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The Effect of Sound Wave Application Training on the Psychological Skills of Volleyball Players

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Abstract

In this study, we extracted sound waves that can improve psychological skills for volleyball players, investigated the changes that the application training of the extracted sound waves has on the brain waves of volleyball players, and the changes in brain waves are the psychological of volleyball players. The purpose of the research is to investigate the effect on technology. In order to achieve this purpose of the study, a total of 10 people from the experimental group and 10 from the control group were selected as the research subjects of university volleyball players with more than 5 years of volleyball experience. The experimental procedure was for the experimental group to listen to sound waves for more than 30 minutes at least 4 times a week for 12 weeks, and brain waves were measured 3 times before, during, and after. In addition, psychological skills were measured twice before and after. The measured data were subjected to t-test and two-way variance repeated measures analysis using SPSS 20.0. The results obtained through this process are as follows. First, as a result of analyzing the differences in psychological skills according to sound wave application training, there were statistically significant differences in goal setting and attention factors of the experimental group. Second, as a result of repeated measurement variance analysis at each time point according to the application of the sound wave application training program, it was found that alpha waves had a synergistic effect at the statistical significance level in the experimental group. Third, as a result of repeated measurement variance analysis at each time point according to the application of the sound wave application training program, it was found that the beta wave had a synergistic effect at the statistical significance level in the experimental group.

Keywords: *Sound wave Application Training, Psychological Skills, Confidence, Attention, Goal setting, Brain Waves, Volleyball Players*

1. INTRODUCTION

It can be said that all sporting events are evaluated in the environment of a match. Even if they usually show excellent performance in the practice situation, there are often cases in which the players show a marked difference in performance from the practice situation due to their own physical, mental, and psychological reactions in the competition environment. In addition, the outcome of a sports competition can fully affect the potential of individual athletes or teams. The general view that it is typically dependent on some physical and psychological traits and the outcome of the best exercise performance is determined by the overall interaction

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of physiological, mechanical and psychological factors. It can be said that it will be done. It has been constantly identified in many previous studies that psychological factors are important factors that govern exercise performance [1, 2]. A volleyball game is also necessarily accompanied by a situation of competition. During practice, the athlete often shows his/her own athletic performance to the fullest, but when he enters a competitive situation, he/she is often unable to show his/her usual athletic performance to the fullest.

Although physical strength, physical functions, tactics, and strategies are normally exhibited relatively stable, when confronted with a competitive situation, various psychological factors that are not coincidentally acted, leading to a loss in a match that was less than expected. Therefore, psychological factors can be said to be very important factors in competitive situations. Recent studies on sports psychology have shown great interest in identifying the causes and effects of pleasant or unpleasant emotional states on exercise performance [3, 4]. Exercise performance can be fun and enjoyable depending on the emotional state of the athlete, or it can be the cause of dislike or avoid participating. Therefore, it can be said that sports competition requires strong and special emotional experiences. That is, even in volleyball games, when all of the psychological factors such as physical factors, concentration, mental power, personality, motivation, aggression, desire level, self-concept, competitive anxiety, cohesion, and attention patterns are in harmony, the best performance will be achieved [5, 6]. it can be seen that. When such various factors become imbalanced, the competitiveness naturally declines. As psychological factors affecting the performance of athletes, various factors such as concentration, mental power, personality, motivation, aggression, desire level, self-concept, and competitive anxiety are considered as psychological factors affecting performance. For example, the ability to consciously adjust one's thoughts and concentrate and collect them, and the ability to maintain one thought for a long time can be called concentration, and anyone can freely increase or demonstrate concentration. Can be steadily strengthened. As such, it focuses on the importance of methods to improve concentration through training, and can be improved with effort. These psychological factors are closely related when looking at the flow of the brain. In other words, the human body moves by issuing commands from the brain to the central nervous system. In order for a person to do something, it propagates through commands from the brain, so brain waves are generated in the brain, and among the brain waves, beta waves appear when a person concentrates attention, and there is a part that affects concentration [7, 8]. Meanwhile, On the other hand, various factors such as concentration, mental power, personality, motivation, aggression, desire level, self-concept, and competitive anxiety were selected as psychological factors affecting athletic performance. A significant drop, many sports psychologists say [9, 10]. As such, it can be said that negative psychological factors such as anxiety, which are commonly felt by athletes in the game field, have a negative effect on performance, concentration, and mental ability. In order to solve this problem, the sports field has undergone a lot of trial and error to improve performance regardless of the sport. It is a time when a groundbreaking attempt is necessary. In this study, we extracted sound waves that can improve psychological skills for volleyball players, investigated the changes that the application training of the extracted sound waves has on the brain waves of volleyball players, and the changes in brain waves are the psychological of volleyball players. The purpose of the research is to investigate the effect on technology.

2. ANALYSIS METHOD AND SURVEY TOOL

2.1 Study Subjects

In order to achieve this purpose of the study, a total of 20 male volleyball players from the university with more than 5 years of volleyball experience were selected as the study subjects: 10 in the experimental group and 10 in the control group. The details of the study subjects are shown in <Table 1>.

Table 1. Study Subjects

Division			N	%	Division			N	%
Experimental group	Age	20	4	20	Control group	Age	20	3	15
		21	3	15			21	4	20
		22	3	15			22	3	15
	Total		10	50		Total		10	50

2.2 Experimental Design and Procedure

The survey tool first selected five sports psychology professors and doctors, one music professor, five volleyball players, and five volleyball experts (directors, coaches) to extract sound waves to improve the psychological skills of volleyball players. And extracted the sound source. In addition, normal brain wave activity was collected by performing a brain wave test at rest. Considering the brain wave test results at rest and the characteristics of volleyball events, sound waves were extracted using a sound source extraction program called Sony Sound Forge with the advice of a music source extraction expert at H University. Brain wave measurement (α, β) is performed in advance by using a PC-connected (USB) digital 8-channel wired brain wave meter developed by Laxtha. Measurements were made after being acclimatized to a stable state for at least 5 minutes in an environment that was explained and easy to measure. The test time was conducted with two bipolar channels in the frontal part along with short-term heart rate variability measurement for 5 minutes.

The brain wave applied to the volleyball player is a sound wave extracted according to the general brain wave activity collection and brain wave test results at rest. The sound waves were distributed to the players using a portable USB device, and the distributed sound waves were listened to at least 4 times a week after lunch and for at least 30 minutes before the start of afternoon training. In addition, before a match or practice, the auto-play function was used to listen for 5 months. In order to measure the effect of the extracted sound waves on the brain waves of volleyball players, the data collection was divided into three stages (before, during, and after the experiment) and EEG was measured. In addition, psychological skill variables were divided into two stages before and after and measured by questionnaire. The detailed experimental procedure is shown in <Figure 1>.

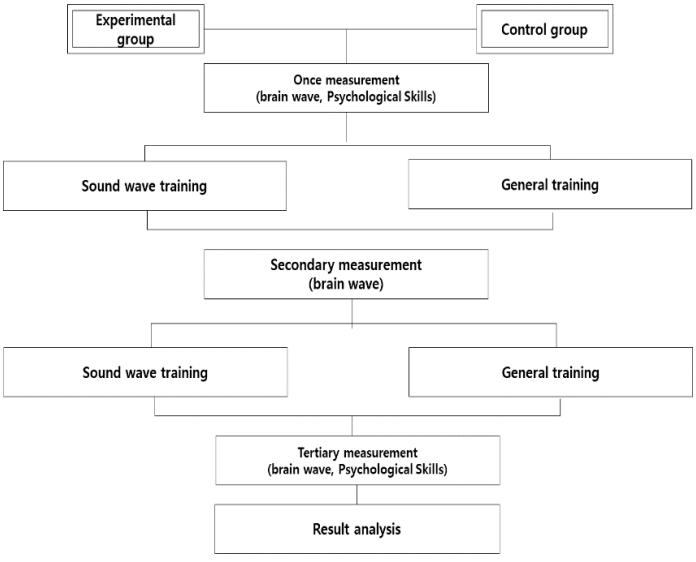

Figure 1. Experimental Procedure

2.2 Research tool

In this study, the psychological skills of volleyball players are closely related to the performance of motor skills in competition and sports situations that require high skill. It refers to all the mental strategies and techniques necessary to maximize [11, 12, 13]. Therefore, as sub-factors of psychological skill factors, 13 items of goal setting factor, 14 items of attention factor, and 10 items of confidence factor were composed of 37 items of 3 factors. It was composed on a 5-point Likert scale. The detailed composition of the questions on the test paper is shown in <Table 2>

Table 2. Questionnaire Composition Indicator

Constituent Indicators	Sub-Factor	Number of Questions
Psychological Skills	Goal Setting	13
	Attention	14
	Confidence	10

3. STATISTICAL ANALYSIS

The SPSS 21.0 statistical program was used to analyze the data required for this study, and the detailed data processing method is as follows. First, t-test analysis was performed to find out the difference in concentration according to sound wave application training. Second, in order to verify the effect of brain waves (alpha and beta waves) according to sound wave application training, repeated measurement analysis of variance was performed. Third, regression analysis was performed to verify the effect of brain waves (alpha waves, beta waves) following sound wave application training on concentration. The statistical significance level of this study was set as $p<.05$.

4. RESULTS

4.1 Differences in Psychological Skills According to Sound Wave Application Training

<Table 3> shows the results of analyzing the differences in psychological skills according to sound wave application training between the experimental group and the control group.

Table 3. t-test analysis of Differences in Psychological Skills According to Sound Wave Application Training

Division			M	SD	t
Experimental Group	Goal Setting	Before the experiment	2.87	0.328	2.358*
		After the experiment	3.17	0.477	
	Attention	Before the experiment	2.81	0.213	5.792***
		After the experiment	3.62	0.527	
	Confidence	Before the experiment	2.78	0.339	1.263
		After the experiment	2.91	0.295	
Control Group	Goal setting	Before the experiment	3.12	0.410	1.055
		After the experiment	3.29	0.566	
	Attention	Before the experiment	2.77	0.273	1.530
		After the experiment	2.91	0.371	
	Confidence	Before the experiment	2.78	0.389	2.017
		After the experiment	3.04	0.499	

*p<0.05, *** p<0.001

Looking at <Table 3>, the motivation/goal setting factor (pre-2.87±.328, post-3.17±.477) in the experimental group was the attention factor (pre-2.81±.213, post-3.62±.527) at the p<.05 level. showed a statistically significant difference at the p<.001 level, and looking at the average value, psychological skills were found to increase in the order of motivation/goal setting, attention, and confidence factors. In the control group, there were no statistically significant differences in motivation/goal setting, attention, and confidence.

Looking at the results of these studies based on previous studies, first, in a study in which a brain function control program was applied to national badminton players [14, 15], pure sound and single sound waves had significant effects on concentration, motivation/goal setting, attention concentration, and confidence. which supports the results of this study. In addition, in a study on kendo players [16, 17], it was reported that the sound wave application training group had higher motivation/goal setting, attention, and confidence than the control group, supporting the results of this study. As a result, sound wave application training helps athletes achieve motivation/goal setting and concentration among psychological techniques. It is said that it is playing a positive role that can increase factors such as self-confidence.

4.2 Brain Wave (alpha) Change Trend According to Sound Wave Application Training

<Table 4> shows the average and standard deviation of alpha waves for each group of volleyball players. The results of examining the changes in alpha waves in the experimental group and control group are shown in <Table 4>. The experimental group prior to sound wave application training (0.22±0.19). Alpha waves increased midway (0.35±0.05) and post-mortem (0.38±0.08). In the control group, there was almost no change in alpha waves with the 1st measurement (0.23±0.20), 2nd measurement (0.25±0.22), and 3rd measurement (0.24±0.19).

Table 4. Mean and Standard Deviation of Alpha Wave Change

Time	Experimental Group		Control Group	
	M	SD	M	SD
1st	0.22	0.19	0.23	0.20
2st	0.35	0.05	0.25	0.22
3st	0.38	0.08	0.24	0.19

< Table 5> shows the results of two-way repeated ANOVA conducted to examine the changes in alpha waves of brain waves between groups according to the sound wave application training.

As shown in <Table 5>, the alpha wave showed an interaction effect between time*group with F=2.466, P<0.001, and a significant difference with period F=11.916, P<0.001. Also, there was a significant difference between the groups with F=15.652, P<0.001.

Table 5. Alpha Wave Repeated Measures Results

Source of dispersion	SS	df	MS	F
Time	0.629	2	0.315	11.916***
Time* Group	0.130	2	0.065	2.466***
Error	2.009	36	0.026	-
Group	0.364	1	0.364	15.652***
Error	0.885	18	0.023	-

*** P<0.001

Looking at the results of these studies based on previous studies, a study on archers reported that alpha waves increased when pure and single sound waves were applied, and beta waves increased together [18, 19] was found to be consistent with the results of this study. In addition, other previous studies have revealed that alpha wave induction training affects concentration increase, supporting the results of this study [20].

4.3 Brain Wave (beta) Change Trend According to Sound Wave Application Training

<Table 6> shows the mean and standard deviation of beta waves for each group of volleyball players. Experimental group prior to sound wave application training (0.05±0.01). Beta waves increased midway (0.16±0.20) and post-mortem (0.29±0.34). In the control group, the beta wave showed little change in the first measurement (0.06±0.02), second measurement (0.11±0.10), and third measurement (0.09±0.08).

Table 6. Mean and Standard Deviation of Beta Wave Change

Time	Experimental Group		Control Group	
	M	SD	M	SD
1st	0.05	0.01	0.06	0.02
2st	0.16	0.20	0.11	0.10
3st	0.29	0.34	0.09	0.08

< Table 7> shows the results of two-way repeated ANOVA conducted to examine the change in beta waves of brain waves between groups according to the time period according to sound wave application training.

As shown in <Table 7>, there was an interaction effect between the beta wave period*groups with F=3.060, P<0.05, and a significant difference with the time*group F=3.568, P<0.05. Also, there was a significant difference between the groups with F=3.891, P<0.05.

Table 7. Beta Wave Repeated Measures Results

Source of dispersion	SS	df	MS	F
Time	0.182	2	0.091	3.568*
Time* Group	0.106	2	0.053	3.060*
Error	1.424	36	0.019	-
Group	0.107	1	0.107	3.891*
Error	0.666	18	0.037	-

*** P<0.05

Based on previous studies, alpha waves or theta waves appear as dominant waves in a calm mental state, and are converted to beta waves with low amplitude and high frequency during excitement [21]. Therefore, it can be seen that the sound wave application training program used in this study is alpha and beta waves, which are the brain waves that focus on improving psychological skills, and this contributes to the improvement of the players' concentration.

5. CONCLUSION

The purpose of this study is to extract sound waves that can improve psychological skills for volleyball players, and to find out the change trend of brain waves (alpha, beta) of volleyball players when applied training

of the extracted sound waves. The results obtained to identify the purpose of this study are as follows.

First, as a result of the analysis of differences in psychological skills according to sound wave application training, there were significant differences in goal setting and attention concentration in the experimental group for the pre/post test. In the control group, there was a significant difference in psychological skills.

Second, as a result of repeated measurement variance analysis of alpha waves according to sound wave application training, it was found that there was an interaction effect between groups at each time point, and there was a significant difference in alpha waves between groups. In other words, the experimental group showed a decrease in alpha waves, and the control group showed almost no change.

Third, as a result of repeated measurement variance analysis of beta waves according to sound wave application training, it was found that there was an interaction effect between groups at each time point, and there was a significant difference in beta waves between groups. In other words, the experimental group showed an increase in beta waves, and the control group showed almost no change.

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