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A Candidate SPORTS Nutrition Supplement, Lonicerae Flos, Attenuates Collagen-Induced Arthritis in Mice

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Abstract

Rheumatoid arthritis(RA) can occur in persons of all ages and of both sexes. Diverse studies recommend exercise to help diminish pain from RA symptoms. Although exercise for patients with RA is an effective therapy to improve functional impairment, patients experience reluctance to exercise because of pain. Several studies have focused on investigating the treatments for this disease. However, RA is currently an incurable disease because its pathogenic cause is still unclear. In view of the complex considerations, the treatment of RA with exercise requires more effective research for developing therapies with proven stability. For example, natural compounds are potential therapeutic agents and candidates as sports nutrition supplements. In the present study, we aimed to find a candidate sport nutrition supplement from natural compounds such as foods and tea. *Lonicerae flos*(LF) has been widely used in Korean traditional medicine and as a tea material. Therefore, we evaluated the effect of LF extract on an RA model. First, we found that the mRNA expression of macrophage migration inhibitory factor(MIF), cyclooxygenase-2(COX-2), and matrix metalloproteinase-9(MMP-9) in synoviocytes stimulated with phorbol-12-myristate-13-acetate was decreased by LF treatment(0.4–1.0 mg/mL). Furthermore, the distribution of MIF-, COX-2-, and MMP-9-positive cells in mice with collagen-induced arthritis treated with LF(45 mg/kg) was remarkably decreased. These data likely indicate that LF may act as an anti-inflammatory agent and may be a potential compound for the development of useful agents for RA treatment.

[Keywords] Sport Nutrition, *Lonicerae Flos*, Inflammation, Natural Compounds, Rheumatoid Arthritis

1. Introduction

Rheumatoid arthritis(RA) is known to affect approximately 1% of the worldwide population. According to the National Health and Nutrition Survey in 2005, the incidence of RA in Korea was 21.1 per 1000[1]. RA is a chronic disease that can lead to synovitis, consequently inducing joint deformity and damage. Diverse studies have suggested that the etiology of RA is multifactorial, involving various genetic and environmental factors, autoimmune functions, and pathogenic mediators. Unfortunately, RA is still characterized as a chronic disease of unknown etiology, and the complete cure for this disease is yet unclear.

Exercise contributes to maintaining health and is associated with significant increases in the function of the immune system and in biological activities[2]. The review article by Metsios et al. suggested that therapy with prescription and exercise was a potential intervention for improving RA[3]. Because the medications for RA consist of disease-modifying anti-rheumatic drugs, biological response modifiers, glucocorticoids, and nonsteroidal anti-inflammatory medications, with the risk of adverse effects from long-term administrations, the treatment for RA requires more effective research for developing therapies with proven stability[4].

Especially, natural compounds may improve the risk of adverse effects. Lonicerae flos(LF) has been commonly used as a tea material. Some studies showed that the diverse pharmacological actions of LF extract include anti-inflammatory, anti-oxidant, and anti-cancer effects. However, the effects of LF on RA mediation have not yet been established. Hence, we designed this study to determine whether LF can mitigate RA through the inhibition of cyclooxygenase(COX)-2 and matrix metalloproteinase(MMP)-9 by means of regulation of macrophage migration inhibitory factor(MIF).

2. Methods

2.1. Materials

All cell culture materials and the MTT assay kit were purchased from Sigma, Gibco BRL(Gaithersburg, MD, USA). Antibodies such as anti-COX-2 and anti-MMP-9 were purchased from Santa Cruz Biotechnology(Santa Cruz, CA, USA). All other chemicals were purchased from Sigma(St. Louis, MO, USA).

2.2. Design of experiments

To determine the effect LF in a collagen-induced RA model, we performed reverse transcription polymerase chain reaction(RT-PCR), histological analysis, and immunohistochemistry.

2.3. Procedure

2.3.1. Cell isolation and culture

Infrapatellar fat pads(IFPs) were harvested from the knees of mice. Ten IFPs were minced and digested in 1 mg/mL collagenase(Wako, Osaka, Japan) for 15 min and passed through a 40-mm filter(Becton Dickinson, Franklin Lakes, NJ, USA). Dissociated cells and undigested IFPs were cultured together in a 100-mm culture dish. The mouse synovium cells(mSCs) were cultured in Dulbecco's modified eagle medium(DMEM) containing 10% fetal bovine serum and 1% penicillin-streptomycin at 37°C in a 5% CO₂ atmosphere. Primary cells were seeded at 5 × 10⁵

cells/well in six-well plates containing DMEM, and incubated for 24 h. Cells were incubated with different concentrations of LF(0.4, 0.6, 0.8, and 1.0 mg/mL) in phorbol 12-myristate 13-acetate(PMA)-free medium or PMA-containing medium for 24 h.

2.3.2. RT-PCR

After cell culture, total RNA was isolated from cells by using TRI-reagent, and then cDNA was synthesized by using 1.0 µg total RNA in a Superscript II Reverse Transcription System. PCR amplification was performed with the following protocol: pre-denaturation at 95°C for 3 min and then either 30 cycles of denaturation at 94°C for 1 min, annealing at the melting temperature of each primer for 1 min, or extension at 72°C for 1 min, followed by a final extension at 72°C for 10 min. mRNA expression was quantified by using an ethidium bromide-stained 1.5% agarose gel. The following primers were used for the PCR reaction: MIF, sense primer 5'- CAC CAT GCC TAT GTT CAT CGT GAA CA-3', anti-sense primer 5'-GGG CTC AAG GCG AAG GTG GAA CCG TT-3'; COX-2, sense primer 5'-TCT CCA ACC TCT CCT ACT AC-3', anti-sense primer 5'-GCA CGT AGT CTT CGA TCA CT-3'; MMP-9, sense primer 5'-AAG CCT CTA CAG AGT CTT TG-3', anti-sense primer 5'-CAG TCC AAC AAG AAA GGA CG-3'; and β-actin, sense primer 5'-GGA GAA GAT CT GCA CCA CACC-3', anti-sense primer, 5'-CCT GCT TGC TGA TCC ACA TCTGCT GG -3'.

2.3.3. Animal care and analysis

The animals(DBA mice, 6 weeks; n = 20) were randomized into two groups: collagen-induced arthritis(CIA) group(CE group)[5] and RA treated with LF group(LT group). LF was dissolved in water and administered to the LT group at 45 mg/kg orally for 28 days. Animal care and all experiments were conducted in conformity with the institutional guidelines of Pusan National University(Institutional Animal Care and Use Committee no. PNU-2016-1290), South Korea, and conformed to the Guide for the Care and Use of Laboratory Animals from the US National Institutes of Health(publication no. 85-23, revised 2011). Segments from each half were embedded in paraffin, and 5-µm sections were prepared,

cleared with xylene, and hydrated with ethanol. The sections were stained with hematoxylin and eosin and observed with a BX51 light microscope. The slides with sections were treated with avidin–biotin block, exposed to diaminobenzidine with hematoxylin, and analyzed under a light microscope.

2.3.4. Statistical analysis

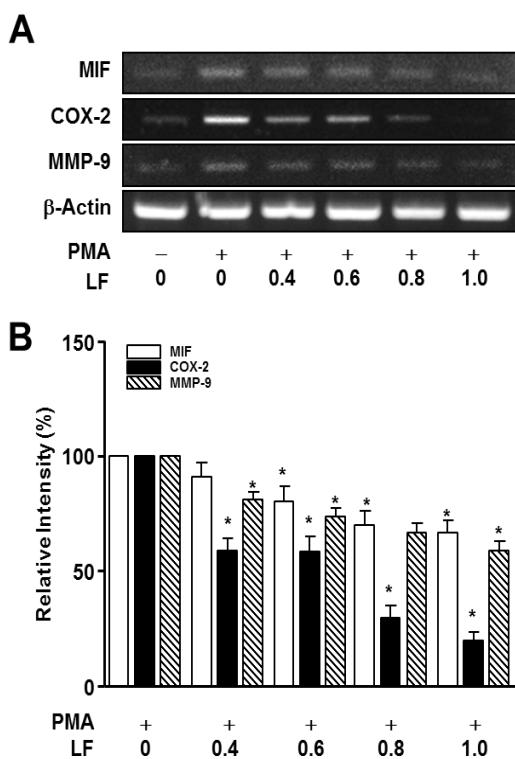
The results are expressed as the mean \pm standard error of at least three independent experiments. The difference between the two groups was examined by using Student's t-test. A p-value of <0.05 was considered statistically significant. Statistical analysis was carried out with GraphPad Prism 4.0 software.

3. Results

3.1. LF attenuates the expression of MIF, COX-2, and MMP-9 in PMA-stimulated mSCs

As shown in <Figure 1>, PMA(1 ng/mL) significantly increased the expression levels of MIF, COX-2, and MMP-9 in mSCs. In contrast, this enhanced expression of MIF, COX-2, and MMP-9 was inhibited by treatment with LF(0.4–1.0 mg/mL) in a concentration-dependent manner. The expression levels of MIF, COX-2, and MMP-9 showed a maximal response at 1 mg/mL LF.

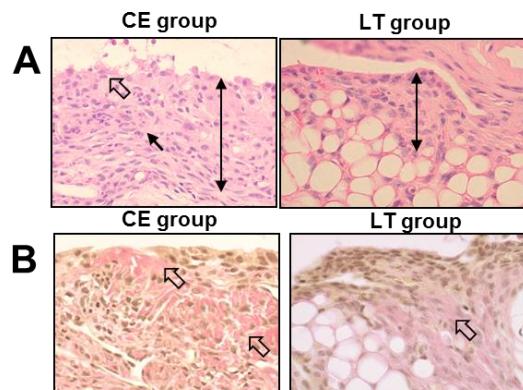
Figure 1. Effect of Ionicerae flos(LF) extract on the expression of MIF, COX-2, and MMP-9 in phorbol 12-myristate 13-acetate(PMA)-stimulated mSCs. Primary cultured mSCs were incubated in the absence or presence of PMA(1 ng/mL) with LF(0.4, 0.6, 0.8, and 1.0 mg/mL) for 24 h, and then the total RNA was isolated. (A) Agarose gel image showing MIF, COX-2, and MMP-9 mRNA of expression in mSCs after LF treatment. (B) Relative band intensities of MIF, COX-2, and MMP-9. Data are means \pm standard error(* $p < 0.05$ compared with the untreated group).



3.2. LF reduces damage in CIA-induced RA mice

As shown in <Figure 2>, LF(45 mg/kg) administration significantly reduced the synovial cell hyperplasia in the CIA-induced RA model <Figure 2A>. Moreover, LF administration reduced the fibrosis in the CIA-induced RA model <Figure 2B>.

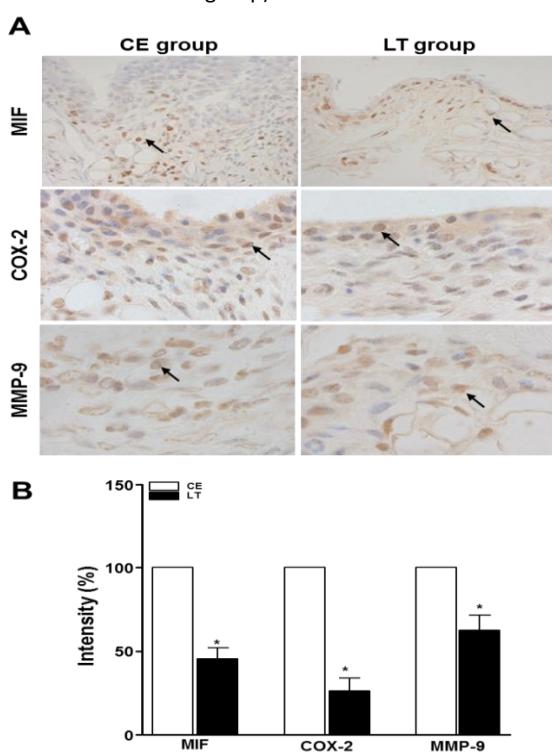
Figure 2. Effect of Iionicerae flos(LF) extract on the CIA(collagen-induced arthritis)-induced RA model. (A) Inhibition of damaged synovial membrane as filopodia (wide open arrow), hyperplasia of synoviocytes (\Downarrow) ;(hematoxylin and eosin, $\times 400$) (B) Inhibition of fibrosis (wide open arrow) ;(van Gieson's, $\times 400$).



3.3. LF modulates the expression of MIF, COX-2, and MMP-9 in CIA-induced RA mice

We used immunohistochemistry assay for COX-2 and MMP-9 to identify the inflammatory response in the synovial tissue of the RA model. As shown in <Figure 3>, the intensity of COX-2 and MMP-9 (arrow indicates positive cells) was lower in the LF-administration group than in the vehicle-treated group.

Figure 3. Effect of Lonicerae flos(LF) extract on the expression of MIF, COX-2, and MMP-9 in CIA (collagen-induced arthritis)-induced RA model. (A) Expression levels of MIF, COX-2, and MMP-9 in the CE and LT groups. (B) Relative expression intensities of MIF, COX-2, and MMP-9. Data are means \pm standard error (* $p < 0.05$ compared with the CE group).



4. Discussion and Conclusion

Although the complete therapy for RA is still unknown, a common pathological phenomenon in patients with RA is chronic inflammation. Abnormal immune response is relevant to inducing serious joint damage by pro-inflammatory cytokines, MIF, and type II collagen. In the viewpoint of enzyme signals, elevated levels occur mostly in inflamed

tissue, whereas unexpressed levels are found in the normal condition. Elevated MMP-9 is also involved in the inflammatory indication[5].

The inflammatory process of the synovium in RA indicates synovial cell hyperplasia and fibrosis. In addition, excessive expression levels of COX-2 and MMP-9 are also identified in RA. In the present study, we investigated whether LF can regulate RA through the regulation of COX-2 and MMP-9 in vitro and in vivo. Our results showed that LF treatment significantly reduced inflammation in the RA model. In conclusion, we recommend the combination therapy with exercise and biological supplementation for RA. Rehabilitative exercise may be effective for patients with RA, and the prescription against RA demand excluding these risk factors in the long term.

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Analysis and Research on Occurrence of Safety Accident in TAEKWONDO Training Center in KOREA

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Abstract

Safety has emerged as the greatest concern of the present age, and now we are paying more attention to safety than ever. Life richer and more comfortable than the past, on the contrary, accompanies the adverse function of complex and unstable civilization. That is, as the modern society where cultural leisure activities increase in life develops, it is necessary to manage the safety accidents accordingly more systematically.

This research began by recognizing the necessity of research as there is no research or direct/indirect safety-management coping plan and manual for juvenile safety management even though it is very import according to increase of the Taekwondo training center. Safety accidents can be occurred by one factor or by complex combination of several factors. It is necessary to conduct a diversified research on the risk factors that can cause or increase safety accidents and the factors that can prevent or reduce safety accidents.

Therefore, this study aims to prevent safety accidents of Taekwondo training center increasing every year, by investigating and analyzing safety accidents occurring in the Taekwondo training center. In order to accomplish this purpose, we'd like to analyze the safety accidents that occurred in Taekwondo training center based on the preceding researches and seek improvement plan accordingly.

The risk factors that can cause or increase the safety accident of Taekwondo training center are as follows: First, fire at the invisible site due to the environmental factors and injuries caused by facilities are the most common. Second is the factor by trainees - the infectious diseases and injuries between trainees were the main ones. Finally, it is the situation that the accidents caused by carelessness of the trainer frequently occur by as the factor of trainer. In particular, safety accidents caused by passive safety management by trainers are increasing every year. Also, regarding the situation of preparedness for emergency treatment, knowledge and preparation about first aid are insufficient in most of Taekwondo training center, so the education by the related institutions and strengthening of qualification are considered to be prepared.

As a result of analyzing the actual situation of safety accidents in Taekwondo training center in Korea, it was found that most of Taekwondo training center are exposed to safety accidents or lack safety management even though there were some Taekwondo training centers with thorough safety management for safety accidents. The fundamental resolution for the problems in safety management against safety accident at the Taekwondo training center has not been conducted even though there has occurred similar incidents and accidents in training center. In this respect, it is considered that the Kukkiwon(World Taekwondo Headquarters) and the Korean Taekwondo Association need to recognize the importance of safety management and to have specific guidelines and manuals to minimize the safety accidents and injuries occurring in the Taekwondo training center and respond quickly. And it is judged that there is a duty to take charge of development of program which can cope with crisis management in Taekwondo training center and safety education for it.

[Keywords] *Taekwondo Training Center, Safety Accident, Safety Education, Injury, Emergency Treatment(First Aid)*

1. Introduction

At present, the age group of Taekwondo trainees in Korea is lowered gradually, and juvenile trainees are more than 80% of all trainees. Although the increase of juvenile Taekwondo trainees has a positive effect in the aspect of Taekwondo industry, the opening of Taekwondo training center by geometrical increase results in deterioration of the quality of training[1]. In particular, children are more likely to get safety accidents than adults or adolescents[2][3]. Accordingly, by recognizing the importance of juvenile safety management due to the increase of Taekwondo training center, this researcher would like to contribute to create safety culture for Taekwondo training center by investigating and analyzing the safety accidents in Taekwondo training center where especially lots of children get training.

2. Theoretical Background

2.1. Concept of safety education

The meaning of safety refers to education enabling to acquire knowledge and skills to protect one's own self from disasters or accidents. Safety education for the necessity and importance of safety should be conducted in the Taekwondo training center as the habit of always living a safe and healthy life with respect to the life of one's own self and others is grown[4].

2.2. The concept of safety accident in taekwondo training center

It refers to the injury or death accidents of trainee or trainer by defects in the installation • management of the training facilities or by intention •negligence of the trainee or trainer occurred during the training activities of Taekwondo training center – i.e., during whole activities and events related to the training, instruction and protection conducted inside/outside the Taekwondo training center[5]. Therefore, in a broad sense, safety accident in Taekwondo training center can be referred to a general term of 'All accidents occurring surrounding Taekwondo training center'.

2.3. Safety management in taekwondo training center

Mitroff(2005), a crisis management scholar, emphasizes to proceed with the following five stages for effective crisis management: ① Detection ② Prevention and preparation ③ Restraint and prevention of spread of damage ④ Recovery to the state before crisis ⑤ Learning and repetition[6]. To graft these with the safety management of Taekwondo training center, they can be referred to ① Detection, ② Prevention and preparation may be regarded as the improvement of the environment of the Taekwondo training center for prevention of safety accidents, and the awareness of the trainer(head of the center) and instructor for safety, ③ Restraint and prevention of spread of damage, ④ Recovery to the state before crisis means to take prompt action in case of a safety accident or to block the factors of safety accident in advance. Finally, ⑤ Learning and repetition can be said that the repeated training is the best safety management in preparation for safety accidents in Taekwondo training center.

2.4. Analysis of preceding research on safety accidents

Researches[7][8][9] on the actual situations of various safety accidents occurred in the circumstances of sports have been conducted continuously, and the researches[10][11][12] on safety consciousness are being conducted, so various solutions for sports safety are being suggested. However, it is the situation that the research on the safety accidents occurred in the Taekwondo training center is insufficient. Therefore, it is necessary to approach as a paradigm of risk factors and protective factors that can consider various factors influencing the causes of safety accidents in order to analyze the prevention of safety accident in Taekwondo training center.

3. Status and Analysis of the Safety Accidents in Taekwondo Training Center

3.1. Safety accidents caused by the environmental factor

As an environmental factor among the risk factors that may cause or increase the safety accidents of Taekwondo training center, injuries by the fire at invisible site and the facilities such as glass doors were found to occur a lot. Generally, it can be assumed that there would be no fire accident by the social wisdom thinking that safety accidents occurring in Taekwondo training center would be only injuries, however, if the site of fire is invisible site such as a locker room, the topic may be changed.

3.2. Safety accidents caused by the factor of trainee

The safety accidents caused by trainee factors were found that the diseases by the infection of trainee and injuries between trainees after getting training occur a lot. The infectious disease can be interpreted as a disease accident rather than an injury accident in the safety management of training center, and it is necessary to conduct continuous research on the effective safety-management method in addition to the current best way, the way that the trainer recognizes the prevention method and let the trainees well-informed it.

3.3. Safety accidents caused by the factor of trainer

As for the trainer factors, it was investigated that there happens many injuries caused by the instruction of the trainer and many safety accidents by carelessness of the trainer. Especially, it was found that lack of awareness of safety management due to passive safety management of trainers and wrong safety management are the problems, and the absence of safety education was also found to be serious.

3.4. Preparation for emergency situation

There are many training centers where the roll allocation of the trainers in emergency in the preparation level against the occurrence of emergency situation, and there were difficulties in preparing contingency as there

is no placement of a trainer /leader who can perform CPR(Cardiopulmonary Resuscitation). The number of trainers/leaders who has received safety education is few, and in the case of first aid, more than half of the trainers/leaders say that 'Not confident.', showing that the self-efficacy for accident-prevention is low, so it can be noted that the preparation for first-aid education and strengthening of qualification is necessary.

4. Conclusion

As a result of analyzing the actual situation of safety accidents in Taekwondo training center in Korea, it was confirmed that most of the Taekwondo training center were exposed to safety accidents or lack safety management even though there were some Taekwondo training centers with thorough safety management for safety accidents. The fundamental resolution for the problems in safety management against safety accident at the Taekwondo training center, one of the domestic juvenile activity areas, has not been conducted, but is just in the level of response of temporary remedy only to escape that moment even though there has occurred similar incidents and accidents in training center. In this respect, it is considered that the Kukkiwon(World Taekwondo Headquarters) and the Korean Taekwondo Association need to recognize the importance of safety management and to have specific guidelines and manuals to minimize the safety accidents and injuries occurring in the Taekwondo training center and respond quickly. And it is judged that there is a duty to take charge of development of program which can cope with crisis management in Taekwondo training center and safety education for it.

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Effects of Physical Fitness Rearing Education on the Task-Reated Physical Fitness and SPECIFIC PHYSICAL FITNESS of College Students Majoring Police in KOREA

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Abstract

This study aimed to College Students Majoring Police of Physical fitness Rearing Education on Task-Related Physical Fitness and Specific Physical Fitness. Sixty voluntary subjects(30 exercise, 30 control) with an understanding toward the aims of this study were selected and their physical composition and Physical Fitness on Job Performance, before and after the Physical fitness Rearing Education program, were measured.

As for the Task-Related Physical Fitness, there were significant differences between pre- and post-values in the exercise group. Meanwhile, in the aspect of comparisons between post-values in both groups, there were significant improvements in push-up, sit-up, Grasping power, 100M Sprint and 1000M Run of the exercise group. As for the Specific Physical Fitness, there were significant differences between pre- and post-values in the exercise group after completing the Physical fitness Rearing Education. In the aspect of comparisons between post-values in both groups, there were significant improvements in only the exercise group.

The study results indicate that the Physical fitness Rearing Education program is effective in improving the Task-Related Physical Fitness and Specific Physical Fitness of College Students Majoring Police. However, there is a need for more specific exercise programs to be developed for the continual improvement of College Students Majoring Police performance in along with further studies to confirm the physiological benefits of those programs.

[Keywords] *Martial Arts, Police, Physical Fitness Rearing Education, Task-Related Physical Fitness, Specific Physical Fitness*

1. Introduction

The police which has a significant responsibility in governmental authority, has the closest relationship with the public's everyday life, and has a huge influence to the people's well and security. In other words, the police is in charge of duties from maintaining the basic public order such as traffic regulations, to establishing the fundamental law and order in everyday lives, and at the same time, in charge of every roles of attracting the national security by preventing and investigating the crimes[1]. These police duties are protection of the

people's liberty and right and maintain of public order, so as means to accomplish the purpose of the police, which are protecting the citizens' security and property, peace maintain, crime prevention and crime investigation, many anticrime policies and programs have been introduced[2]. The existence of police can be acknowledged when the police not only do their own duties, but also are regarded as a partner to solve the local issues with the local citizens. Furthermore, people expect not only the one-way service from the police, but also the Community Oriented Policing including the people's participation[3]. In order to handle

all duties including regular police duties and duties by the people's demand, the police officers are under great stress, vulnerable to chronic diseases because of insufficient exercise, and have 3 times higher rate of official death than other public safety offenders[4]. Likewise, even though it is crucial to have physical fitness to do patrol activity and criminal arrest, as a result of heavy workload, night duties and great stress, they are suffering from several illnesses and injuries, and even to death. However, there are no specific measures to deal with these issues[5].

Despite the efforts in order to magnifying the effects of the police by their proper duties, when the police is not functioning well, the life and the body of the people cannot be protected as whole, and the public well and order cannot be guaranteed. It is understandable that the requisites of physical fitness, which is the basic physical ability is highly demanded in order to perform the specific duties, and the police, as being the special national officer, cannot be excluded from these requisites. Thus, because of the job patterns that demand a strong physical fitness, the police organizations worldwide are operating the Physical Fitness Programs in their own way, but these are not getting better, as a result of work overload and manpower shortage

Exercise should be encouraged to police, because exercise not only improves the officers' physical health but also has a greater impact on the productivity of the organization. According to Kim[6], among officers, participants in sports activities have

lower rate of depression and anxiety than those who are not, and Lee et al[7] also suggested that the officer's sports club activities increased the teamwork, built the trust among group, and contributed to the job satisfaction. Also, sports club activities among officers encourage group unity and bond, increase work productivity, and effective preventing adult diseases such as metabolic syndromes and cardiovascular diseases.

As a result, more studies are needed about the importance of health related to officers' duty ability and the effects of increasing physical fitness on officers' health and duty ability. Thus, in this study, we provide basic materials for physical fitness for duty ability of officers and special improvement of physical fitness by analyzing the effects of physical fitness rearing education on college students majoring police.

2. Materials & Methods

2.1. Subject of study

This study was performed at students majoring in police in D University from March 2015 until December 2015, distributed by police martial arts trained group(EG/30 participants) and non-trained group(CG/30 participants). In the beginning, each group has 60 participants, but because personal illnesses and exercise absents, participants who gave up along the study(EG/15, CG/12) were excluded and are reorganized as having 60 participants each. The physical status of the participants are in <Table 1>.

Table 1. Physical characteristics of subjects.

| | Age(yrs) | Height(Cm) | Weight(Kg) | BMI(kg/m^2) | M±SD |
|--------------------------|------------------|-------------------|-------------------|-------------------------------|------|
| Exercise group (N=30) | 20.47 ± 1.14 | 176.79 ± 5.80 | 67.40 ± 8.75 | 21.96 ± 2.67 | |
| Control group (N=30) | 19.60 ± 2.50 | 174.90 ± 7.85 | 68.03 ± 11.07 | 22.66 ± 3.22 | |

2.2. Measure and method

2.2.1. Physical composition test

Physical composition test was measured after participants arrived at the test place, removed all metals on the bodies, urinated, and took a good rest for five minutes. With Inbody 720(Biospace Co., Seoul, Korea),

weight(kg), BMI(kg / m²), WHR(%), body fat rate(%) were measured. The subjects were instructed to stand erect, put their legs and arms apart, and put their bare foot on the labeled site of measurement, then hold the electrode with their hands. Then according to the order of the machine, the body compositions were analyzed.

2.2.2. Fitness test

Table 2. Physical fitness on job performance test.

| Items | Model | Manufacturer |
|----------------|---------|--|
| Push-up | DW-732E | Deawoo sports industry (Seoul, Korea) |
| Sit-up | DW-731E | |
| Grasping power | DW-781 | |
| 100M sprint | DW-765E | |
| 1000M run | DW-750A | |

Table 3. Specific physical fitness.

| Items | Measurement | Manufacturer |
|--------------------|-------------------------------|----------------------------------|
| Strength | Back strength | Takei phycial fitness (Japan) |
| Strength endurance | Sit-up | |
| Power | Standing long jump | |
| Balance | One leg standing balance test | |
| Flexibility | Sitand reach | |
| Agility | Systemic response measurement | |

2.2.3. Data process

The data of this research has been processed with SPSS 20.0(window statistical package) by calculating average and standard deviation of all collected data, and the significance test for within-group was practiced by Paired t-test before and after experiment, and the significance test for inter-group was practiced by Independent sample t-test before and after experiment. At this time, a significance level was set up p<.05.

3. Results

3.1. Change in task-related physical fitness factor

The Change in Variance in task-related physical fitness following the police martial arts training is indicated in <Table 4>. Variance in physical fitness factor in EG showed significant differences in all factors including left grasping power, right grasping power, sit-ups, push-ups, 100m, 1000m, and in CG showed statistically significant differences in right grasping power, and sit-ups. Furthermore, pretest of group differences as a result of police martial arts training, there was no significant differences in all factors, while in post-inspection showed statistically significant differences in all factors including left grasping power, right grasping power, sit-ups, push-ups, 100m, and 1000m.

Table 4. The change in physical fitness on job performance.

M±SD

| Items | | CG(n=30) | | | EG(n=30) | | | t** |
|----------------|---|-----------------|-----------------|--------|-----------------|-----------------|------------------------|----------------------------------|
| | | Pre | Post | t* | Pre | Post | t* | |
| Grasping power | L | 38.43 ±11.60 | 38.95 ±11.15 | -0.941 | 41.36 ±9.63 | 50.68 ±8.13 | -15.836 ⁺⁺⁺ | 1.249a 5.439b ⁺⁺⁺ |
| | R | 43.05 ±9.11 | 40.09 ±9.61 | 3.434† | 45.82 ±8.63 | 55.70 ±6.82 | -18.998 ⁺⁺⁺ | 1.421a 8.472b ⁺⁺⁺ |
| Sit-up | | 43.88 ±6.65 | 41.35 ±7.07 | 2.903 | 42.58 ±7.58 | 54.30 ±6.77 | -31.512 ⁺⁺⁺ | -0.838a 8.507b ⁺⁺⁺ |
| Push-up | | 35.51 ±10.11 | 35.86 ±9.10 | 0.493 | 36.53 ±10.06 | 53.73 ±13.05 | -24.899 ⁺⁺⁺ | 0.457a 7.275b ⁺⁺⁺ |
| 100m | | 16.05 ±9.00 | 16.14 ±1.06 | 0.240 | 18.06 ±8.31 | 16.31 ±1.86 | -5.817 ⁺⁺⁺ | 1.058a 5.667b ⁺⁺⁺ |
| 1000m | | 5.00 ±0.51 | 5.09 ±0.53 | 0.681 | 4.54 ±0.56 | 4.42 ±0.48 | -4.151 ⁺⁺⁺ | 0.728a 6.619b ⁺⁺⁺ |

Note: * Paired t-test between pre- and post-values in a group

** Independent sample t-test' results between pre- and post-values in both groups

†,‡, and ††† mean $P < 0.05$, $P < 0.01$, and $P < 0.001$, respectively.

3.2. The change in specific physical fitness factor

The change in exercise function-related physical fitness factor is indicated in <Table 5>. Variance in physical fitness factor in EG showed significant differences in all factors including left counterbalance, right counterbalance, back muscle strength, flexibility, and ability, and in CG showed

statistically significant differences in left counterbalance, right counterbalance. Furthermore, pretest of group differences as a result of police martial arts training, there was no significant differences in all factors, while in post-inspection showed statistically significant differences in all factors including left counterbalance, right counterbalance, back muscle strength, flexibility, and ability.

Table 5. The change in specific physical fitness factor.

M±SD

| Items | | CG(n=30) | | | EG(n=30) | | | t** |
|---------------|---|------------------|------------------|----------------------|------------------|------------------|------------------------|-----------------------------------|
| | | Pre | Post | t* | Pre | Post | t* | |
| Balance | L | 16.76 ±9.13 | 21.85 ±8.54 | -3.901 ^{††} | 18.25 ±7.99 | 34.36 ±11.78 | -13.971 ⁺⁺⁺ | 0.672a 4.710b ⁺⁺⁺ |
| | R | 17.19 ±9.45 | 19.95 ±10.45 | -2.218† | 17.81 ±9.10 | 37.59 ±14.63 | -12.922 ⁺⁺⁺ | 0.262a 5.372b ⁺⁺⁺ |
| Back strength | | 114.63 ±18.48 | 113.48 ±21.36 | 0.870 | 109.77 ±14.19 | 130.92 ±22.96 | -8.556 ⁺⁺⁺ | -1.144a 3.045b [†] |
| Flexibility | | 12.76 ±4.55 | 13.09 ±4.28 | -0.983 | 13.79 ±4.63 | 16.49 ±6.72 | 2.078 ⁺⁺⁺ | 0.864a 4.275b ⁺⁺⁺ |
| Agility | | 293.25 ±12.37 | 288.97 ±12.08 | 1.845 | 291.72 ±14.99 | 258.28 ±26.13 | 8.101 ⁺⁺⁺ | -0.432a -5.782b ⁺⁺⁺ |

Note: * Paired t-test between pre- and post-values in a group

** Independent sample t-test' results between pre- and post-values in both groups

†, ‡, and †† mean $P < 0.05$, $P < 0.01$, and $P < 0.001$, respectively.

4. Discussion

This research is By analyzing the effects of physical fitness rearing education on the task-related physical fitness and exercise function related physical fitness in 60 college students majoring police(EG 30, CG 30), this study discuss as following.

While physical fitness is a fundamental physical ability for managing a human life, in different aspects of body's activity, it can also be put as exercise ability or task ability. However, by scholars and eras, physical fitness is defined in various way; according to An et al[8], physical fitness is defined as not just in physical aspect, but in much more comprehensive term including physical, mental, social and spiritual aspects, so that it is actually a total of all abilities that are needed in managing life[9]. Physical fitness is constituted of fitness of performance, which is a force needed for activity, and fitness of protection, which is a physical force needed to adapt climate change and to fight off germs, but in most studies, physical fitness is a value by measuring cardiovascular endurance, body composition, muscular power, muscular endurance, flexibility, agility and etc[10].

In this study, in order to improve the chronic illness and lower job productivity of police officers, we measured 5 task-related physical fitness(grasping power, push-ups, sit-ups, 100m, and 1000m) and 4 exercise function physical fitness(counterbalance, back muscle strength, flexibility, and agility).

Duties of police requires high level of physical fitness and strong physical fitness can improve work productivity, therefore, it is a trend to encourage the officers to exercise[11]. Also, unlike elite physical education, police officers' exercise can not only improve the team members' health but also contribute a lot in organization productivity. As a result, as a way to improve the police officers' physical fitness, programs

including police martial arts and police physical fitness development programs are initiated[11]. Kim[6] suggested that officers who participated in sports activity has lower depression and anxiety level, and improve work productivity and health. Also, outside workers which requires more physical activity showed higher variance in physical fitness factors than inside workers. This agrees the term with this study's result that physical fitness rearing education has effects on improving police task-related physical fitness[12].

In addition, it also agrees the term with the result of the higher the participants' involving in physical fitness program, the more rate of improvement in work productivity and task-related physical fitness, and this supports that physical fitness rearing education has an effect on task-related physical fitness and exercise function related physical fitness in college students majoring police[13]. While most of the police officers are aware of the importance of physical fitness and a need to exercise, in reality, they cannot do exercise, and are suffering from various illnesses and injuries resulting from word overload, night duties and stress[14]. We have to face this reality, and as a basic study, the status of police exercise and how this effects on groups needs to be investigated in order to improve the welfare of police exercise.

To sum up, physical fitness rearing education can improve the task-related physical fitness and exercise function related physical fitness in college students majoring police, reduce work stress, and lower the incidence of metabolic syndromes and other stress-related illnesses. In contrast, the studies showing how exercise contribute to the organization do not exist, and organic integrate program between work productivity improvement and physical fitness should be developed.

5. Conclusion

This study focused on the effects of physical fitness rearing education on the task-related physical fitness and exercise function related physical fitness and confirmed that the improvement of the police officers' task-related physical fitness and exercise function related physical fitness can be developed through physical fitness rearing education.

For this research, participants were selected among college students majoring in police in D university, and we can get the following conclusions by investigating the effects of physical fitness rearing education on the task-related physical fitness and exercise function related physical fitness.

1. Variance of task-related physical fitness in EG as a result of physical fitness rearing education showed statistically significant differences in prior and post exercise in left grasping power, right grasping power, sit-ups, push-ups, 100m, and 1000m.

2. Variance of exercise function related physical fitness factor in EG showed statistically significant differences in left counterbalance, right counterbalance, back muscle strength, flexibility, and ability

In conclusion, we can confirm that physical fitness rearing education are effective in improving task-related physical fitness and exercise function related physical fitness in college students majoring police, and the development of specific physical fitness training program for improving health factors caused by police officers' work stress and for the crime prevention can improve the police officers' work ability.

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Composition Information of Allium Tuberousum Juice Extract and Its Anticancer Effect in C6 GLIOMA CELLS

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Abstract

Cancer is one of the leading causes of death worldwide. Cancer motility plays a central role in malignant tumorigenesis. Hence, several studies have been focused on investigating effective treatments for this disease. Natural compounds are among the potential therapeutic agents against cancer. Allium tuberosum has been used in Korean traditional medicine to improve stamina, and has been recently reported to possess anti-cancer properties. In the present study, we aimed to investigate the effect of A. tuberosum juice extracts(ATS) on migration and proliferation of glioma cells. The composition of ATS was determined using gas chromatography-mass spectrometry(GC/MS). Cell viability and proliferation were determined using MTT(3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide), and cell migration was assessed using scratch wound-healing assay. The expression levels of proteins were determined using western blot with specific antibodies such as the extra cellular signal-regulated kinase 1/2(ERK1/2) and MMP2. Our data showed that ATS did not affect cell viability at a concentration of 300 µg/mL in C6 glioma cell lines. However, ATS significantly reduced the migration of C6 glioma cells. Moreover, ATS significantly suppressed ERK1/2 phosphorylation and MMP2 expression at dosages of 100 and 300 µg/mL. A total of 34 constituents of ATS were detected using GG/MS. Therefore, we suggest that ATS is a potential agent against glioma.

[Keywords] *Allium Tuberousum, Juice, Natural Compounds, Glioma, Anti-Cancer*

1. Introduction

In the last few decades, western nations have had a sizable number of patients affected with cardiovascular disorders, stroke, and cancer[1][2]. Cancer, in particular, has been the leading cause of death worldwide[3][4][5].

World Health Organization(WHO) recommends individuals to exercise for health. Some researchers claim that the risk of developing cancer is decreased with nutrition and exercise. Therefore, research is required to combine exercise and scientific methodology for effective treatment.

Glioma, a malignant tumor of the brain, accounts for approximately 50% of primary brain diseases[6]. Glioma entails a very high mortality rate because the tumor has peculiar and abnormal characteristics, such as rapid cell migration into normal tissues that cannot be controlled by surgery or radiation[7][8]. Thus, in the case of glioma, a patient may suffer a fatal condition within a year from the developmental stage, because therapy against the mortality pattern, such as migration, is still unclear[9].

A recently influential medical report showed that cancer motility has a central role in malignant tumorigenesis[10]. The malignant process of cancer has been reported to

be caused by the activation of mitogen-activated protein kinase(MAPK)[11]. In particular, ERK1/2 phosphorylation is involved in cell invasion, migration, and motility, coupled with the progression of most types of cancer cells[12].

A Korean medical encyclopedia, called “Donguibogam”, provides extensive information on medicinal plants having side effects, but does provide sufficient clinical data up until the present. Allium tuberosum has been used in Korean traditional medicine to improve stamina. In this study, we aimed to establish the potential efficacy of *A. tuberosum* juice(ATS) against cancer motility. The results indicated that ATS may be a potent chemo-prevention agent that acts by inhibiting the migration of glioma cells.

2. Methods

2.1. Materials

The cell culture materials and MTT were purchased from Sigma, Gibco BRL(Gaithersburg, MD, USA), and Daeil Lab Service(Seoul, Korea), respectively. Antibodies—NOX-1, Cu/Zn SOD, MMP-2, Cleaved caspase-3, Bax, Bcl-2, anti-ERK1/2, anti-phospho-ERK1/2, and anti-GAPDH—were purchased from Santa Cruz Biotechnology(Santa Cruz, CA, USA). All other chemicals were purchased from Sigma(St. Louis, MO, USA). Rat C6 glioma cells were obtained from the Korean Cell Line Bank(Seoul, Korea).

2.2. Design of experiments

We performed the MTT assay to evaluate cell viability, the scratch wound-healing assay to test cell migration, western blot to test the expression levels of proteins, and gas chromatography-mass spectrometry(GC/MS) assay to determine the composition of ATS.

2.3. Procedure

2.3.1. Cell culture and MTT assay

Cells were cultured in Dulbecco's modified Eagle's medium(DMEM) containing 10% fetal bovine serum(FBS) and 1% penicillin-streptomycin at 37°C in a 5% CO₂ atmosphere. Rat

C6 glioma cells were seeded at 2×10⁴ cells/well in a 96-well microplate containing DMEM and incubated for 24 h. Cells were incubated with different concentrations of ATS(10–1000 µg/mL) in FBS-free or FBS-containing medium for 24 h. Cell viability was then determined using an MTT reduction method. The cell viability of ATS-treated cells was determined relative to that of control cells by measuring the absorbance at 540 nm.

2.3.2. Scratch wound-healing assay

After culturing the cells, a scratch wound was made by scratching the center of each well with a 200-µl sterile pipette tip. This was followed by incubation in the presence or absence of ATS in serum-containing medium for 24 h. Images of the cells that migrated into the cell-free scratch wound area were acquired using an inverted microscope(COOLPIX; Nikon, Japan), and analyzed using ImageJ software(NIH, Bethesda, MD, USA).

2.3.3. Western blot

Twenty micrograms of protein from each treatment group were used. After the proteins were boiled at 100°C for 10 min, they were separated using electrophoresis on 12% acrylamide gels, and transferred onto polyvinylidene difluoride(PVDF, Amersham Pharmacia Biotech, Piscataway, NJ, USA) membranes in transfer buffer at 4°C for 2 h. The membrane was blocked in 5% bovine serum albumin in Tris-buffered saline(TBS) at room temperature for 1 h, and then washed in TBS with 0.1% Tween 20(TBS/T). The membrane was incubated overnight at 4°C with antibodies. The membranes were washed with TBS/T, followed by incubation with a 1:5000 dilution of IgG secondary antibody conjugated to horseradish peroxidase. The protein expression levels were analyzed via chemiluminescence(ECL plus kit; Amersham Pharmacia Biotech). The protein bands were visualized and quantified using ImageJ software.

2.3.4. Gas chromatography-mass spectrometry assay

GC/MS analysis was performed using an Agilent 6890N GC/5975i MS instrument(Palo

Alto, CA, USA) and DB5-MS capillary column($30\text{ m} \times 250\text{ }\mu\text{m}$, $0.25\text{ }\mu\text{m}$ film thickness). The carrier gas used was helium at a flow rate of 1 mL/min . The injector port and interface temperatures were 280 and 300°C , respectively. The gas chromatography oven was kept at 40°C for 2 min and increased to 230°C at a rate of $5^\circ\text{C}/\text{min}$, and then kept constant at 300°C for 5 min . The split ratio was $1:10$. The mass ranges were from $\text{m/z } 40$ to 800 .

2.3.5. Statistical analysis

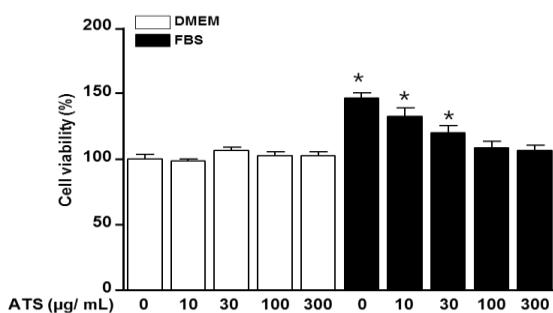
The results were expressed as the mean \pm standard error(SE) of at least three independent experiments. The difference between the two groups was examined using Student's t-test. $p < 0.05$ was considered statistically significant. Statistical analysis was carried out using GraphPad Prism 4.0 software.

3. Results

3.1. Effect of ATS on the viability and proliferation of C6 glioma cells

ATS at different concentrations, ranging from 10 to $300\text{ }\mu\text{g/mL}$, did not induce cytotoxicity in C6 glioma cells. A concentration-dependent decrease in cell density was observed at 100 and $300\text{ }\mu\text{g/mL}$ ATS <Figure 1>.

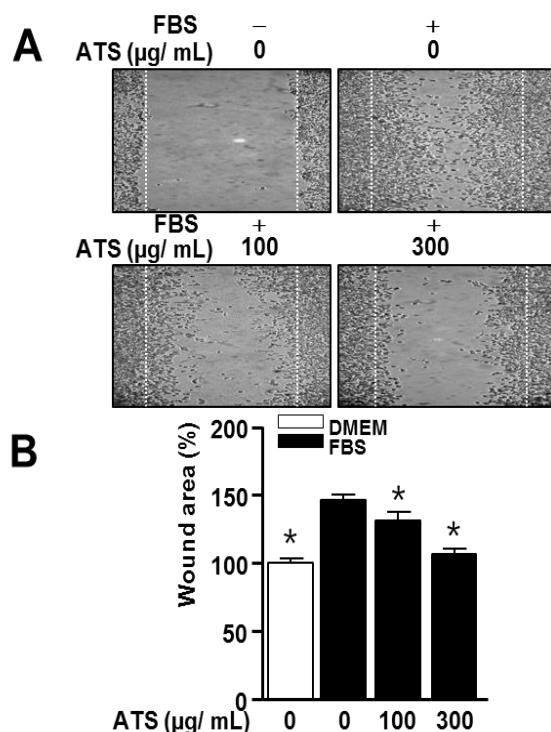
Figure 1. Effect of allium tuberosum(ATS) on FBS-induced cell proliferation of C6 glioma cells. C6 glioma cells were incubated with 10 , 30 , 100 , and $300\text{ }\mu\text{g/mL}$ ATS in FBS-containing media for 24 h , and their proliferation rates were assessed via MTT assay. Data represented are means \pm SE of at least three independent experiments(* $p < 0.05$ compared with untreated group).



3.2. Effect of ATS on scratch wound-healing in FBS-stimulated C6 glioma cells

Treatment with ATS(100 and $300\text{ }\mu\text{g/mL}$) induced a concentration-dependent decrease in FBS-induced cell migration <Figure 2>.

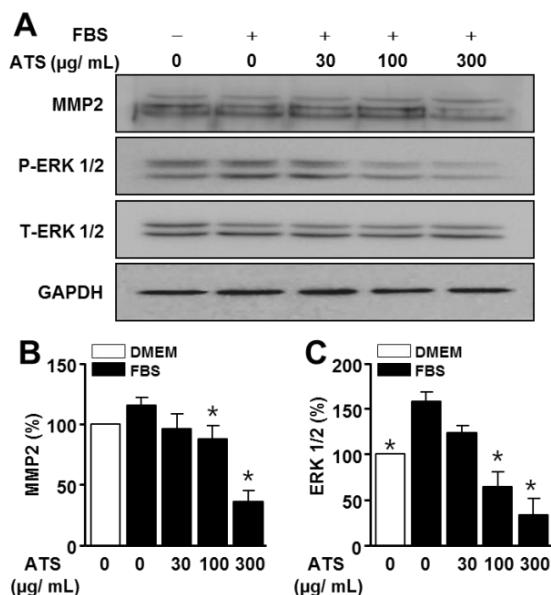
Figure 2. Effect of Allium tuberosum juice(ATS) on serum-induced migration of C6 glioma cells assessed using wound-healing assay. (A) Photographs of scratch-wound assay showed that serum-induced C6 cell migration could be inhibited by treatment with ATS. (B) The relative migration ratio of C6 glioma cells were obtained after analyzing measurements of scratch wound-healing distance. Data represented are means \pm SE(* $p < 0.05$ compared with FBS-treated alone).



3.3. Effect of ATS on ERK1/2 and MMP-2 in FBS-stimulated C6 glioma cells

Data show that FBS-induced MMP2 and ERK 1/2 expression decreased upon treatment with ATS in a concentration-dependent manner <Figure 3>.

Figure 3. Effect of allium tuberosum juice (ATS) on the expression of MMP2 and P-ERK 1/2 in FBS-stimulated C6 glioma cells. (A) Expression levels of MMP2, P-ERK 1/2, and T-ERK in C6 glioma cells after ATS treatment. (B, C) Relative band intensity of MMP2 and phosphorylation of ERK 1/2. Data represented are means \pm SE(* $p < 0.05$ compared with FBS-treated group).



3.4. Composition of ATS

A total of 34 constituents of ATS were detected, and these major compounds are listed in <Table 1>.

Table 1. Composition of absolute from allium tuberosum juice extracts.

| Compound name | Area (%) |
|---|----------|
| 1-METHYL PROPYL FORMATE; Formic acid | 4.89 |
| gamma.-Hydroxycrotonic acid lactone | 1.61 |
| Glycerin | 7.52 |
| 2-METHYL-1-D1-AZIRIDINE Butanal, 2-methyl-Silacyclopentane | 2.3 |
| 1,4-dimethyl-Piperazine | 2 |
| 1,2,2,3,3-Pentamethyl-aziridine 1-Piperidineethanol | 1.67 |
| propylamine | 2.99 |
| Thymine | 2.46 |
| 2,3-dihydro-3,5-dihydroxy- 6-methyl-4H-pyran-4-one | 10.16 |
| (S)-5-Hydroxymethyl-2[5H]-furanone | 1.31 |
| Isothiourea | 1.56 |
| 2,6-Difluorobenzyl alcohol | 1.62 |
| 1-Acetyl amino-5,5-dimethoxy-2,3-dimethyl-2(E)-pentenePropylamine | 1.54 |
| 2-Methoxy-4-vinylphenol | 3.29 |
| 3-Pyridinecarboxamide | 1.7 |
| Pyrrolidine | 1.38 |
| 1-Octen-3-ol Cyclopentanol | 1.51 |
| 1,6-Anhydro-.beta.-D-glucopyranose (levoglucosan) | 1.63 |
| 2,5-dioxo-3-methylpiperazine 2(3H)-Furanone | 2.35 |
| N2-ethylguanine ETHYL N-O-TOLYLCARBAMATE | 4.8 |
| 5-Chloro-2-methyl-3(2H)-isothiazolone PIMELIC ACID-CARBOXY-D2 1-Pentanol | 1.3 |
| 4-Methylproline Mefloquine Pidolic Acid | 2.58 |
| (E)-(2,2,2',2'-d4)-2,2',3,3'-tetrahydro-1,1'-bi-1H-indenylidene 2(1H)-Pyridinon | 1.86 |
| 3-Pyrrolidin-2-yl-propionic acid | 2.7 |
| ADENINE; 1H-Purin-6-amine | 4.05 |
| Pyrrolo[1,2-a]pyrazine-1,4-dione | 6.72 |
| 1,2-Cyclopentanedione | 2.6 |
| Pyrrolo[1,2-a]pyrazine-1,4-dione | 2.53 |

| | |
|---|------|
| 1,4-diaza-2,5-dioxo-3-isobutyl bicyclo[4.3.0]nonane | 3.47 |
| Cyclo(L-prolyl-L-prolyl) | 1.56 |
| 4-Methoxy-3,5-dihydroxybenzoic acid | 1.53 |
| 5-Nitroso-2,4,6-triaminopyrimidine | 1.43 |
| [1,1'-Biphenyl]-4-ol | 2.48 |
| 13-Docosenamide | 5.89 |

4. Discussion and Conclusion

In this study, we focused on ATS extract, a juice based on Korean traditional medicine, as a potential treatment for human illness. Although the modernization of medicines influences the simplification of curing a disease, it also encourages drug abuse and overdosing. For these reasons, fast advancement of alternative medicines or medication is critical to counteract the effects of western medicine. We have identified 33 constituents of ATS. The major component is 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one(DDMP), which is an active molecule and antioxidant.

Many species of *A. tuberosum*, a perennial herb, are widespread in Korea, Japan, and China. This plant has been cultivated as a condiment vegetable that is highly preferred owing to its characteristic taste and fragrance. In traditional medicine, *A. tuberosum* is considered a therapeutic agent for blood circulation owing to its spicy characteristics and detoxification function. Previous studies have confirmed that *A. tuberosum* contains important nutrients including carotene, vitamin B2, vitamin C, calcium, iron, and the eight main aliphatic sulfur compounds, such as allyl sulfide, pentose and allithiamine many sulfide derivatives, adenosine, alanine, glutamic acid, aspartic acid, valine, amino acid, dimethyl disulfide, and dimethyl trisulfide. A recent research showed the biological activity of *A. tuberosum* from Gimhae and Pohang(Korea) on cancer by analyzing quinone reductase induction activity, superoxide dismutase assessment, and anti-bacterial and anti-oxidant effect. However, the effective ingredients of *A. tuberosum* and their use as cancer-preventive functional foods are worth investigating. Therefore, in this study, we sought to evaluate the application of ATS for combined prescription against C6 glioma migration.

Glioma is characterized by rapid cell growth, migration, and invasion to surrounding normal tissues. Despite advanced treatments, glioma is resistant to surgical operation, chemotherapy, and radiation therapy. It has a high relapse rate, and still has no accurate therapy. In a previous study, Lee et al. suggested blocking the migration of cancer cells as a strategy to inhibit the progression of glioma[13]. Therefore, we performed scratch wound-healing assay to understand the inhibitory effect of ATS against migration, and the results showed that it can significantly reduce the migration of C6 glioma cells.

Furthermore, Lee et al. showed that inhibition of ERK1/2 expression can significantly reduce cancer cell migration[13]. Our results also indicated that ATS significantly reduced the expression of ERK1/2 in vitro. Our data implied that the major role of ATS in cancer cell migration is to regulate the ERK1/2 signaling pathway. MMP-2, the regulating protein for cancer cell migration Migration of C6 glioma cells decreased in the presence of ATS in a dose-dependent manner.

In conclusion, the results of this study suggest that ATS may inhibit cancer cell migration by reducing ERK1/2 phosphorylation. We clearly show the in vitro anti-cancer effect of ATS. Downregulating ERK1/2 phosphorylation not only suppresses migration but also regulates cell proliferation. Therefore, ATS is a potential treatment for human health, and a promising candidate as a therapeutic agent against metastasis of glioma.

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A Research for JUDO Usability as a Martial Art in the Security Service Organization in Republic of KOREA: Concentrating upon Te-Waza and Koshi-Waza

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Abstract

This study aims at researching Te-waza and Koshi-waza as a usability of defending techniques of Judo in Republic of Korea by interviewing and analyzing participants who have experienced in Security Service. The results of this study are as followings.

Firstly, in personal protection work of security site, among the usability of Te-waza in the scale from '1'(very agree) to '9'(very disagree), 27 participants have marked Ippon-seoi-nage as '1'(very agree), 17 participants as '2', and 18 participants have marked '9'(very disagree) in Seoi-nage, the following highest in the scale as '7' with 17 participants(20.5%). In Tai-otoshi technique, 20 participants have chosen '1'(24.1%) the highest, and 14 participants have marked '2'(16.9%) as the following highest.

Secondly, in personal protection work of security site, the usability of Koshi-waza of Judo techniques in the scale from '1'(very agree) to '9'(very disagree) 26 participants have marked '1'(very agree) as the highest in the scale, 16 participants have marked '2' as the following highest. For Tsurikomi-goshi technique, 20 participants have marked '9'(24.1%) as the highest, 18 participants have chosen '8'(21.7%) as the second highest out of '1'(very agree) to '9'(very disagree) scale. 25 participants have chosen '1'(30.1%) out of 1 to 9 scale in Harai-goshi, and 17 participants have chosen '2' (20.5%) as the second highest. As the last technique, 18 participants (21.7%) have marked '1' in Hane-goshi, 15 participants(18.1%) have chosen '2' for the second highest in the scale.

[Keywords] Sport, Judo, Taekwondo, Kendo, Aikido

1. Necessity of the Research

'The Security Martial Arts Demonstration Ceremony' of the Office of the Presidential Security has been regularly held once in every 5 years since the fifth Republic in 1980 from the civilian government in Yeonmukwan of the Blue House. The ceremony consists of demonstrations of security martial arts, breaking roof tiles, and actions for security situations for about 1 hour.

Meanwhile, the U.S Security Service has realized none of those prevention activities may guarantee the perfect security for their protectees, therefore, thoroughly developed close-security priority principle. In this principle, 'Cover and Evacuation' is emphasized, a

contrary concept of 'Counter Offend' by attacking the attackers to eradicate from the security site to protect the protectee according to the environment the protectee is located [1].

In addition, the defending principle of the basic principles in Security Service has emphasized the defending actions of close-security such as building human wall by surrounding the protectee are more effective than attacking actions such as rushing toward attackers leaving the protectee alone in any unexpected situation in security site.

According to the diversified international situations and treats, recently the necessity

of security martial arts that are more effective in the real security situations, is highlighted. However, the current security martial arts are composed of Judo, Taekwondo, Kendo, and Hapkido with previous martial arts training without any clear concept of defending techniques in real security sites. Thus, an in-depth study for the security martial arts needs to be done in the field.

This study aims at discussing the usability of defending techniques in Judo utilized in the security martial arts by investigating the security martial arts in depth. The research questions are as following.

How about the usability of Te-waza in Judo of Security Service?

How about the usability of Koshi-waza in Judo of Security Service?

2. Previous Research

This research highly assembles exploratory research as surveying people in the field of security service about the defending techniques of Judo in security sites. The following <Table 1> is a summary of the previous research of Judo and Security Martial Arts with main contents.

Table 1. Previous research.

| Category | Researcher | Main contents |
|-----------------------------|-----------------|--|
| Judo | Jin (2010) | Provides the object data for Judo as a valuable Security Martial Art to demonstrate Judo as a perfect practice for security task implementation [2]. |
| | Cho (2009) | The Techniques and practice regarding to the spirit of Judo and the principle of competence strengthen to be scientifically systemized, realizing the real value of Judo and developing Judo techniques to present the strength of Judo [3]. |
| | Cho (2008) | Provides the data for teaching Judo techniques and improving score effectiveness in Judo competition by modifying and supplementing current Judo practice [4]. |
| Security martial arts | Jung (2012) | When unexpected situation occurs in security site, applying security techniques combining with the security martial arts to insure personal protection of protectee, and finding application plan as academic basic information [5]. |
| | Kwyun (2006) | The relation between the close security service and the security martial arts which consider securing protectee's personal security as the first priority and demonstration of its' application plan [6]. |

3. Methodology

This study has been conducted by connectionally collecting and analyzing quantitative data and qualitative data according to the mixing study model of Creswell(2003) in the order. The quantitative data has been statistically arranged by Excel 2010, and the qualitative data has been analyzed by the interview method based on the grounded theory. The electronic survey has been conducted in

the research in a consideration of the current situation where various survey being implemented in online networks[7].

4. The Security Service in the Republic of Korea

The concept of the Security Service in the Republic of Korea is as following in <Table 2>.

Table 2. The concept of the security service.

| Categories | Contents |
|------------|----------|
| | |

| | |
|--|--|
| The office of the presidential security 「Legislation for presidential security」 | Any and all security activities for preventing and eliminating any and all possible physical dangers to protect the protectee's life and property, and to guard, patrol and defend in the particular security site. |
| The national police agency 「Security regulations」 | The National Police Activities for protecting protectee from any and all possible dangers by guarding the protectee's travel route, accomodations, trains, vessels, airplanes, where are realized to be thoroughly protected for protectee's security. |
| Private security companies 「Legislation for private security business」 | Business for protecting one's life from physical dangers to ensure personal protection. |

Also, the concepts of security service may be divided into two separate categories in the practical security of fundamental and theoretical stance and the realistic security of realistic security notion. Therefore, in the concept of security service, 'security' means to prevent or eliminate any possible dangers from protectee to ensure physical safety, and 'guard' to protect life and property by guarding, patrolling, and defending certain areas, including all the concepts, is called 'Security Service' which also includes information protection activities, examination or prosecution activities[8].

5. Judo Techniques

The significance of Judo is physical and mental training by practicing offense and defense for physical and mental harmony. Judo

is a match game to compete by direct physical techniques according to any and all rules and regulations. In other words, a strong will can be boosted from the physical exercise by repeating offense and defense. Thus, in the process of practicing Judo the strong mind of refusing to yield can be created which may help to produce a good attitude or habit to live in the society[9].

The main purpose of practicing Judo is development of physical ability, techniques and attitude as a broad objectivity of physical training in 'education by physical activities', also to enhance the ability of self-protection[10].

The following <Table 3> has contained Nage-waza, Te-waza, and Koshi-waza of Judo techniques, the main discussion of the research.

Table 3. Nage-waza in judo[11].

| Categories | | Contents |
|------------|------------|--|
| Te-waza | Tai-otoshi | A throwing technique with cooperation of the strength of hands, waist, and legs by taking advantage of the moment of movement of the other party which could be performed over the weight division for shorter competitor to perform for a head start. |

| | | |
|------------|-----------------|---|
| | Ippon-seoi-nage | A technique of completely carrying the other party on the back to throw by using the other party's pushing force which is more effective to the shorter party as it is easy to carry on the back when the other party has higher physical balance. |
| Koshi-waza | O-goshi | A technique of throwing the other party the waist by using the rebound of ankle and the re-pushing force by the other party, balancing on the waist. |
| | Harai-goshi | O-goshi is a throwing technique by loading the other party on the waist, on the other hand, Harai-goshi is a transformed technique from Hane-goshi with lower waist position and twisting the upper body, that uses a leg to lift the other party to throw. |
| | Tsurikomi-goshi | A technique to throw the other party lifted on the waist by using the other party's pushing force and one's pulling force with hands to stick the other party on the waist to throw by twisting the upper body. |
| | Hane-goshi | A technique with banded knees and waist to lift the other party to throw by rushing into the other party's arms quickly. |

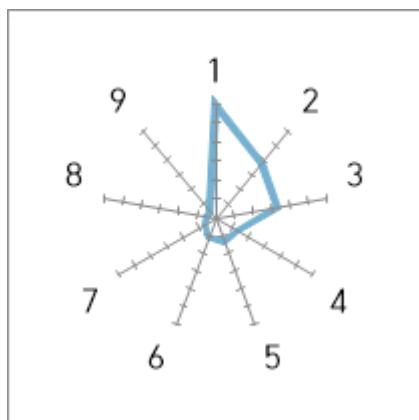
6. Analysis Result

6.1. Te-waza

6.1.1. Ippon-seoi-nage

The following <Figure 1> shows the frequency of Ippon-seoi-nage in the application of the security service in the real security site as a protection martial art in the graph.

Figure 1. Ippon-seoi-nage application.



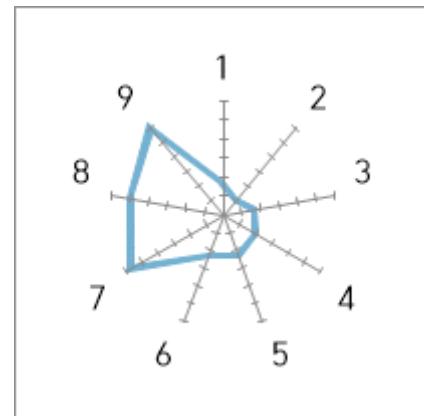
In the opinions of participants of the research in the application of Ippon-seoi-nage of Judo as a protection martial art in the security service, 27 participants(32.5%) has chosen '1' as the highest, and 17 participants (20.5%) in '2' for the second highest in the scale of '1'(very agree) to '9'(very disagree).

"There are two different ways to protect VIP clients by directly protecting the VIP clients or protecting by suppressing the attacker. When the attacker carries a weapon Ippon-seoi-nage technique can change the attacking direction to eliminate the first stage danger from the attacker." (20160501_KDH_M).

6.1.2. Seoi-nage

The following <Figure 2> shows the frequency of Seoi-nage in the application of the security service in the real security site as a protection martial art in the graph.

Figure 2. Seoi-nage application.



In the opinions of participants of the research in the application of Seoi-nage of Judo

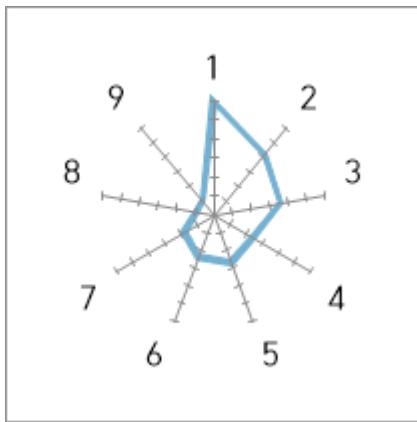
as a protection martial art in the security service, 18 participants(21.7%) has chosen '9' for the highest, and 17 participants(20.5%) has chosen '7' for the second highest out of '1'(very agree) to '9'(very disagree) scale.

"In my opinion, Seoi-nage usability could be less effective when the attacker wearing everyday clothes that may be torn while exercising the technique failing to eliminate the danger to the client." (20160617_PKH_M).

6.1.3. Tai-otoshi

The following <Figure 3> shows the frequency of Tai-otoshi in the application of the security service in the real security site as a protection martial art in the graph.

Figure 3. Tai-otoshi application.



In the opinions of participants of the research in the application of Tai-otoshi of Judo as a protection martial art in the security service, 20 participants(24.1%) has marked '1' for the highest, and 14 participants(16.9%) has chosen '2' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

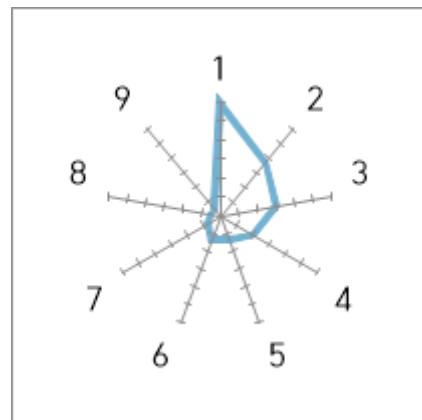
"I don't think the technique of throwing by grabbing the clothes is effective. So, Kubi-nage, one of the Tai-otoshi technique without grabbing the clothes could be the better way to perform. It's similar skill as Tai-otoshi by hooking the other party's neck with arms to throw him, it should be the better technique to fall holding the attacker inside the arms to protect the clients." (20160524_JMA_W).

6.2. Koshi-waza

6.2.1. O-goshi

The following <Figure 4> shows the frequency of O-goshi in the application of the security service in the real security site as a protection martial art in the graph.

Figure 4. O-goshi application.



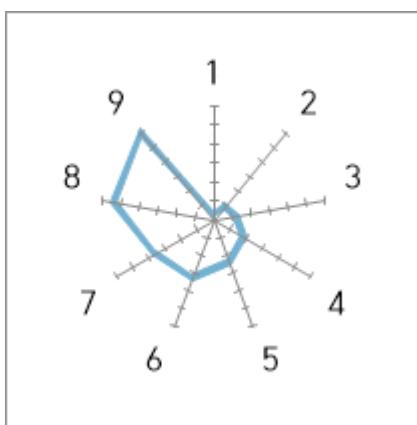
In the opinions of participants of the research in the application of O-goshi of Judo as a protection martial art in the security service, 26 participants(31.3%) has marked '1' for the highest, and 16 participants(19.3%) has chosen '2' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

"In my experiences, the attackers, in many occasions, have opened their waist. When the attacker is closely approaching O-goshi is a very effective technique to dominate them." (20160513_LHS_M).

6.2.2. Tsurikomi-goshi

The following <Figure 5> shows the frequency of Tsurikomi-goshi in the application of the security service in the real security site as a protection martial art in the graph.

Figure 5. Tsurikomi-goshi application.



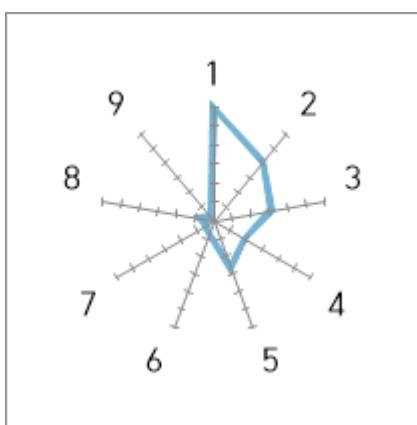
In the opinions of participants of the research in the application of Tsurikomi-goshi of Judo as a protection martial art in the security service, 20 participants(24.1%) has marked '9' for the highest, and 18 participants(21.7 %) has chosen '8' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

"For Tsurikomi-goshi to be effectively applied, the attackers' belt has to be caught, but if it's failed, the VIP clients could be exposed to dangers."(20160504_JYS_M)

6.2.3. Harai-goshi

The following <Figure 6> shows the frequency of Harai-goshi in the application of the security service in the real security site as a protection martial art in the graph.

Figure 6. Harai-goshi application.



In the opinions of participants of the research in the application of Harai-goshi of Judo as a protection martial art in the security

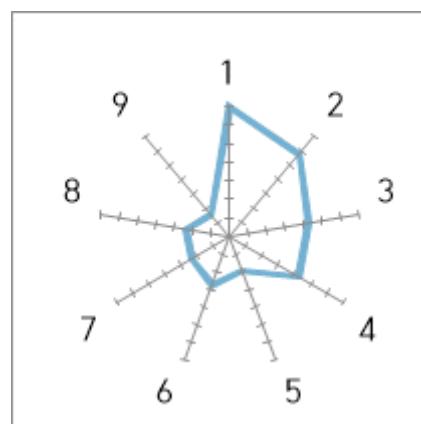
service, 25 participants(30.1%) has marked '1' for the highest, and 17 participants(20.5%) has chosen '2' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

"It is an appropriate technique when dealing with bunch of other people in the security site to quickly throw the others into the close distance to control."(20160517_SBG_M)

6.2.4. Hane-goshi

The following <Figure 7> shows the frequency of Hane-goshi in the application of the security service in the real security site as a protection martial art in the graph.

Figure 7. Hane-goshi application.



In the opinions of participants of the research in the application of Hane-goshi of Judo as a protection martial art in the security service, 18 participants(21.7%) has marked '1' for the highest, and 15 participants(18.1%) has chosen '2' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

"Performing this technique needs a lot of practices, however it's very effective in the real security site as Harai-goshi when you have to deal with many people in the same time." (20160515_KHU_M)

7. Conclusion

7.1. Te-waza

The results of this research have shown several investigations of Te-waza of Judo.

At first, in the survey on the frequency of the usability of Ippon-seoi-nage on the security service in the real site, 27 participants(32.5%) has chosen '1' as the highest, and 17 participants(20.5%) in '2' for the second highest in the scale of '1'(very agree) to '9'(very disagree).

Secondly, in the survey on the frequency of the usability of Seoi-nage on the security service in the real site, 18 participants(21.7%) has chosen '9' as the highest, and 17 participants(20.5%) in '7' for the second highest in the scale of '1'(very agree) to '9'(very disagree).

Thirdly, in the same survey of Tai-otoshi, 20 participants(24.1%) has chosen '1' as the highest, and 14 participants(16.9%) for '2' as the second highest.

7.2. Koshi-waza

The results of this research have shown several investigations of Koshi-waga of Judo. In the opinions of participants of the research in the application of O-goshi of Judo as a protection martial art in the security service, 26 participants(31.3%) has marked '1' for the highest, and 16 participants(19.3%) has chosen '2' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

Secondly, in the application of Tsurikomi-goshi of Judo as a protection martial art in the security service, 20 participants(24.1%) has marked '9' for the highest, and 18 participants(21.7%) has chosen '8' as the second highest on the '1'(very agree) to '9'(very disagree) scale.

Thirdly, in the survey on the frequency of the usability of Harai-goshi on the security service in the real site, 25 participants(30.1%) has chosen '1' as the highest, and 17 participants(20.5%) in '2' for the second highest in the scale of '1'(very agree) to '9'(very disagree).

Lastly, in the survey on the frequency of the usability of Hane-goshi on the security service in the real site, 18 participants(21.7%) has chosen '1' as the highest, and 15 participants(18.1%) in '2' for the second highest in the scale of '1'(very agree) to '9'(very disagree).

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