic abilities. Performance especially is very important for all athletes in sports situations [14, 15], and elite competitors with remarkable athletic abilities have firm and stable confidence in themselves [16]. Considering those aspects, the high resilience of taekwondo sparring athletes will become a resource for enhancing their performance and for recognizing their capacity.

From such a viewpoint, resilience can affect mental skills which are called individual psychological competency or change in mental states. Resilience, in particular, is reflected by the two aspects of adversity and adaptation [7] and continuously works even in stressful circumstances [9], so it can be used to handle pressure experienced in the middle of doing exercise performance and as a resource of positive adaptation and growth. Furthermore, resilience can have positive effects on the improvement of the mental skill capacity at the right time and right places when athletes do competition training and take part in competitions.

Mental skills comprise all mental strategies and techniques necessary for overcoming pressure and maximizing performance through controlling thoughts and feelings in sports situations [17] or the abilities to draw out the best performance through controlling mental states. Mental skills refer to the psychological competency which athletes should have [4]. Mental skills that feature the abilities to draw out the best performance through controlling their mental states consist of cognition, behavioral routines, positive self-control, the handling of pressure, regulation of anxiety and awareness, and a sense of confidence [2, 18, 19]. As mental skills work as key factors [20] directly affecting performance improvement, athletes with higher levels of mental skills will possibly display better performances at competitions [21].

Combined with the above-mentioned resilience, mental skills can bring synergy effects during competitions. As mental skills are the individual abilities to not only overcome difficulties present in sports situations but also the capability to draw out the best performance through controlling mental states [22], they are expected to bring mediated effects in the relationship between resilience and performance of taekwondo athletes.

Resilience of judokas has a negative effect on exhaustion and stress and has positive effects on the intention to do exercise [23]. Judo is combat sport similar to taekwondo. To athletes, resilience is a resource for buffering against stress and total exhaustion. Such a resource can directly and indirectly affect the intention to do exercise and intrinsic motivation through reducing negative attitude[24]. Moreover, it contains the element of mental immunity [25] to stress or adversity and mental skills also work as a strategy for controlling negative attitude [26, 27], so resilience will improve mental skills and, as a result, will raise performance.

Unfortunately, there have been only a small number of studies on the resilience of taekwondo sparring athletes in comparison with those about other items. Sparring (training competition) creates competitive situations because of frequent body contacts, and slumps

or injuries taking place in the process weaken performance and, in the end, aggravate athlete psychological tenseness. In addition, to be exposed to competitive situations excessively leads to mental, emotional and physical exhaustion [4, 28-30] and causes mental conflicts, such as the lowering of the ability to concentrate, reduction in attentiveness and the loss of confidence. People who previously studied taekwondo performance have emphasized the necessity to boosting athlete mentality and to develop their performance through integrating psychological factors, such as resilience [31, 32].

This study targeted high school taekwondo athletes for the following reasons. First of all, there actually are many drop-outs among student athletes. There are about 100,000 student athletes in Korea [33]. About 24% of student athletes withdraw from sports teams every year and no more than 10% of them remain as athletes [34]. Students leave sports teams due to hard and painful training, stress from their performance, injuries, conflicts with their trainers and colleague athletes and violence [34].

Next, they are placed under the double burden of doing sports and studying. It is important for student athletes to improve their abilities to perform exercise, to develop to be professional athletes and to adapt to their studies and campus life. Student athletes in Korea are experiencing various psychological difficulties due to such double and separated roles, but no educational or systematic assistance is provided to them for preventing these kinds of difficulties [1, 10, 35]. For these reasons, resilience is an important factor for high school student athletes in terms of sports and school life.

Overall, resilience is expected to be accepted as an important social and psychological factor for student athletes in a development stage. Additionally, resilience apparently has positive effects on performance. Moreover, athlete resilience affects their psychological skills and will have positive effects on their performance through using mental skills.

This study is aimed at understanding the structural relationship among resilience, psychological skills and performance of high school taekwondo sparring athletes.

Decomposition of the research aim into hypotheses

Hypothesis 1: relationship between resilience and psychological skills

As resilience contains skills for successfully coping with hardships and an ability to adapt to them [36], it can be used as athlete strong point through properly dealing with stress and negative situations [37]. Successful experiences in overcoming adversity improves psychological well-being [38], an ability to control oneself [39], happiness felt through overcoming adversity [40], and most of all, resilience.

The fact that resilience has positive effects on diverse social and mental factors is expected to form a close relationship with the intentional changing of psychological standards and states. Hence, *hypothesis 1 is 'resilience of high school taekwondo sparring athletes will have positive effects on psychological skills.'*

Hypothesis 2: relationship between resilience and performance

Resilience enhances mental immunity during episodes of stress or adversity [25] and can lead to an above-average performance ability [41]. Higher-level resilience leads to higher abilities to conduct jobs [36] and has positive effects on results [42-44]. In sports, athletes perceive positive results, such as formation of new viewpoints, motivation and mental power improvement, through resilience [45, 46]. Most of all, resilience positively affects performance [23, 47]. According to previous studies, resilience is expected to have positive effects on taekwondo athlete performance. In consequence, *hypothesis 2 is 'resilience of high school taekwondo sparring athletes will have positive effects on performance.'*

Hypothesis 3: relationship between psychological skills and performance

During competitions, athlete mental states rapidly change in accordance with game (match) situations. Such change is directly connected with the results of games [2, 22, 48, 49]. Regarding members of the national taekwondo team, Lim [30] reported that mental skill training positively affected their performance. Lim [21] found that athletes who got medals in the Olympic Games used mental skills better than other athletes and their stable mental states were maintained well. Lim and O'Sullivan [4] said that athletes with higher skills were more mentally prepared through

Negative attitude – *noun* a pessimistic mental attitude towards an activity that may decrease the chance of succeeding [90].

Motivation – *noun* **1.** the act of giving somebody a reason or incentive to do something **2.** a feeling of enthusiasm, interest, or commitment that makes somebody want to do something, or something that causes such a feeling **3.** the biological, emotional, cognitive, or social forces that activate and direct behaviour [90].

RMSEA – Root Mean Square Error of Approximation.

AVE – Average Variance Extracted.

CFI – Comparative Fit Index.

GFI – Goodness-of-Fit Index.

TLI – Tucker-Lewis Index.

LLCI – Lower Limit Confidence Interval.

ULCI – Upper Limit Confidence Interval.

mental skills. According to Eom et al. [50], elite taekwondo athletes get help with regard to competition anxiety, condition controlling, psychological states, emotional control and performance improvement through taking part in mental skill training. Therefore, *hypothesis 3 is 'psychological skills of high school taekwondo sparring athletes will have positive effects on their performance.'*

Hypothesis 4: mediated effects of psychological skills in relationship between resilience and performance

Resilience is a mental resource helping players adapt themselves to challenging situations [51]. In recent times in sports, not only victory and defeat but also mental aspects are stressed as standards for assessing athlete performance [52]. According to reports, athlete mental skills are a sufficient condition for performance improvement and growth [53, 54]. As psychological skills promote a sense of confidence, raise attention and help athletes control anxiety through enhancing motivation, they are closely related to performance [55-57]. Therefore, *hypothesis 4 is 'the factor of mental skills will have mediated effects on the relationship between resilience and performance of high school taekwondo sparring athletes.'*

MATERIAL AND METHODS

Study Participants

The study was conducted with regard to 400 athletes registered in the Korea Taekwondo Association. Questions were asked using the purposive sampling method which was one of the non-probability sampling methods. Questionnaires were distributed and 359 copies, excluding 41 copies containing unfaithful replies were used for statistical treatment. Demographic characteristics of respondents were suggested regarding the gender (237 males, 122 females), grades (90 first graders, 121 second graders, 148 third graders), athletes career (42 with a career of three years or shorter, 75 with a career from four to six years, 111 with a career from seven to nine years, 131 with a career of 10 years or longer), and prize-winning records (six winners in national competitions, 151 advanced to quarter-finals, 120 winners in regional competitions, 82 advanced to quarter-finals in regional competitions).

Measuring instruments and validity

Measuring instruments

For this study, three measuring instruments were used. First, a resilience scale developed by Shin et al. [58] was used to measure resilience of middle and high school taekwondo sparring athletes. This scale, which was developed for juveniles, has three sub-factors of control, positivity and relationship. Its detailed factors – an ability to analyze causes, an ability to control feelings, an ability to control impulses, to appreciate, life satisfaction, optimism, relationship, an ability to communicate and an ability to sympathize – consist of a total of 27 questions.

Second, three factors, a sense of confidence, attention and anxiety control, representing psychological sports skills were selected from the Korean-version tennis mental skill testing paper [59]. These three factors have received responses most frequently in the process of investigating mental skills and they were selected based on a previous study [4] which analyzed that those factors worked as the most important elements for performance.

Finally, key factors forming taekwondo performance were used based on a questionnaire about perceived performance developed by Mamassis and Doganis [60] for tennis players. The elements were related to skills, timing and actual performance, which consisted of a total of three questions. For development of taekwondo performance, skills to bring other athletes under control, timing for getting points and an ability to actually perform due to the characteristics of combat sports are more important than anything else [4]. All questions of this study were composed with a five-point Likert scale from one to five points.

Validity

An analysis of descriptive statistics was executed to confirm normal distribution of data [61]. According to the analysis, the average of performance (M = 3.301, SD = .651) was lowest and that of resilience (M = 3.676, SD = .409) was highest. All of the measurement variables were higher than intermediate values.

According to West et al. [62], skewness and kurtosis have a standard of two or lower and seven or lower, respectively. In this study, skewness was −.353~.612 and kurtosis was −.508~.662, suggesting that measurement

Table 1. Results of a Confirmatory Factor Analysis of the Entire Measurement Model.

Variables	Items	Standardization factor load	Factor load	t	Concept reliability
Resilience	Sociability	.703	1.000	-	.973
	Positivity	.694	1.056	10.392	
	Control	.760	.997	10.738	
Psychological skills	Attention	.687	1.000	-	.846
	Anxiety control	.730	1.112	10.392	
	Confidence	.715	1.237	10.314	
Performance	Actual performance	.707	1.000	-	.901
	Timing	.829	1.133	13.548	
	Skill	.847	1.125	13.632	

χ^2 = 29.104(df = 24, p=.216), GFI = .982, TLI = .993, CFI = .995, RMSEA = .024

variables assumed normal distribution. Next, Cronbach's alpha coefficient was extracted. Internal consistency of each factor was .751~.835 satisfying .70 [63], the normally adopted standard of reliability.

A confirmatory factor analysis was executed to confirm construct validity (Table 1). According to the analysis, χ^2 = 29.104 (df = 24, p = .216), GFI = .982, TLI = .993, CFI = .995, RMSEA = .024, thus generally satisfying standards. In addition, all of the factor loads of measurement items about three potential factors measured by reflective measures were statistically significant (t>10.00). The AVE was .505~.635 and concept reliability was .846~.973, satisfying standards (AVE .5 or higher, concept reliability .7 or higher) suggested by Hair et al. [64].

Finally, the AVE of each of two potential factors suggested by Spreng et al. [65] and the correlation square between these two potential factors were compared to confirm discriminant validity. Size of the correlation square among all potential factors of this study was .112~.161. As a result, the AVE of this study had a smaller value than .505 of the smallest mental skill, so potential factors of this study were interpreted as having discriminant validity.

Study procedure

A survey was conducted about high school athletes who took part in the 28th Yong-In University Presidential Cup National Taekwondo Championship (Date: April 2~8, 2018, Place: Haenam in South Jeolla Province. Two investigators who were fully aware of the survey method in advance and the researcher visited the arena to conduct the survey. Respondents gave replies using a self-administrated method after listening to explanations about meanings and purposes of the study. It took about 10 minutes for them to fill out questionnaires and those questionnaires were collected at the site.

Data processing

Collected data was processed statistically using SPSS 21.0 and AMOS 21.0 statistical programs. An analysis of descriptive statistics was executed to figure out demographic characteristics of samples and characteristics of important variables contained in study models. To verify the validity of questionnaires, a confirmatory factor analysis was conducted and Cronbach's alpha coefficient was produced. Finally, a correlation analysis and a structure equation modeling (SEM) analysis were conducted to figure out structural relations among variables.

The hypothesis of this study is to verify the mediated effects of psychological skills in the relationship between resilience and performance. For this, direct effects and total effects were compared to verify mediated effects of psychological skills which worked as indicators in a theoretical model, and the bootstrapping technique was used for verifying significance about it. In addition, reverification was performed using PROCESS Macro model 4 proposed by Hayes [66, 67] in order to increase the strictness of statistical verification. The confidence interval was set at about 95% and resampling was executed about 10,000 times.

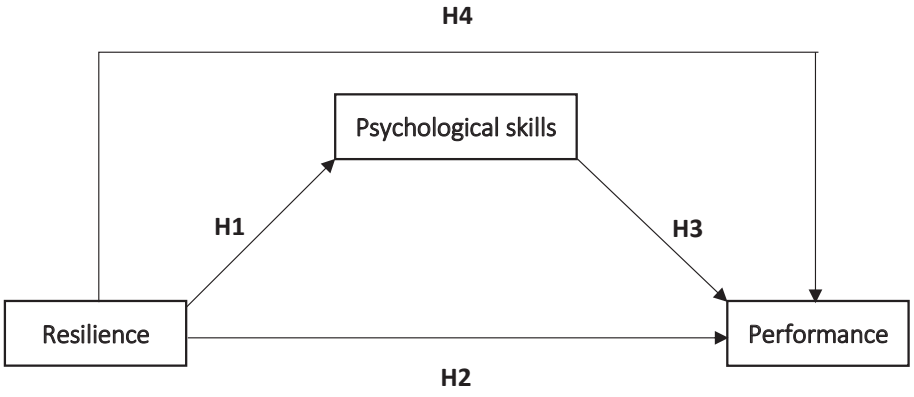

Figure 1. Study model.

Adequacy of study models

A structural model was established to figure out the effects of resilience on psychological skills and performance and effects of psychological skills on performance specifically (Figure 1).

RESULTS

Correlation analysis

According to the study, the relation between resilience and mental skills and performance was .397 and .335, respectively, and the relation between mental skills and performance was .401. Correlations between resilience and each variable, between mental skills and each variable, and between performance and each variable had statistically significant values in the range of .335~.401 (Table 2).

The level of overall fit was confirmed through verifying structural equation modeling for hypothesis verification (Table 3). The result was x^2 =29.104,(df = 24, p = .216), GFI = .982, TLI = .993, CFI = .995, RMSEA = .024 and the entire model was thought to be highly appropriate. Accordingly, it was found that there would be no problems for explaining hypotheses and the model established in this study.

Verification of hypotheses in the study model

Individual hypothesis was verified as the model established in this study was considered as proper and the results are shown in (Table 4). First of all, the relationship among standardization path coefficient is as follows. Resilience and psychological skills (path coefficient = .926, t = 6.809, p<.001), resilience and performance (path coefficient = .414, t = 3.050, p<.01), and psychological skills and performance (path coefficient = .376, t = 4.687, p<.001). As all of three the hypotheses had statistically significant positive relations, they were adopted.

Based on the above results, resilience and psychological skills exerted a relative influence

Table 2. Descriptive statistics and correlation analysis among measurement variables.

Variable	1	2	3
1.Resilience	.973		
2.Psychological Skills	.397** (.158)	.846	
3.Performance	.335** (.112)	.401** (.161)	.901

** p<.01, () is the square of a correlation coefficient and the shaded part is AVE.

Table 3. Fit of research model.

Indices		df	GFI	TLI	CFI	RMSEA
Standard	-	-	.9 or higher	.9 or higher	.9 or higher	.05 or less
Values	29.104	24	.982	.993	.995	.024
Accept	-	-	fit	fit	fit	fit

Table 4. Results of hypothesis testing.

Hypotheses	Paths	Path coefficient	Standardized regression coefficient	Standard error	t-value	Adoption
1	Resilience → Psychological skills	.926	.526	.136	6.809***	Adopted
2	Resilience → Performance	.414	.235	.136	3.050**	Adopted
3	Psychological skills → Performance	.376	.376	.080	4.687***	Adopted

**p<.01; ***p<.001

on performance (standardization path coefficient = .235, p<.01) and it was determined that (standardization path coefficient = .376, p<.001), psychological skills had a greater influence than resilience.

Mediated effects of psychological skills were verified in the relationship between resilience and performance. As a result, total effects were .433, direct effects .235 and indirect effects .198 (Table 5). As it was found that there were direct effects between resilience and performance through verifying the hypothesis, it can be said that there are partial mediated effects of psychological skills. After confirming indirect effects using PROCESS Macro model 4, size of indirect effects of resilience which had significant effects on performance through the medium of psychological skills was .2009 (Table 6). Regarding the confidence interval, the LLCI was .1174 and the ULCI was .2941. As 0 was not included within the confidence interval, statistical significance of indirect effects was secured. In consequence, psychological skills have partially mediated effects on resilience and performance.

DISCUSSION

After analyzing the importance of the resilience of high school taekwondo sparring athletes on their psychological skills and performance, <*hypotheses 1 and 2*> were adopted. In other words, as the resilience of those athletes increased, their psychological skills and performance improved. Such a theory supports the results of Mack's study [68] which maintained that athletes with greater resilience could reach a mental state to leap to the next level and acquire necessary mental skills, and also supports a study [36] which stressed that people with higher levels of resilience had higher abilities to execute their jobs as well as a study [42, 43, 45] which noted that higher resilience had positive effects on performance.

Student athletes, in general, experience various mental difficulties internally and externally during exercise performance. In the process, whether they can overcome difficulties or not depends on a proactive attitude to identify problems and solve them. Sports athletes with higher resilience tend to use adversity and hardships to bring about positive psychological change [46]. Such a study result suggests that high school taekwondo sparring athletes interact with factors

Table 5. Results of indirect effect testing.

Path	Direct effects	Indirect effects	Total effects
Resilience ⟶ Psychological skills	.526		.526
Resilience ⟶ Performance	.235	.198**	.433
Psychological skills ⟶ Performance	.376		.376

**p<.01

Table 6. Results of mediated effect testing.

Independent variable	Dependent variable	Indicator	Indirect Effect	SE	LLCI	ULCI
Resilience	Performance	Psychological skills	.2009	.0449	.1174	.2941

which threaten their individual safety, reduce their danger and reveal psychological skills to minimize negative influences.

Considering those studies which maintained that resilience formed the basis for the ability of athletes to successfully cope with and adapt to difficulties [69] and that higher levels of resilience led to positive change in athlete's life and mental resources [10, 38, 39], it is essential to encourage high school taekwondo sparring athletes to develop resilience and to cultivate resilience so it can be used as a psychological resource. As athletes increasingly perceive stress and anxiety, which are their chief mental problems, their recuperative powers [70, 71] and motivation to solve them decline [72]. Most of all, the resilience of high school taekwondo sparring athletes is expected to be meaningfully used in sports situations and competitive events.

In the meantime, high school taekwondo sparring athletes suffer due to the demands imposed by training and adaptation to campus life and feel under pressure because of schoolwork [1, 73, 74], so they should develop resilience to maintain a good psychological balance. When they develop a high level of resilience in training and schoolwork, it is highly possible that they will be able to remain calm by using various mental skills obtained from mental well-being. In the process, resilience can play the role of a catalyst for developing psychological skills and maintaining stable mental states [46, 69].

Furthermore, resilience can promote solutions to problems through requests for help among leaders and friends of the same age. Cohn [75] reported that children with high resilience displayed various communication abilities in difficult situations and had the confidence to ask adults for help. According to such a viewpoint, high school taekwondo sparring athletes can cultivate mental strategies and skills to alleviate conflicts and stress through building friendly relations with student athletes of the same age. Follow-up studies are required to find ways to develop psychological capabilities through fostering student athletes' resilience.

After analyzing the effects on resilience and performance of high school taekwondo sparring athletes, <*hypothesis 2*> was adopted. Such a result is interpreted as meaning that higher resilience leads to better performances. The result confirms previous studies which stressed that athletes with higher resilience had stronger mental immunity [25], higher self-positivity [76] and above-average functions [41]. It also supports existing studies which reported that higher levels of resilience led to higher abilities to perform jobs [36] and had more positive effects on achievements [42-44].

People with higher levels of resilience means that they have firmer and more stable confidence in themselves [16]. It seems that student athletes taking part in this study believe they can develop their performance through establishing cognitive and behavioral strategies necessary to achieve the best performance based on confidence in themselves and resilience. Such a result is interpreted in the same context as a previous study which said that student athletes could achieve better performances through adapting themselves to difficult circumstances without losing heart [77]. When they are in these kinds of situations, it is difficult for them to have a firm belief

in themselves. Hopefully, there will be more studies about mental techniques for developing resilience and performance specifically, coaching techniques and intervention strategies, and studies will not continue to focus on the relationship between resilience and performance.

After analyzing the relationship between psychological skills and performance of high school taekwondo sparring athletes, <hypothesis 3> was adopted. Such a result is interpreted as meaning that athletes with higher abilities to use their psychological skills possibly display much improved performances at competitions. Such a result coincides with previous studies which identified the relationship between psychological skills and performance [30, 78-82]. In addition, it supports studies which looked into the effectiveness of applying psychological skills training in various sporting events [3, 83-86].

Considering the fact that athletes who display a high level of skills in actual competitions usually maintain and control their mental levels and states well [21], psychological skills and performance are closely related. It means that athletes can reach the highest level of performance when they control game (match) situations based on psychological advantages, including confidence, concentration and positive attitudes. As the environment of sparring competitions induces fierce competition and frequent body contacts and competitors must display their skills under unpredictable conditions, it is most important for athletes to exert their ability to control mental states. Even athletes who possess remarkable abilities to perform exercise can experience subtle changes in their mental states depending on actual competition situations [2, 20, 21, 87-89], so they need psychological skills and strategies to positively cope with such challenges.

Finally, after an analysis was conducted about the mediated effects of psychological skills in the relationship between resilience and performance, <*hypothesis 4*> was adopted. This was understood as verifying the partially mediated effects of resilience because resilience apparently had direct positive effects on performance and indirect effects on performance through psychological skills. Resilience is used as a powerful mental resource by athletes at sporting events [51] and psychological skills help athletes form confidence, raise attention and control anxiety [55-57]. As a result, psychological skills can be used as a basis for assessing performance [52].

People can infer that athletes will make better efforts for recovery and improve their abilities to use their psychological skills through perceiving higher levels of resilience. In this way, their performance can be ultimately improved. Regarding this, Podlog and Eklund [45] studied athletes who began to distinguish themselves after recovering from injuries. According to the study, athletes experience negative emotions and conflicts in the process of recovering from injuries but they also perceive positive mental resources, including an increase in new viewpoints and motivation and an improvement in mentality. Athletes endlessly exchange the effects in structural relations among resilience, psychological skills and performance under very complicated sports environments. As high school taekwondo sparring competitors are taking courses to develop into professional athletes, in particular, they can cultivate high resilience through acquiring mental skills after gaining various experiences and this can make a contribution to ultimately improving their performance by way of enhancing their ability to adapt.

Taken together, it is more important for high school taekwondo sparring athletes to use mental resources than to promote abilities to perform sports. In addition, they should increase their technical capacity to develop them. Such a prediction becomes firmer when they develop them with resilience and acquire the capacity to use them.

Recommendations

The above discussion stresses the importance of psychological resources for achieving the remarkable performance of high school taekwondo sparring athletes and drew implications accordingly. Owing to the limitations of this study, future studies should be conducted considering them. Suggestions for follow-up studies are as follows.

First, this study was focused on the positive psychological attitude of high school taekwondo sparring athletes to figure out the relationship between it and their performance. This study apparently expected how positive thoughts and recognition conversion through them produced positive results, but on the other hand, it overlooked the possibility that this might cause negligence in exercise. In consequence, follow-up studies should look into variables used in this study and effects adjusted by negative factors.

Second, this study was cross-sectional designed on the basis of a competition held at a university. Athletes can't simply possess resilience and psychological skills at a certain point of time. They can improve them only when efforts to develop them are accumulated. It is necessary for follow-up studies to be executed longitudinally. Hopefully, future research will be conducted to specifically discuss the roles of resilience, development processes of psychological skill capacities and their influence utilizing this study.

CONCLUSIONS

All hypotheses have been verified positively (adopted). Overall, the structural relationship model about resilience, psychological skills and performance established in this study is appropriate. Resilience of high school taekwondo sparring athletes improves their ability to utilize psychological skills and has positive effects on performance improvement. In addition, psychological skills work positively between resilience and performance.

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