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Garlic Gongjin-Dan Ameliorates Scopolamine-Induced AMNESIA in Mice

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Abstract

Gongjin-Dan is a traditional oriental medicine herbal drug that has been used tonics. In the present study, we investigated the effects of the hot water extract of Gongjin-Dan mixed garlic(GGD) against scopolamine-induced memory impairment and its mechanism of action. We used the Y-maze and passive avoidance tests to assess anti-amnesic activities in scopolamine-induced memory impairment mouse model. In this model, GGD(12.5, 25 or 50 mg/kg) significantly ameliorated scopolamine-induced memory impairment. We also explored its mechanism of action by conducting an antioxidant activity assay using 2,2-diphenyl-1-picrylhydrazyl(DPPH) and 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) free and acetylcholineserase(AChE) activity assay using the mouse whole brain. GGD increased the scavenging activities of free radical DPPH and ABTS, inhibited AChE activity in the brain. Taken together, our findings suggest that GGD exerts an anti-amnesic effect through the free radical scavenging, AChE inhibition, ameliorate of scopolamine-induced memory impairment. The effect of GGD may be useful for treatment of memory impairment in Alzheimer's and its related diseases.

[Keywords] ***Sport, Garlic Gongjin-Dan, Scopolamine, Memory Impairment, Alzheimer's Diseases***

1. Introduction

Alzheimer's disease(AD) is a progressive neurodegenerative disorder of the central nervous system associated with cognitive impairment. The pathophysiology of AD includes senile plaques, neurofibrillary tangles[1] and amyloid beta protein deposition[2], increased oxidative stress[3] and neuroinflammation[4], and reduced acetylcholine levels[5]. Many researches have reported that AD patients have severe cholinergic dysfunction in the brain[6], and scopolamine as a muscarinic cholinergic receptor antagonist has been shown to evaluate memory impairments in experimental animals[7][8][9]. Indeed, after administration of scopolamine, the oxidative stress status was altered and impaired cognitive performance on behavioral tests[10][11]. Until now, AD treatment drugs have been used AChE inhibitors such as tacrine and donepezil(DNPZ)[9]. Nevertheless, there is a growing need for development of new cognitive augmenting agents because of the disadvantages such as gastrointestinal symptoms[12], hepatotoxicity[13] and cardiovascular adverse effect[14].

Garlic Gongjin-Dan(GGD) is the mixture of Gonjin-Dan and aged black garlic extract. Gongjin-Dan is a traditional multi-herb formula that has been used to treat symptoms caused by weak constitution and aged population in Korea and China. A traditional medical books, Dongeuibogam, Donguisusebowon and Bangyakhapyun, documented that Gongjin-Dan can maintain body homeostasis. Many studies have been conducted on the pharmacological effects of Gonjin-Dan, such as anti-amnesic effect[15], anti-fatigue effect[16][17] and immune modulation[18]. Garlic has been used widely medicinal herb

and culinary seasoning in Asia and America. Despite its beneficial effects, raw garlic has unpleasant odour, acrid taste and adverse effects, such as gastrointestinal disorder[19] and hemolytic anemia[20]. Heating treatment has made black garlic to improve the flavor and quality, and further newly form bioactive compounds[21]. Many studies have been reported cardioprotective[22], antioxidant[23] and anti-lipogenic effect[24].

Based on these reports, we hypothesized that GGD might also have memory ameliorating effect. In the present study, we investigated the effects of GGD on scopolamine-induced memory impairment mice. Furthermore, we measured the free radical scavenging and acetylcholinesterase(AChE) activity to identify the mechanism underlying the antioxidant and anti-cholinergic effects of GGD.

2. Methods

2.1. Preparation

Four medicinal herbs(Angelicae Gigantis Radix, Corni Fructus, Aucklandiae Radix, Ginseng Radix, Rehmanniae Radix Preparata) and one animal-derived material(Cervi Parvum Cornu) were purchased from the Omniherb (Daegu, Korea) and aged black garlic extract was provided from Jeju bio farm(Jeju, Korea). GGD(40 g) was extracted with 1 L distilled water for 2 hours at 100℃, and then their residue was filtered through Whatman No.2 filter paper(Whatman Ltd., England). The extracts were concentrated using a rotary evaporator under vacuum condition, and the residual crude extracts were freeze-dried at -80℃. The GGD were stored at -20℃ during test. The yield was 39%.

Table 1. Composition of Garlic Gongjin-Dan.

Name	Ratio (g)
Cervi Parvum Cornu	15g
Angelicae Gigantis Radix	15g
Corni Fructus	15g
Aucklandiae Radix	2g
Ginseng Radix	15g
Rehmanniae Radix Preparata	15g
Aged Black Garlic Extract	90g

2.2. 2,2-Diphenyl-1-picrylhydrazyl(DPPH) radical scavenging activity

DPPH free radical scavenging activity was measured according to the method described by Brand-Williams and coworkers[25] with slight modifications. DPPH solution(0.2 mM in ethanol) and sample were prepared in the concentration range of 1 mg/mL and serial diluted in distilled water. Sample solution(100 µL) at various concentrations was mixed with 100 µL of DPPH solution and incubated for 30 min in the dark at room temperature. Absorbance was determined at 570 nm using microplate reader(Tecan, Austria) with ascorbic acid as a positive control. Measurements were carried out in triplicate. Radical scavenging activity was calculated as follows:

Radical scavenging activity(%)=1−Absorbance of sample/Absorbance of control×100DPPH solution(0.2 mM in ethanol) and sample were prepared in the concentration range of 1 mg/mL and serial diluted in distilled water. Sample solution(100 µL) at various concentrations was mixed with 100 µL of DPPH solution and incubated for 30 min in the dark at room temperature. Absorbance was determined at 570 nm using microplate reader(Tecan, Austria) with ascorbic acid as a positive control. Measurements were carried out in triplicate. Radical scavenging activity

was calculated as follows:

Radical scavenging activity(%)=1−Absorbance of sample/Absorbance of control×100

2.3. 2,2′-Azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical scavenging activity

ABTS free radical scavenging activity was measured according to the method described by Re and coworkers[26] with slight modifications. The ABTS radical cations were produced by mixing 7 mM ABTS stock solution with 2.45 mM potassium persulfate in the dark at room temperature for 16 h. The ABTS radical solution was diluted by ethanol to an absorbance of 0.7 ± 0.02. Sample solution (100 µL) at various concentrations was mixed with 100 µL of ABTS radical solution and incubated for 7 min in the dark at room temperature. Absorbance was determined at 734 nm using microplate reader(Tecan, Austria) with ascorbic acid as a positive control. Measurements were carried out in triplicate. Radical scavenging activity was calculated as follows:

Radical scavenging activity (%)=1−Absorbance of sample/Absorbance of control×100

2.4. Animals

Male ICR mice(21-23 g) were purchased from Daehan Biolink(Eumseong, Korea) and housed individually in the home cages in a controlled room temperature(22±2℃) and humidity(50±5%) with a 12 h light-dark cycle (lights on at 7 a.m.) and allowed standard food pellets and tap water ad libitum. After acclimatization for 1 week, the mice were randomly divided into seven groups(n =7-8/group): (1)normal group(saline, p.o.); (2) control group[scopolamine(1 mg/kg, i.p.) treatment plus saline, p.o.]; (3)scopolamine + GGD 6.25 mg/kg group [scopolamine treatment plus GGD(6.25 mg/kg, p.o.) treatment group]; (4)scopolamine + GGD 12.5 mg/kg group[scopolamine treatment plus GGD(12.5 mg/kg, p.o.) treatment group]; (5)scopolamine + GGD 25 mg/kg group[scopolamine treatment plus GGD(25 mg/kg, p.o.) treatment group]; (6)scopolamine + GGD 50 mg/kg group[scopolamine treatment plus GGD (50 mg/kg, p.o.) treatment group]; (7)scopolamine + donepezil group [scopolamine treatment plus donepezil(5 mg/kg, p.o.) treatment group]. Donepezil was used as a positive control. Mice were administered GGD, donepezil or the same volume of saline 1 h before the experiment, and administered of scopolamine or saline 30 min after each drug administration. This protocols were approved by the Institutional Animal Care and Use Committee of Daegu Haany University(Approval number: DHU2018-040).

2.5. Y-maze test

This test was assessed to examine the effects of GGD on short-term and working memory. The Y-maze equipment has three arms(40 cm long×3 cm wide×12 cm high) which are disposed at 120° angles from each other(labeled A, B, and C). The mice were individually placed at the end of one arm, and the test period was 8 min. During the period, the sequence(e.g., ABCCAB) and number of arm entries for each mouse was manually recorded. An actual alternation was considered as entries into all three arms with consecutive choices(e.g., ABC, BCA, or CAB, but not ABA). The percentage of alternation(%) for each mouse was calculated as the ratio of the actual-to-possible alternations, as shown in following equation: percentage alternation=(number of alterations)/(total arm entries-2)×100. The total number of arm entries was used as an indicator of locomotor activity. Each arm was thoroughly cleaned with ethanol between each test to remove odors and residues.

2.6. Passive avoidance test

The test was used to measure the effects of GGD on long-term and learning memory. The passive avoidance apparatus consists of two compartments, one lighted and one dark were separated by a guillotine door. The two

chambers were equipped with stainless steel bars for electric shock. During the acquisition trial, test mice were gently placed in the light chamber, and the guillotine door was opened 10 sec later and latency to enter the dark chamber was recorded as step-through latency. After the mice entering the dark chamber, the door was closed and an electric foot shock(0.5 mA, 3 sec) was applied. The retention trial was conducted 24h after the acquisition trial by returning the mouse to the light chamber, and the time to enter the dark chamber after door opening was manually recorded again without electric foot shock for 300 sec as cut-off.

2.7. Acetylcholinesterase activity

The AchE activity was determined on the basis of degradation of acetylthiocholine iodie into a product that binds to 5,5-dithiobis-2-nitrobenzoic acid(DTNB) and turns yellow using the acetylthiocholine iodide-based colorimetric method according to the method of Ellman et al.[27] with some modifications. Sample and donepezil were dissolved and serial dilute. Mouse whole brain was homogenized in the 100 mM phosphate buffer(pH 8.0) using homogenizer and centrifuged at 12,500 rpm for 20 min at 4℃. The supernatant was collected and used as an enzyme source. Phosphate buffer(144 µL, 100 mM, pH 8.0) was mixed with 22 µL of buffered Ellman's reagent(10 mM DTNB and 15 mM sodium bicarbonate), 1.1 µL substrate(75 mM acetylthiocholine iodide solution), 10 µL sample solution and enzyme source at room temperature for 10 min. Thereafter, the mixture was stopped by adding 4.4 µL of a neostigmine solution(100 mM). The AchE activity was measured at a wavelength of 405 nm using microplate reader(Tecan, Austria).

2.8. Statistical analysis

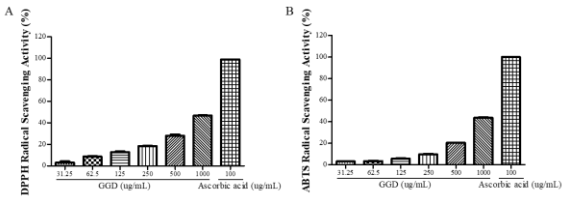
All data are expressed as the means±standard error of mean(SEM). The statistical significance of the differences between the groups were analyzed using one-way analysis of variance(ANOVA) followed by Newman-Keuls test in GraphPad Prism(version 5.03). Differences were considered statistically significant if p value less than 0.05.

3. Results

3.1. Effects of GGD on the antioxidant activity

Antioxidant activity of GGD was evaluated by free radical scavenging assay <Figure 1>. DPPH free radical scavenging of GGD was 3.0±1.2, 8.7±0.3, 12.7±0.7, 18.3±0.3, 28.0±1.0, 46.7±0.3 at a concentration range of 31.25, 62.5, 125, 250, 500 and 1000 µg/mL <Figure 1A>. Ascorbic acid showed 99.0±0.0 inhibition at 100 µg/mL against DPPH. ABTS free radical scavenging of GGD was 3.0±0.0, 3.3±0.3, 5.7±0.3, 9.7±0.3, 20.3±0.3, 43.7±0.3 at a concentration range of 31.25, 62.5, 125, 250, 500 and 1000 µg/mL <Figure 1B>. Ascorbic acid showed 100.0±0.0 inhibition at 100 µg/mL against ABTS. GGD was revealed concentration dependent response. Ascorbic acid was used as a positive control.

Figure 1. Effects of the GGD on antioxidant activity.



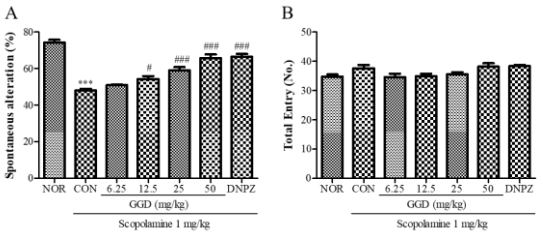
In vitro antioxidant activity assay was performed as described in the Methods section. Antioxidant activity of GGD was assessed by a free radical scavenging assay for DPPH(A) and ABTS(B). Ascorbic acid was used as a positive control. Data represent the mean ± SEM of three independent experiments.

3.2. Effects of GGD on the Y-maze test

The results of the Y-maze test are shown in <Figure 2>. Scopolamine administration significantly reduced spontaneous alterations

compared with the normal group(p<0.001). This alternation was significantly recovered by GGD(12.5, 25, and 50 mg/kg, p.o.) and donepezil(5 mg/kg, p.o.) treatments compared with the control group <Figure 2A>. The difference in the total numbers of arm entries among all the treatment groups was not significant <Figure 2B>. This result implies that GGD did not affect the locomotor activity in mice.

Figure 2. Effects of GGD on scopolamine-induced memory deficits in Y-maze test in mice.

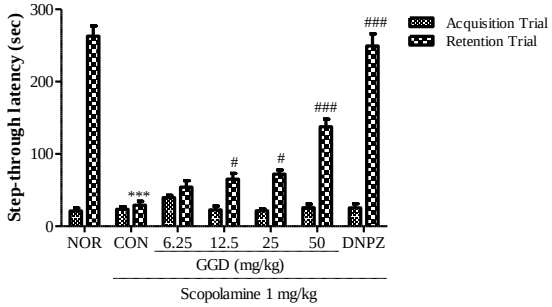


The results from the spontaneous alternation(A) and total entry(B) are presented. GGD or donepezil(DNPZ; 5 mg/kg, p.o.) as positive control were orally administered to mice 1 h prior to the Y-maze tests. After 30 min, the mice were injected with 1 mg/kg scopolamine (i.p.) and tested in the Y-maze. Data represent the mean±SEM. (n=7-8/group) (***p<0.001 vs. the NOR group; #p<0.05, ###p<0.001 vs. CON group).

3.3. Effects of GGD on the passive avoidance test

The results of the passive avoidance test are shown in Fig.3. Scopolamine administration significantly shortened the step-through latency compared with the normal group (p<0.001). GGD(12.5, 25 and 50 mg/kg, p.o.) and donepezil(5 mg/kg, p.o.) treatments significantly recovered the control group. There was no difference in step-through latency among the all groups during the acquisition trial.

Figure 3. Effects of the GGD on scopolamine-induced memory deficits in the passive avoidance test in mice.

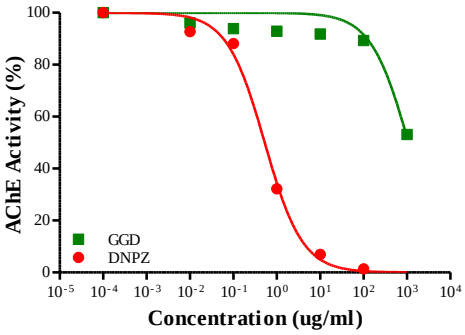


Results from the acquisition trial and retention trial are presented. GGD or donepezil(DNPZ; 5 mg/kg, p.o.) as positive control were orally administered to mice 1 h prior to the passive avoidance tests. After 30 min, the mice were injected with 1 mg/kg scopolamine(i.p.) and tested in the passive avoidance. Normal group(NOR) received vehicle solution(0.9% saline). Donepezil (DNPZ) was used as a positive control. Data represent the mean±SEM.(n=7-8/group) (***p<0.001 vs. the NOR group; #p<0.05, ###p<0.001 vs. CON group).

3.4. The effect of GGD on AChE activity

AChE inhibition activity of GGD was investigated to cholinergic antagonistic effect in the brain <Figure 4>. GGD has shown concentration dependent manner with an IC50 value of 1088 μg/mL. Donepezil, a positive control, has shown an IC50 value of 0.5 μg/mL.

Figure 4. Effects of the GGD on AChE activity. Ex vivo AChE activity assay was performed as described in the methods section.



Donepezil(DNPZ) was used as a positive control. Data represent the mean±SEM of three independent experiments.

4. Discussion

The present study provided that GGD, a modified Gongjin-Dan, has the anti-amnesia effects on scopolamine-induced memory impairment in mice. The results demonstrated that GGD administration alleviated the cognitive deficits induced by scopolamine in both Y-maze and passive avoidance tests. And its action may be related to scavenge free radical and inhibited AChE activity.

Oxidative stress is considered to play a significant role in the onset and development of various diseases[28][29]. In AD, oxidative stress is caused to produce neuronal changes in the brain, especially hippocampus[30][31]. In previous studies, scopolamine increased oxidative stress in the hippocampus by a number of mechanisms, including decreasing superoxide dismutase(SOD), glutathione peroxidase(GPX) and catalase(CAT) levels[32][33][34]. GGD increased the radical scavenging activity for DPPH and ABTS in a dose-dependent manner. These results confirmed that GGD had the anti-oxidative effects.

In this study, two types of memory tests were utilized to assess the effects of GGD on scopolamine-induced amnesia in mice. The Y-maze test was carried out to evaluate the hippocampus-dependent short-term and spatial working memory. Our current results demonstrated that scopolamine significantly decreased the percentage of spontaneous alteration in Y-maze test, which was consistent with the previous studies. GGD administration was showed to improve the decreased memory in the scopolamine-treated mice. There were no significant differences in the total number of entries in all groups, which indicated that GGD did not affect the locomotor activity. The passive avoidance test was conducted to evaluate the long-term and learning memory. These results exposed that scopolamine significantly reduced the step-through latency in the retention trial, which was consistent with the previous studies. GGD administration was revealed to increase the reduced memory in the scopolamine-treated mice. There were no significant differences in the latency in all groups during the acquisition trial, which implied that GGD did not influence the locomotor and exploratory activity. These results of the behavioral studies confirmed that GGD had the anti-amnesia effects against scopolamine-induced memory impairments.

The cholinergic neurotransmitter is known to play the most important role in cognitive function. Acetylcholine is synthesized from choline and acetyl-CoA by choline acetyltransferase, which is in turn catalyzed into acetate and choline by AChE after its release[5]. It is known that scopolamine increased AChE activity leading to memory loss[35]. AChE activity is elucidated the underlying mechanism of effect of GGD. Our present findings showed that GGD reduced the AChE activity in the whole brain. These results confirmed that GGD reduced the AChE activity.

5. Conclusion

The present study provides evidence that GGD ameliorates the scopolamine-induced cognitive impairment and memory deficits by scavenging free radicals and inhibiting AChE activity. All these results suggested that GGD may be a potential candidate agent for the treatment of some neurodegenerative diseases such as AD.

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The Process of KARATE's Adoption as Formal Game for the TOKYO Olympic Games and Its Prospects

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Abstract

The ancient Olympic games, which were held every four years as now for a millenium from 776 BC until 395 AD, were a forum of competition for the mankind to mutually compete and enjoy in a variety of ways. Such Olympic games are a unique connection between the ancient and the modern times. The modern Olympic games were held for the first time in Athens, Greece, in 1896 and the 32nd Tokyo Olympic Games will be held in 2020. After Japan experienced the great earthquake in 1923 and lost the second World War, Tokyo was the first to attract the Tokyo Olympic Games in 1964 in Asia, where 19 games were held, with 94 countries and 6,318 athletes participated, thereby becoming an opportunity to inform the world about the high speed growth and strength of the post war Japan.

In particular, Japan, which has grown into an economic powerhouse and which is standing in the center of the international political arena, has endeavored to make the 2020 Tokyo Olympic Games as the ones attracting greater attention from the world than any other host country in history. Among such endeavors, Japan intended to raise its stature as the host country of the larger and successful games by adding games. Of the games, Karate was a traditional Japanese martial art, which was first introduced from Okinawa to the main islands of Japan in 1917. Thereafter, in 1922, as the Ministry of Education hosted an ancient martial art exhibition in which Karate participated, and as Keio University and Waseda University founded Karate departments, Karate developed into a martial art culture of Japan.

Thereafter, Karate has become globalized by the spectacular performance and leadership of Oyama Masters, in which process the Japanese society escaped from the ruins of the war and achieved prosperity and success drawing attention from the world. Furthermore, the spirit of martial art through Karate has brought the Japanese people together, and Karate became the spirit of the Japanese people.

For these reasons, Japan has wanted Karate to become an official game for the 2020 Tokyo Olympic Games.

While 26 games were held at the 30th London Olympic Games in 2012 and 28 official games were held at the 31st Rio de Janeiro Olympic Games in 2016, including golf and rugby, but Japan has successfully enabled adopting Karate as an official Olympic game, and by including surfing, skateboarding, sports climbing, baseball and softball, the number of official games grew to 33 in total.

The modern Olympic games are also used to strengthen national interests, international status, and pride of the nation rather than promoting the understanding of international peace and harmony of mankind.

In particular, Karate had faced difficulties in being adopted as a formal game since it was a similar game to Taekwondo of Korea, but since Japan was able to decide on which games to add through the "Olympic Agenda 2020," the Tokyo Olympic Games Organizing Committee nominated additional candidates of official games for pentathlon to the IOC in September 2013 and acquired approval of the executive committee for the finalization at the general assembly.

Accordingly, this study will examine the process of changes for the Olympic games and what process the Japanese Karate underwent to be adopted for the 2020 Tokyo Olympic Games as an official game. In particular, it will be helpful to understand what impact it will have on the martial art sport after the Tokyo Olympic Games

and the flow of sports diplomacy as Karate is adopted as an official Olympic game representing the Japanese martial arts.

[Keywords] ***Olympic Games, Karate, History, Sports Games, Taekwondo***

1. Introduction

Mankind has lived through mutual competition in a variety of ways. One of which was a sports competition to enjoy, and the representative games were the Olympic games. Such Olympic games are a unique connection between the ancient and modern times. From 776 BC until 395 AD, the games were held every four years as now for a millennium[1]. The 1st modern Olympic games were held in Athens, Greece, in 1896, with 9 games and 13 countries and 311 athletes participating. Thereafter, they have been held every four years as a festival for the global citizens in the country which hosted the games. To commemorate its 2,600th anniversary, Japan applied for and acquired approval of the IOC to host the 1940 Summer Olympic Games. However, they were put off by the second World War[2]. After losing the second World War, Japan hosted the 1964 Tokyo Olympic Games for the first time on the Asian continent with the participation of 19 Olympic games, 94 countries, and 6,318 athletes, through which Japan had the opportunity to inform the world about the high speed growth and strength of the post war Japan.

The 1964 Tokyo Olympic Games were a competitive game intended to elevate the honor of Japan beyond the meaning of a simple sports game. At the time, Japan invested $3 billion, which was the largest amount ever in the history of Olympic games, and redeveloped the city of Tokyo over 3 years, thereby transforming it into a new city through the hosting of the Olympic games. Yoyogi Square in downtown Tokyo had remained a symbol of militarism where the Japanese military paraded in the presence of the emperor. However, the city constructed a large scaled athletic village in Yoyogi Square and successfully held the Olympic games, which are the largest festival of mankind. For Japan, the Tokyo Olympic Games were a great revolution which attracted the attention of the world for the first time since the great earthquake in 1923 and the second World War. The then chairman of the Organizing Committee, Riotaro Azuma said, "Japan used the Olympic games in order to join the league of advanced industrial nations. Had there been no such magic about the Olympic games, Japan would not have invested so much money. By hosting the games as a policy, Japan has turned it into an opportunity to inform the world that it is no longer a defeated country[3]."

As such, Japan, which has grown into an economic powerhouse and which is standing in the center of the international political arena, has endeavored to make the 2020 Tokyo Olympic Games as the ones attracting greater attention from the world than any other host country in history. Among such endeavors, Japan intended to raise its stature as the host country of the larger and successful games by adding games.

In particular, Karate is a traditional Japanese martial art from Okinawa, and after being demonstrated by Funakoshi Gichin in 1917 for the first time on the main islands of Japan, the Ministry of Education hosted an ancient martial art exhibition in which Karate participated, and in 1924, Keio University and Waseda University founded Karate departments for the first time. In 1934, Shotokan was founded and became the most influential organization on the Japanese main islands[4]. As such Karate entered the 1950s, it became known across the world by Oyama Matsudatsu, in which process the Japanese society escaped from the ruins of the war and achieved prosperity and success drawing attention from the world. Furthermore, the spirit of martial art through Karate has brought the Japanese people together, and Karate became the spirit of the Japanese people[5]. For these reasons, Japan has wanted Karate to become an official game for the 2020 Tokyo Olympic Games.

In this background, this study will examine the process of changes for the Olympic games and what process the Japanese Karate underwent to be adopted for the 2020 Tokyo Olympic Games as an official game. In particular, we intend to understand what impact it will have on the martial art sport after the Tokyo Olympic Games as Karate is adopted as an official Olympic game representing the Japanese martial arts.

Table 1. Changes in the ancient Olympic games.

Year implemented	Game	Remark (Olympiad)
776 BC	200M race	1st Olympiad
724 BC	400M race	14th Olympiad
720 BC	4800M long-distance race	15th Olympiad
708 BC	Pentathlon, wrestling	18th Olympiad
688 BC	Boxing	23rd Olympiad
680 BC	Four horse chariot race	25th Olympiad
648 BC	Pancration, horse racing	33rd Olympiad
632 BC	Boys 200M race, wresting	
628 BC	Boys : Pentathlon	Implementation ceased
616 BC	Boys : Boxing	
520 BC	Race in armor	65th Olympiad
500 BC	Mule cart race	Ceased after implementation
496 BC	Race for mares	Ceased after implementation
408 BC	Two horse chariot race	93차 Olympiad
396 BC	- Trumpeter competition - Herald competition	
384 BC	Four horse chariot race (colt)	
256 BC	Single horse race(colt)	
200 BC	Boys : Pancration	

2. Changes of the Olympic Games

The ancient Olympic games began with running races and the 5 game races first emerged in 708 BC. Winners were decided by hosting the games of standing long jump, javelin, running, discus, disc throwing and wrestling. The boxing games began in 688 BC. In 680 BC, the four horse chariot race was adopted, and in 648 BC, pancration games and horse racing games, which were a mixture of boxing and wrestling, were adopted as official games. In 384 BC, the four horse chariot race was adopted as an official game in which participants competed with their physical strength and skills required for war or fighting.

3. Process of Karate's Adoption as a Formal Game for the Olympic Games

On October 10, 1964, the 18th Tokyo Olympic Games, in which 5,140 athletes from 93 countries participated, became the first Olympic games hosted in Asia. Before then, Tokyo, Japan, was selected as the host of the 12th Olympic Games in 1940, but following the outbreak of the second World War, they were ceased, and after becoming the defeated nation, Japan was not able to participate in the international sports world including the Olympic Games. However, after the post war Japanese society escaped from the ruins of the war, and as the national order came back on its track, Japan endeavored again to participate in the Olympic games[8].

In 1949, the 3 gaming organizations of swimming, wrestling and cycling returned to the League of Nations, thereby laying a foundation for international sports. In May 1951, the Japan Olympic Committee(JOC) was approved by the IOC at the general assembly, thereby enabling Japan’s participation in the Winter and Summer Olympic Games of 1952 and return to the Olympic games in 16 years.

Table 2. Changes in the modern olympic games.

No. of Times	Year	Host City	No. of Participant Countries	No. of Personnel	No. of games
1	1896	Athens, Greece	13	311	9
2	1900	Paris, France	21	1,088	14
3	1904	St. Louis, USA	12	562	12
4	1908	London, United Kingdom	22	2,666	20
5	1912	Stockholm, Sweden	28	2,561	14
6	1916	Berlin, Germany, was decided to host, but was put off by the first World War			
7	1920	Antwerp, Belgium	29	2,655	19
8	1924	Paris, France	44	3,211	19
9	1928	Amsterdam, The Nether-lands	46	4,308	16
10	1932	Los Angeles, USA	38	1,366	16
11	1936	Berlin, Germany	49	4,308	21
12	1940	Tokyo, Japan, was decided to host but then was changed to Helsinki, Finland, due to the second World War			
13	1944	London, United Kingdom, was decided to host, but was put off by the first World War			
14	1948	London, United Kingdom	58	4,447	18
15	1952	Helsinki, Finland	69	6,358	18
16	1956	Melbourne, Australia	67	3,555	17
17	1960	Rome, Italy	84	5,933	17
18	1964	Tokyo, Japan	94	6,318	19
19	1968	Mexico City, Mexico	125	7,470	18
20	1972	Munich, West Germany	123	10,080	21
21	1976	Montreal, Canada	94	7,814	21
22	1980	Moscow, Soviet Union	81	5,923	21
23	1984	Los Angeles, USA	140	7,810	21
24	1988	Seoul, Korea	160	13,304	23
25	1992	Barcelona, Spain	169	15,229	23
26	1996	Atlanta, USA	192	17,765	26
27	2000	Sydney, Australia	200	15,300	28
28	2004	Athens, Greece	202	11,000	28
29	2008	Beijing, China	204	11,028	28
30	2012	London, United Kingdom	204	11,028	26
31	2016	Rio de Janeiro, Brazil	207	11,239	28
32	2020	Tokyo, Japan	207	11,239	28

When Japan returned to the Olympic games, Japan participated in competing for winning the 17th Olympic Games for 1960 in Tokyo, but ultimately, Roma, Italy, turned out to be the winner.

Thereafter, the IOC members, who attended the IOC's general assembly in November 1956, successfully attracted the IOC's general assembly to be hosted in Tokyo in 1958. Japan used the 13th Asian Games in 1958 to publi-

cize the game organizing and operating capability to the members of the IOC. Eventually, Tokyo, Japan, successfully attracted the 18th Olympic Games, beating Brussels, Detroit, and Vienna at the IOC's general assembly held in Munich, West Germany, on May 23, 1959[9].

Japan attempted to include Judo, which is the national sport of Japan, in the Olympic Games with the hosting of the Tokyo Olympic Games. At the IOC's general assembly held in Rome from August 3rd through 23rd, 1960, Japan proposed Judo as an official game, which was approved by 32 votes against 2. Meanwhile, Japan strived to include Karate among the Olympic games while continuously competing against Taekwondo of Korea. However, through the 1988 Seoul Olympic Games, Taekwondo was adopted as a pilot game, which in 2000, was confirmed as a formal game at the Sydney Olympic Games. Consequently, the IOC's preception of precluding similar games has made it even more difficult to adopt Karate as an Olympic game[10].

At the 31st Rio de Janeiro Olympic Games in 2016, a total of 28 official games were held with golf and rugby added to the 26 official games held at the 30th London Olympic Games in 2012. Japan succeeded in adopting Karate as an official game for the 32nd Tokyo Olympic Games in 2020, thereby increasing the number of official games to 33 including surfing, skateboarding, sports climbing, baseball, and softball[11].

As such, official games were added and changed according to the host country of the Olympic Games, and the International Olympic Committee(IOC) decided at its general assembly in 1989 that only the universal games widely spread worldwide and in which both men and women could participate can be adopted. Consequently, 25 games were adopted, with 2 games less than the 1992 Olympic Games in Barcelona and the 1988 Olympic Games in Seoul. What is important is that the host countries of the Olympic games strive to achieve commercial effects through the Olympic games. While wrestling was a game which had walked alongside the history of Olympic games since the first Olympic Games, it was on the verge of exclusion in 2013 from among the official games for the lack of fun and popularity evidence by small audiences. The International Olympic Committee(IOC) designated 25 core games which have not been excluded forever from the Olympic games in the reform plan for the Olympic games entitled, "Agenda 2020." Karate was also faced with much difficulty to the point of being adopted for the 2020 Tokyo Olympic Games. On May 30, 2013, the International Olympic Committee's executive committee held a meeting in St. Petersburg, Russia, and finalized baseball and softball, which had been ousted in 2005, and wrestling and squash, which had been ousted in 2013, as the candidates for the new games for the 2020 Olympic Games. While Karate was disqualified for its similarity with Taekwondo, the IOC decided at the 129th general assembly held in Rio de Janeiro, Brazil, in December 2014, that the host cities of the Olympic games can decide which games to add through the "Olympic Agenda 2020." Consequently, the organizing committee of the Tokyo Olympic Games in September 2013 nominated candidates for the 5 additional games to the IOC, and the IOC had them approved at the executive committee in June 2014 and finalized them at the general assembly[12].

4. Conclusion

This study examined the process of changes for the Olympic games and what process the Japanese Karate underwent to be adopted for the 2020 Tokyo Olympic Games as an official game. In particular, this study intends to present the impact it will have on the martial art sport after the Tokyo Olympic Games and the flow of sports diplomacy as Karate representing the Japanese martial arts is adopted as an official Olympic game.

1)At its general assembly in 1989, the International Olympic Committee(IOC) allowed only the universal games, which are widely spread across the world and in which both men and women could participate. Consequently, the IOC designated a total of 25 core games which have not been excluded forever from the Olympic games in the reform plan

for the Olympic games entitled, “Agenda 2020,” respectively.

2)Host countries of the Olympic games strive to achieve commercial effects through the Olympic games. In particular, they are using the games to strengthen their national interests, international status, and pride of the nation rather than promoting the understanding of international peace and harmony of mankind, respectively.

3)The IOC allowed host cities of the Olympic games to decide which games to add through the “Olympic Agenda 2020.” Consequently, the organizing committee of the Tokyo Olympic Games nominated candidates for the 5 additional games to the IOC, and the IOC had them approved at the executive committee in June 2014 and finalized Karate to be among the official games at the general assembly, respectively.

4)At the 32nd Tokyo Olympic Games in 2020, the number of games grew to a total of 33 by adding Karate, surfing, skateboarding, sports climbing, baseball and softball, respectively.

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Trend in and Strategic Implementation Plan for the International Development COOPERATION through SPORTS

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Abstract

In the present day, the significance of sports has been emphasized as an effective mediator for the international development cooperation such as by being used for economic and social development of developing countries. The United Nations has designated 2005 as a year for sports and athletics and has also adopted a resolution such that sports are an important means of promoting health, education, development and peace, while stressing such a positive role for economic development and social development. In this vein, advanced contributors such as Australia and Canada are participating in the international development cooperation utilizing sports, while international sports organizations including the International Olympic Committee (IOC) as well as sports organizations such as organizations for each event are participating in international development and carrying out activities through sports. As such, even as the significance of sports is stressed for the international development, related studies are conducted such as the international development and cooperation through sports and sports ODA, yet the studies conducted with sports as an effective tool of the international development cooperation intended for strategic plan and system development have been minimal. Accordingly, in this study, the concept and significance of international development cooperation through sports are examined, and recent trends and cases of international development cooperation through sports are analyzed to present strategic alternatives for related projects. Strategic implementation plans for international development cooperation through sports include, first, the establishment of global governance among the related organizations, second, the participation of companies to secure stable financial resources, and, third, the utilization of sports stars to help publicize related programs, respectively.

[Keywords] ***Sports, Sports International Development, Sports ODA, International Development Cooperation through Sports, Development through Sport***

1. Introduction

Following the development of high economic growth, advanced technology, and the expansion of trade through globalization, the mankind has enjoyed material wealth. However, many countries across the globe still continue to live painful lives due to their lack of food, health, and drinking water. According to the results of a survey conducted by the World Bank[1], 707 million people, or 10.7% of the world as of 2013, are suffering from poverty, subsisting on less than $1.9 per day, and among the children of age less than 10, 1 child is dying every 5 seconds[2].

The most universal objective of international development cooperation is to help address poverty across these developing countries. If we refer to the various types of exchanges which take place in the international society, such as paid and free capital cooperation, trade cooperation, technology and manpower cooperation and social and cultural cooperation among countries or among countries and international organizations, that would mean a cooperation related to the development of developing countries whose level of economic and social development is lower than that of advanced countries[3].

Korea International Cooperation

Agency(KOICA)[3] said that international development cooperation means "all of the procedures for which various entities such as governments, international organizations, and civic organizations of each country have worked together for the development of the global village." That is, the “international development cooperation” means the international society’s efforts and actions to help reduce the gap between the development and rich and poor existent within developed and developing countries, developing and developing countries, or within developing countries, while protecting the human rights of the mankind through resolving poverty problems of the developing countries[3].

The United Nations defined poverty reduction of developing countries as a global issue through the declaration of Millennium developmental goals(MDGs) and Sustainable developmental goals(SDGs) and has also requested the International Development Cooperation to actively participate for each country of the planet earth[4].

Today, sports are emphasized for their significance as an effective medium of international development cooperation and are also used for economic and social development of developing countries[4]. The United Nations has also designated 2005 as a year for sports and athletics and has also adopted a resolution such that sports are an important means of promoting health, education, development and peace, while stressing such a positive role for economic development and social development. According to the United Nations report entitled ‘Sport for Development and Peace: Towards Achieving the Millennium Goals,’ sports contribute to economic development through the production of sports related goods, creation of sports related jobs, and the development of related infrastructures and facilities, while being an effective means for social development such as health promotion, cultivation of cooperative spirit, pursuit of gender equality, and crime prevention, among others, via participation in sports activities. Furthermore, since the adoption of the MDGs, Kofi Annan, the then Secretary General of the United Nations, appointed a special advisor of ‘Sports for Development and Peace’ and also launched a related office(UN Office on Sport for Development and Peace, or the UNOSDP), through which has been leading international sports activities in order to help achieve developmental goals through sports cooperation across all relevant entities such as the UN related organizations, member countries, sports organizations, civic organizations, private sector, academia and the media[5].

In this vein, advanced contributors such as Australia and Canada are participating in the international development cooperation utilizing sports, while international sports organizations including the International Olympic Committee (IOC) as well as sports organizations such as organizations for each event are participating in international development cooperation and carrying out activities through sports[3]. Furthermore, international sports NGOs such as RIGHT TO PLAY, SCORE, and MYSA are conducting development cooperation activities in developing countries through sports. The activities of such international sports organizations and NGOs are sponsored by attracting sports stars and corporate sponsorship, and are conducting related sustainable activities by securing financial resources and carrying out publicity activities[6].

As such, even as the significance of sports is stressed for the international development, related studies are conducted such as the international development and cooperation through sports and sports ODA, yet the studies conducted with sports as an effective tool of the international development cooperation intended for strategic plan and system development have been minimal.

Accordingly, this study intends to present a strategic plan by analyzing recent trends and cases of international development cooperation utilizing sports starting off from the perception of such issues. Towards that end, first, we will examine the concept and significance of international development cooperation through sports, and second, we will explore the current projects of international development cooperation through sports implemented by the related organizations such as NGOs, International Olympic Committee(IOC), and the UN, among others. Based on which, we will present a strategic plan for the international development cooperation program by utilizing sports.

2. Concept and Meaning of the International Development Cooperation through Sports

2.1. Sports and development

Recently, academia has clearly identified the concept of sports development, development of sports and development through sports. The “development of sports” focuses on the reinforcement and development of sports, such as building sports infrastructures, enhancing

coaching skills, developing sporting goods and equipment, and improving performance[7], whereas the “development through sports” is considered as a means of changing and developing society[8]. That is, by utilizing the positive strengths of sports, they are claiming to ultimately contribute to the global society by resolving diverse social problems such as racial and ethnic conflicts, gender discrimination, disease and health problems, and refugee problems, among others[9].

Furthermore, Kidd[10] classified them into sports development and development through sports / sports for development from a similar perspective. He said that the sports development means providing cooperating and support for the people who are engaged in the areas of sports based on sports, whereas the development through sports / sports for development is intended for those who are not participating in sports activities, and they are distinguished in that the participants do not have a purpose to engage in organized sports organizations thereafter.

Table 1. Definition of sport development and sport for development[11].

Classification	Definition
Sport development	Means activities carried out for the purposes of sports participation and performance improvement, supports people engaged in organized sports activities(athletes, coaches, government officials, and administrators, etc.) and strengthens and develops facilities and systems for sports(infrastructures)
Sports for development	Means activities utilizing sports as a means to achieve various social, economic, and political goals other than sports, is a concept which has recently emerged and attracted much attention rather than sports development, and includes ODA, PPP, and private entities' programs.
International sports cooperation	Presented the concept of global social contribution' as one of the 3 largest components of international sports cooperation, and the sports ODA is understood as a way of global social contribution enabling mutual growth with underdeveloped countries.

Furthermore, development through sports is divided into 'Sport Plus' and 'Plus Sport' as illustrated in <Table 2>. Coalter[12] defined 'Sport Plus' as follows. First, it eliminates factors of obstruction against sports activities. Second, it fosters and supports sports leaders. Third, it develops basic physical capabilities and sports skills. Fourth, it focuses on providing opportunities to develop sports skills and expertise. That is, it may be said that 'Sport Plus' focuses on strengthening the foundation of sports and competency, while incidentally pursuing development performance such as public health and education[4].

'Plus Sport' is different from 'Sport Plus' in that it prioritizes social and economic developmental performance, and sports are used as a means for achieving developmental goals. Many 'Plus Sport' organizations are social development organizations which address poverty, youth education, and conflict area issues, among others, and sports are utilized as a tool for such projects[11].

Table 2. Classification of the development through sports[13].

Sport plus	Plus sport
- Focused on sports infrastructures and competency enhancement - Developmental effects are pursued incidentally	- Social and economic developmental performance is a priority goal - Sports are used as a means to achieve developmental goals

2.2. Meaning of the international development cooperation through sports

Koo[6] claimed that the international development through sports is intended to contribute to

the issues of human rights, social integration, education, disease prevention and social development for developing countries by utilizing the medium of sports. In the past, sports were used as a tool for diplomacy and national prosperity among nations, but as the role and importance of sports in the international society have enlarged, they are rapidly emerging as an alternative to more effective and developmental international development. Kim et al.[14] claimed that the international development through sports not only offers a microscopic aspect of health promotion of local residents in the developing countries, school enrollment rate of local youth, and disease prevention, but also the political and economic development of the countries, enhanced sense of identity of the constituents, and resolution of social inequality, and that such effect can be achieved even in the macroscopic aspects. Furthermore, the four directions of international sports development were explained as follows. First, it is through declarations made such as the MDGs and SDSs.

Together with the 'International Year of Sport and Physical Education' in 2005, the United Nations recommended participation of major international sports organizations and governments such as the IOC and FIFA in order to help identify the importance of sports for the humanitarian international development projects and promote them more effectively. Second, it is the international development program of each country. International Inspiration and CSLC(Canadian Sport Leadership Corp) of Canada, IDEALS (International Development Through Excellence and Leadership in Sport), Dreams and Teams, and International Inspiration of the UK, and TTASPE(Trinidad and Tobago Alliance for Sport and Physical Education) of Australia are international sport development programs which are carried out at the government level in relation to achieving the UN's MDGs[15]. Third, each country or city develops its own program and conducts international sports development with international support from national, international organizations, corporations and NGOs. For instance, there are local development programs such as Magic Bus and GOAL NAZ of India, Go Sisters of Zambia, MYSA(Mathare Youth Sports Association) and Moving The Goalposts of Kenya. Lastly, it is the project of professional clubs and international sports organizations. International sports organizations such as the World Taekwondo Federation, FIFA, professional sports leagues and professional teams support elite sports through domestic federations of developing countries directly or through partnership, and also fund local developmental programs such as health centers and library constructions.

As such, sports related development projects not only offer a microscopic aspect of health promotion of local residents in the developing countries and the school enrollment rate of local youth in developing countries, but also are recognized as the projects capable of deriving effects in macroscopic areas such as the enhanced integrated sense of identity of the constituents gained from providing support for the activities of their national teams[16].

The UN's report on the sports for development entitled, "Sport for Development and Peace: Towards Achieving the Millennium Developmental Goals," explains the effects of economic development and social development for sports, while claiming that the effects of economic development for sports are manifested via the production of sports related goods, creation of sports related jobs, related occupational training, and social infrastructure and facilities, and as for the social development effects, contribution to the reduction of substance abuse and crimes, gender equality, and welfare for the disable is detailed.

2.3. Trends in international development through sports

2.3.1. Activities of the international development cooperation through sports of non-governmental organizations

Non-governmental organizations(NGOs) may be said to be essential organizations for implementing projects of international development cooperation through sports. NGOs have a flexible organizational structure relative to governmental institutions, which allows them to carry out their projects promptly and carry out international development cooperation projects in a neutral manner and with less non-political burden[17]. Furthermore, the activities of NGOs complement the activities of government level assistance by encouraging voluntary participation by the governments of the countries which are not able to carry

out projects and the poor class of the beneficiary countries and expanding independence of local communities, while most developed countries are shifting from the project funding support to program support or strategic support[11]. Examining the programs implemented by NGOs, it can be seen that they are consisted of diverse developmental areas such as human rights, environment, and peace, among others, as illustrated in <Table 3>.

Table 3. Developmental programs via the NGOs' sports[11][18][19].

Organization	Project details and vision	Region
Right to Play	4 types of developmental areas - Basic education and child development - Health enhancement and disease prevention - Dispute resolution and peace realization - Improvement of quality of life for children in disadvantaged areas around the world via development	Canada
Mathare Youth Sports Association (MYSA)	- Provision of opportunities for mental and physical training through the development of youth community - Acquisition of life skills and participation in social activities - Increased responsibilities for education and society as a member of the community	Kenya
Sport Coaches' Outreach (SCORE)	- Promotion of youth's health and leadership - Promotion of gender equality and women's leadership via sports participation	South Africa
Education through Sport(ETS)	- Protection of children from against ill treatment and abuse - Provision of health services - Improvement of physical activities and infrastructure development	Ghana Senegal Zambia
Education through Sport (Edu Sport Foundation)	- Strengthening of women's competency, physical education in school, public health, leadership, and sports' value - Women's human rights education via sports events, etc.	Zambia

2.3.2. Activities of the international development cooperation through sports of international sports organizations

International sports organizations, such as the International Olympic Committee(IOC) and the international sports federations(IFs), are also actively participating in international development cooperation projects through sports, beyond expanding the foundation of sports and carrying out developmental activities in developing countries.

The Olympic Solidarity Program may be said to be one of the most representative international development cooperation activities through sports of the IOC. Details of the Program's purpose and structure are provided in the IOC's Olympic Solidarity Plan 2017-2020 and the Olympic Charter, whose contents are as follows.

The Olympic Solidarity Program has been in effect since the 1960s in order to expand sports development and Olympic spirit across newly independent countries. According to Chapter 1 Article 5 of the Olympic Charter, the purpose of the Olympic Solidarity Program is "to support the National Olympic Committees(NOCs), which are in dire need of special assistance, and such support programs are formed by the ICO and NOCs, and in times of need, are supported by international sports federations.

The programs adopted by the Olympic Solidarity are intended to contribute to the following:

1. Promote the basic principles of Olympic spirit
2. Support player / team preparation for the NOC's participation in the Olympic Games
3. Develop technical sports knowledge for ath letes / coaches

4. Improve athlete / coach skills through coop eration with NOC and IF by providing scholarships
5. Sports administrator education
6. Build cooperative relationship with related organizations / entities through Olympic education and sports promotion
7. Build simple, functional and economic sports facilities through cooperation with domestic / international organizations
8. Support organizations of national, regional and continental competitions under the authority and support of NOC and support preparation for competitions
9. Encourage participation in the NOC's bilateral or multilateral cooperation programs
10. Recommend governments and internation al organizations to include sports in official development assistances

Furthermore, the international sports federations are also actively participating in international development cooperation projects through sports as well as carrying out activities for promoting sports events, thereby contributing to solving social problems such as poverty reduction in developing countries[4]. The FIFA, which is overseeing the largest single sports event, will be developing soccer by hosting various soccer competitions such as FIFA World Cup and continental soccer competitions as well as development activities such as disease, education, environment and poverty reduction in developing countries. Such a most representative social contribution project of the FIFA is 'Football for Hope' program. This program is implemented by cooperating with sports NGOs in cooperation with each country, and from 2005 to 2015, it has supported 170 NGOs in 78 countries, and has also been implementing various programs such as HIV / AIDS prevention education, gender equality, peace promotion, and youth leadership, among others[6]. The project details of the 'Football for Hope' program are as illustrated in <Table 3>.

Table 4. Football for hope program[6].

Organization of implementation	Program & activity	Remark
Street football	- Strengthening of the rights of women and children - Encouragement of social participation, and improvement of human rights - Education of women leaders - Establishment of sports facilities - Provision of schools' physical education program - Soccer education	1,195,000 participants
Grass root soccer	- Provision of disease control program via soccer and free treatment - Youth education - Leader and referee education - Establishment of sports facilities	41,000 participants
Play soccer	- Education and health management - Provision of social participation program via soccer - Social and economic development - Leadership education - Establishment of sports facilities	25 countries
Sport-the bridge	- Women's activities - Youth education and soccer education - Provision of disease control program - Establishment of sports facilities	Active in Ethiopia
Georges malaika foundation	- Soccer education - Leader and referee education - Establishment of sports facilities	4,000 participants
Mathare youth sports association (MYSA)	- Education for the disabled - Health and disease education - Social participation activities and education via soccer	14,000 people / 1,200 teams operated
Special olympics	- Provision of environment for the education for the disabled - Strengthening of human rights - Soccer education - Establishment of	2 million participants

	sports facilities	
South African Red Cross Society	- Social services - Provision of youth development program - Education for education and volunteer activities - Health - Establishment of sports facilities	

2.3.3. UN's International development cooperation through sports

The United Nations stresses the importance of sports for the achievement of the MDGs and SDGs, and is committed to continuing efforts and activities in cooperation with governments, international organizations, corporations and private organizations of each country. In particular, 2005 was designated as a year of sports and physical education, while the importance of sports was emphasized and various activities are carried out in connection with sports related associations such as international sports organizations and NGOs including those under the umbrella of the United Nations[4].

The UN formed the UN Inter-Agency Task Force on Sport for Development and Peace, consisted of UN agencies and international organizations such as UNESCO, WHO, and UNICEF to develop strategies for developmental activities through sports since the adoption of the MDGs. and also recommended the UN member nations to include sports as an important means of development through relevant reports[20].

Furthermore, the then UN Secretary General appointed a special advisor for "Sports for Development and Peace" and launched the UN Office on Sport for Development and Peace(UNOSDP)[11]. The role of the special advisor, who oversees this office, is to represent the United Nations and achieve its developmental goals through sports cooperation between all relevant entities, such as the UN agencies and member countries, international and national sports organizations, civic organizations, private sector, academia and the media, and is also responsible for publicizing the importance of sports as a means of promoting development[5].

The UN's past international sports development activities were limited to simple support projects such as providing supplies and dispatching leaders, but in recent years, various programs have been operated through encouragement and connection with each country, sports organization, and corporation[21]. <Table 3> illustrates the activities of the United Nations on sports development via supporting and connecting related institutions.

Table 5. UN's sports developmental activities[21].

Organization	Program	Details	Region
Football beyond borders	Established in 2009(UK) - FBB Schools - FBB Academy - FBB Youth Leaders	Provision of program for children aged 7 to 13 via soccer academy 6,000 children participated	developing countries
Football club alliance	Established in 2007(Switzerland) - Young Coach Education Programme	Provision of soccer and leadership programs to 9,000 children and establishment of sports facilities	Jordan, Colombia, India, Uganda, etc.
Group international de paz	Established in 2009(Colombia) - BEISBOLERITOS - Convivencia Y Paz - Embajadorres Fair Play - Olas Del Viento	Promotion of development and education, gender equality and peace for approximately 11,000 children at 20 offices	Amazon and undeveloped areas
Right to play	Established in 2000(Canada) - Sport for Development and Peace	School attendance increased by 15% via sports and physical activity programs, dis-	20 countries such as Africa, Asia, and the Middle East

		eases decreased by 82% via health education, and women's social participation increased by 70% via sports activities	

3. Discussion

International development cooperation through sports in the earlier years was focused on strengthening the competency of sports themselves, such as by building sports infrastructures, establishing relevant infrastructures, improving sports instruction methods, developing sporting goods and equipments, and improving performance[22]. That is, international development cooperation projects through sports, such as the international sports federations, focused on strengthening the competitiveness of the events themselves, such as by dissemination and facilitation of the sports concerned, and in the case of related projects conducted at the national level, projects were implemented with concentration on the interests of their own country, such as by propagating the culture of beneficiary country and enhancing their national image[4]. Such an approach was short termed and exhaustive as support activities to the beneficiary country, which could bring about a temporary effect on the beneficiary country or beneficiary area, however, revealed limitations as aid activities as a tool for resolving temporary relationship among nations and for national interest[21].

Accordingly, as for the direction of implementation of international development projects through sports, activities for social and economic development of developing countries must be carried out through sports, such as by strengthening the physical and psychological integrity of the beneficiary country, not by strengthening and developing the sports themselves such as supplying and facilitating the corresponding events. Strategic plans of implementation for international development cooperation activities through sports are as follows.

First, global cooperative governance should be established among the related organizations. UN, international societies and sport international organizations, and many associations lead international development cooperation using sports, however, more systematic structuration and organizations are needed for specific objects and activities by concrete organization[6]. To develop international development cooperation through sport, the related organizations should be integrated and linked for its decision makings, planning and operating for the project. But many relating projects have been conducted according to each organization respectively, such as International sport organizations, NGO, and etc. Hence, they should construct global cooperative governance, which will improve the productivities and efficiency.

Second, it is participation in international sports development cooperation activities by companies. It is essential to secure stable financial resources in order to implement projects continuously. However, when compared with other development cooperation areas such as food, medicine, and health, the international development cooperation projects through sports are assessed to be relatively insignificant, and such a low evaluation is having a negative influence on securing financial resources such as sponsorship of companies[6].

Accordingly, it is necessary to improve the perception of the programs concerned by quantifying and presenting the results through clear project assessment methods. This will prove the feasibility and legitimacy of related projects, thereby providing the logics of project implementation, thereby enhancing the participatory rate of international development cooperation projects for which companies utilize sports[4].

Third, it is a plan of utilizing sports stars. In 2018, 6 athletes were selected among the top 100 most influential people by “Time“ of the United States, and as such, in a modern society, athletes are recognized as public figures and have a social influence. Such star athletes are actively participating in related activities to help resolve various social problems. Famous sports stars such as Tiger Woods, Hines Ward, Ji-Sung

Park, and Yuna Kim are involved in social contribution activities such as establishing foundations and carrying out social activities with corporations[23][24]. Considering the performance results of sports stars' philanthropic activities, the use of star athletes multiplies the promotional impact of related programs and projects and is likely to positively influence the participation of local residents. In order for star athletes to participate, it is necessary to support and cooperate with the associations of the sports concerned, and it is also necessary to encourage the athletes to participate for the purposes of public interest. The World Taekwondo Federation has been actively promoting related projects by utilizing star athletes, such as by appointing Aaron Cook of Moldova as honorary ambassador for the Taekwondo Humanitarian Foundation. As such, including the retired athletes, utilizing athletes as the instructors for the projects and honorary ambassador is determined to be a way for enhancing the effectiveness of international development cooperation projects through sports.

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Effects of Naegong-Chesool EXERCISE on Physical Fitness and Balance Abilities in Male Elderly

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Abstract

This study was to investigate the effects of Naegong-Chesool exercise on physical fitness and balance abilities in male elderly. The participants were divided into two groups: Exercise group (n=20) and Control group(n=20). The Naegong-Chesool exercise program for 12 weeks. The results of this study were as follows: First, there were significantly increased in muscular strength, muscular endurance, cardiovascular endurance, flexibility and agility. Second, there were significantly increased in UP, Down, Left, Right Balance abilities. As conclusions, this study confirmed that the Naegong-Chesool exercise could improve the physical fitness and balance ability of male elderly.

[Keywords] ***Sport, Naegong-Chesool, Physical Fitness, Balance Abilities, Male Elderly***

1. Introduction

A recent characteristic of global population change is the shift to an aging society due to the rapid increase in the elderly population. As the average life span of humans is gradually extended due to improvement of health hygiene and improvement of modern medicine due to low fertility and improvement of average life, the elderly population is continuously increasing. This has become a global social problem not only in Korea. The society where aged 65 and over accounts for more than 7% of the total population is called aging society, more than 14% is aged society, and more than 20% is post-aged-society. According to the National Statistical Office[1], it is also expected to enter the super-aged society in 2030 as the Aged Society in 2020 and the fastest rate of aging in OECD countries.

Decreased physiological function of the elderly due to aging reduces adaptability to disease and environment, such as weakening of physical function, slowing of exercise function, weakening of musculoskeletal system, lowering of cardiopulmonary function and immune function[2]. It causes negative effects on the quality of life of the elderly, causing the mental and physical damage of the elderly. In addition, it causes functional problems of health related physical fitness(muscle strength, muscle endurance, cardiopulmonary endurance, flexibility) and behavior related physical fitness(balance, agility, system response time) as the aged of the elderly grows[3]. Thus, the importance of health for elderly is an absolute necessity, and health maintenance is a problem to be solved. The decline in functional fitness due to aging can not be completely prevented, but adequate physical activity can slow down the rate of physical fitness [4]. Therefore, it is essential

* This paper is a reanalysis of the results of the research by extracting Lee KS's 2017 master's thesis.

to maintain regular exercise and proper lifestyle in order to live healthily in old age[5].

In an aging society, the elderly are encouraged to participate in exercises as an effective way to reduce medical costs by improving the physical function of the elderly, enabling independent physical activity and lifestyle, and reducing the treatment of chronic diseases[6]. Continuous exercise is also effective in improving health-related fitness and antioxidant enzyme activation and prevention of metabolic syndrome[7]. Regular participation of aerobic exercise improves the risk factors of chronic metabolic diseases, improves cardiovascular function, and improves the health and fitness of the elderly with preventive effects[8]. A study of Kim KJ et al[9] reported that regular exercise participation has positive effects on changes in body composition by increasing muscle mass and decreasing body fat mass in the elderly. And the body fat, body fat and body fat were decreased, and fat, muscle strength, and oxygen uptake were improved[10][11]. Fatouros et al[12] also reported that regular exercise improves the bones of elderly people, improves flexibility, improves overall balance, as well as overall cardiovascular function. However, despite the positive effects of exercise on the elderly, many older people do not practice systematic exercise. The reason for this is that the necessity of physical activity decreases with increasing age. Second, it thinks that exercise is dangerous. Third, it thinks that light exercise does not help health[13]. And fourth, If you have an attitude to avoid exercise because of illness[14], because they are generally low in physical fitness and are interested in health but improve their physical and mental health without a limited facilities, space and economy.

Therefore, this study is a movement that strengthens physical strength and energy simultaneously by coinciding breathing and movement, and is widely applied to all age groups[15]. The purpose of this study is to clarify the effect of the Korean traditional martial arts Naegong-Chesool exercise, which is similar to Chinese taijiquan, on the physical fitness and balance ability of the elderly. The purpose of this study is to verify the feasibility and efficiency of the exercise program for elderly people.

2. Materils & Method

2.1. Subject of study

The subject of this study is composed of male elderly in D city and physically healthy persons without any medically specific findings. The subject is divided into two groups through random sampling: Naegong-Chesool exercise group(EG/20 people) and non-exercise group(CG/20 people). The physical characteristics of subjects are shown in <Table 1>.

Table 1. Physical characteristics of subjects.

	Age(yrs)	Height(cm)	Weight(kg)	BMI(㎏/㎡)
EG(N=20)	68.93±2.31	168.27±2.94	65.07±3.41	26.47±1.33
CG(N=20)	69.13±1.81	169.60±2.80	65.67±3.35	27.20±1.54

2.2. Exercise program

The Naegong-Chesool program consisted of the basic textbook of the handicapped, and composed of stroke, pushing, and blocking exercises in consideration of elderly's physical functions[16]. The Naegong-Chesool program was performed for 60 minutes 4 times a week for 12 weeks in compliance with the exercise recommendation shown in ACSM[17]. The contents of Naegong-Chesool program are as shown in <Table 2>.

Table 2. Naegong-Chesool program.

Contents	Exercise program	1~4 weeks (reps/set)	5~8 weeks (reps/set)	9~12 weeks (reps/set)	Exercise intensity
Warm-up (10min)	Stretching walking, stroke, pushing				

Work-out (40min)	punch-ing(palm, fist, side-fist)	20/3	30/3	50/3	RPE 8~10
	Pushing (lower wrist, side hand, chin, one hand, two hands, neck, trunk)	20/3	30/3	50/3	
	Blocking (hands, feet, knees, twist trunk, hanging, turning) /	20/3	30/3	50/3	
Cool-down (10min)	Stretching				

2.3. Measurt and method

2.3.1. Measurt and physical fitness

As the physical fitness was measured by five variables, which was based on the Senior Fitness Test(SFT) developed to evaluate elderly ' s physical fitness[18]. Muscular strength(grip strength), muscular endurance(chair stand test), cardiovascular endurance(2 minute step test), flexibility(chair and reach), Agility(244 cm up and go) were mesured according to SFT.

2.3.1.1. Measurt and muscular strength

Muscular strength is measured by using a tonometer(TAKE 1, Japan), holding the instrument panel facing outward, and then adjusting the width so that the second joint of the second finger is almost perpendicular in an upright posture. Higher values were selected after 2 measurements(unit of measurement: kg).

2.3.1.2. Measurt and muscular strength

Muscle endurance was measured by using a chair. The subjects were sitting on their chairs for 30 seconds with their arms held together in front of their chests and measuring the total number of times they had occurred. During the measurement, the subjects were allowed to stretch their knees to the maximum extent. In order to prevent the mobilization of both arms or other muscles, muscular endurance were measured so that only lower extremity could be mobilized with their hands crossed on both shoulders.

2.3.1.3. Measurt and cardiovascular endurance

The whole body endurance test was performed with a 2 minute step test. Subjects walked for 2 minutes with a "start" command in a comfortable position. The right knee was regarded as one occasion when it reached the specified position, and it was recognized that the knee was raised to the middle part between the patella and the iliac crest[19].

2.3.1.4. Measurt and flexibility

Flexibility was achieved by sitting and reaching the body. Participants should be careful not to bend their knees with their two knees on their knees and to stretch their fingers to their fullest extent. A total of 2 measurements were performed and the highest value was recorded. A measuring instrument(Helmsas NH-3000G, Korea) was used for the measurement.

2.3.1.5. Measurt and agility

The agility was measured using 244 cm up and go walk. The chair was placed on the wall and the point 244 cm from the chair was marked as a turning point. The subjects placed their backs on their chairs, their hands on their thighs, and their entire soles to sit on the floor. When the "start" command was received, the subject walk up from the chair and measured the time to sit on the chair again after turning around. The unit was 0.01 seconds.

2.4. Date process

To process the data of this study, the mean and standard devation of all the data were calculated using SPSS 20.0. The significance test before and after experiment was conducted by paired t-test, and the significance test between each groups was conducted by independent sample t-test. The significance level was $\alpha<.05$.

3. Results

3.1. Changes in physical fitness

Changes <Table 3> shows the change of physical fitness after Naegong-Chesool program. Changes in physical fitness of EG group were statistically significant in all variables of left muscular strength(p=.000), right muscular strength(p=.000), muscular endurance(p=.003), cardiovascular endurance(p=.000), flexibility(p=.000), and agility(p=.000). Changes in physical fitness of CG group were not statistically significant in all variables. In the pre-test, there was no statistically significant difference of all variables betweeen groups. In the post-test, there were statistically significant differences of left muscular strength(p=.000), right muscular strength(p=.000), muscular endurance(p=.000), cardiovascular endurance(p=.000), flexibility(p=.000), and agility(p=.000) betweeen groups.

Table 3. Changes in physical fitness.

Contents		Group	Pre-test	Post-test	t*
Muscular strength	Left	EG(n=20)	21.73±1.58	23.09±1.17	-3.532†††
		CG(n=20)	21.54±1.38	21.61±1.16	-0.338
		t**	0.367	3.972†††	
	Right	EG(n=20)	22.96±1.13	23.95±0.99	-3.051†††
		CG(n=20)	22.58±0.99	22.82±0.84	-0.316
		t**	0.476	3.369†††	
Muscular endurance		EG(n=20)	16.33±2.79	18.00±1.31	-2.820††
		CG(n=20)	16.53±2.20	16.27±1.33	0.695
		t**	-0.218	2.991†††	
Cardiovascular endurance		EG(n=20)	81.38±2.61	83.46±1.80	-3.731†††
		CG(n=20)	81.14±2.26	81.23±1.69	-0.396
		t**	0.272	3.492†††	
Flexibility		EG(n=20)	8.07±3.15	10.93±3.13	-4.489†††
		CG(n=20)	7.53±3.02	7.60±2.50	-0.250
		t**	0.473	4.224†††	
Agility		EG(n=20)	7.65±1.18	6.55±0.90	3.292†††
		CG(n=20)	7.92±1.06	7.84±1.02	0.360
		t**	-0.667	-3.073†††	

Note: Value EG/Exercise group, CG/Non Exercise group
*: Paired t-test between pre-test and post-test in a group
**: Independent sample t-test in pre-test and post-test between groups
††and †††mean p<0.01, and p<0.001 respectively.

3.2. Changes in balance ability

<Table 4> shows the change of physical fitness after Naegong-Chesool program. Changes in balance ability of EG group were statistically significant in all variables of Up(p=.000), Down(p=.003), Left(p=.000), and Right(p=.000). Changes in balance ability of CG group were not statistically significant in all variables. In the pre-test, there was no statistically significant difference of all variables betweeen groups. In the post-test, there were statistically significant differences of Up(p=.000), Down(p=.003), Left(p=.000), and Right(p=.000) betweeen groups.

Table 4. Changes in blance ability.

Contents	Group	Pre-test	Post-test	t*
Up	EG(n=20)	-1.63±0.37	-0.61±0.65	-5.533†††
	CG(n=20)	-1.72±0.29	-1.59±0.33	-1.702
	t**	0.728	5.179	
Down	EG(n=20)	-1.57±0.59	-0.76±0.49	-4.109††
	CG(n=20)	-1.41±0.66	-1.47±0.63	0.730
	t**	-0.705	3.413	
Left	EG(n=20)	-1.11±0.57	-0.10±0.51	-5.329†††
	CG(n=20)	-1.15±0.46	-1.24±0.51	0.932
	t**	0.179	6.133	
Right	EG(n=20)	-0.77±0.53	0.16±0.51	-7.954†††
	CG(n=20)	-0.92±0.48	-1.01±0.45	2.053
	t**	0.820	6.657	

Note: EG/Exercise group, CG/Non Exercise group
*: Paired t-test between pre-test and post-test in a group
**: Independent sample t-test in pre-test and post-test between groups
†† and ††† mean p<0.01, and p<0.001 respectively.

4. Discussion

For As a result of comparing and analyzing effects of Naegong-Chesool exercise program on physical fitness and balance ability of 40 male elderly(exercise group of 20, non exercise group of 20), discussion is as follows.

4.1. Exercise and physical fitness

The physical fitness required for the elderly is muscular strength, muscular endurance, cardiovascular endurance, flexibility, and agility of the lower and upper body in order to ensure safe and normal life activities[18], a significant change due to aging has been reported change of muscle and musculoskeletal

system which is the major factor affecting self-reliance directly[20].

These physical strength factors generally decrease with physical performance ability as age increases, and muscular strength, muscular endurance decrease gradually after age 30 and decrease by 50% until age 70. In addition, the decrease in muscular strength, muscular endurance, as well as all physical fitness, also decreased rapidly with aging at the age of 75 years[4]. However, according to various previous research results, exercising regularly for 24-32 weeks can help elderly people aged 80-90 improve their $VO2_{max}$ by 15-17%. Also aerobic endurance training improves older people's ability to maintain exercise at maximum energy expenditure[21], and regular participation in physical activity programs reported a positive change in improving physical fitness of the elderly[22].

The changes in physical fitness of elderly people in this study showed positive effects on Naegong-Chesool exercise group all physical fitness variables such as muscular strength, muscular endurance, cardiovascular endurance, flexibility, and agility, which is the same as the research results of Kim et al[22] and Oh et al[21], also supports the research results of Kim[23] which was a significant difference in all the variables of physical fitness between exercise group and non exercise group in the change of physical fitness difference by age.

4.2. Exercise and balance ability

Changes Balance is a complex phenomenon due to the integration of senses, musculoskeletal and nervous systems[24], and these functions deteriorates with age. In particular, depression of proprioception causes falls by impairing body function that maintains balance, which is perceived as a serious health problem[25]. Many studies have shown that prevention of falls in elderly people requires improvement of physical fitness and regular exercise to improve balance ability[26]. Lee[27] reported 3 times a week, 30 minutes daily mat exercise improved the overall balance ability of elderly people aged 65 and over, and muscle strength increase and ROM increase through regular exercise improved the balance ability of the elderly and reduce the risk and fear of falling[28]. Falling refers to falling over to a lower position or floor than originally, except falling outside due to external forces, loss of consciousness, or sudden paralysis[29]. Due to the physiological changes due to the aging process, elderly people are 10 times more likely to fall than other age groups[8], 30% of elderly people aged over 65 experience more than one fall each year[30], and fall is recognized as a serious social problem due to the high risk of relapse[31].

The changes in balance ability of elderly people in this study showed positive effects on Naegong-Chesool exercise group all balance ability variables and it is the same as the research results of Park[32] which is improvement of the elderly physical fitness had a positive effect on the improvement of balance ability, and supports the preliminary study[33] that the declining fitness of the elderly is increasing the risk of falls due to poor balance, also supports the research results of Kim[3] that decrease in physical fitness of elderly is increasing the risk of falls due to decrease in balance ability[33]. In addition, results of this study is supporting that reported that Naegong-Chesool exercise makes body and soul united by matching abdominal respiration and Naegong-Chesool's motion, and it is gentle enough to slowly stretch joints and muscles to improve strength and overall endurance, to improve body balance and agility[15].

5. Conclusion

The purpose of this study is to investigate the effect of Naegong-Chesool exercise on physical fitness and balance abilities in male elderly. The participants were divided into two groups: Exercise group(n=20) and Control group(n=20). Naegong-Chesool program was performed for 60 minutes 4 times a week for 12 weeks. And the effects of Naegong-Chesool exercise on physical fitness and balance abilities in male elderly were as follows.

1. Changes in physical fitness of EG group were statistically significant in all variables of

muscular strength, muscular endurance, cardiovascular endurance, flexibility, and agility, but there was no significant difference in all variables of CG group.

2. Changes in balance ability of EG group were statistically significant in all variables of UP, Down, Left, and Right, but there was no significant difference in all variables of CG group.

The results of this study suggest that Naegong-Chesool is an effective exercise on physical fitness and balance abilities in male elderly. Therefore, it is thought that the elderly people can provide more information to improve physical fitness, performance fitness and balance ability, if they develop programs to exercise such as exercise therapy considering eating habits, lifestyle and environment.

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