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Questionnaire on Physical Complaints of High School Esports Players -Potential Targets for Acupuncture-

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Abstract

[Introduction] Electronic sports (esports) are growing rapidly worldwide. Players can win millions of dollars in large competitions. They often spend more than 10 hours a day for practicing. there are reports of physical complaints in collegiate and professional players. Recently, esports competitions is being held for high school students with the government support. It is required for young, high school players to receive proper care as early as possible if they have any complaint due to hard practice for the competitions. We clarify whether high school esports players have any physical complaint and take care of their physical condition.

[Materials and Methods] We contacted the teachers of high schools that participated in the tournament or advanced to the finals of the 2020 Esports High School Championship. If the teacher of high school agreed with the purpose of the study, the teacher informed his students about the questionnaire recruitment. The students participated in the survey of their own free will. Data was collected anonymously using an unpaid, self-report electronic questionnaire distributed, upon agreement.

[Results] Responses were received from 43 players (40 males and 3 females) who played world-famous esports games (e.g., League of Legends, Fortnite). The daily practice time was between 1 and 10 hours (average: 4.5 ± 2.3 hours); 22 of the players practiced 7 days a week, 6 practiced for 6 days a week, and 9 practiced for 5 days a week. 79% (34 participants) had one or more complaints about their eyes, shoulders, neck, lower back, right wrist, right arm, or feet or had headaches. In total, 81% (35 participants) performed self-care, such as stretching, self-massage, and warm up. Some players had received massage or osteopathic therapy, but no player received medical care or acupuncture.

[Discussion] 80% of high school players had physical complaints such as eye , neck, sholders, low back, arms. These are symptoms that have been treated with acupuncture, and acupuncture may be useful. Although acupuncture treatment tends to be received mostly by middle-aged and elderly people, acupuncture is widespread among athletes in some sports, and some high school athletes receive acupuncture treatment. The number of players in esports is expected to increase in the future, especially among the younger generation. Acupuncture could be considered as a modality which alleviate the complaints of esports players

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Key words: *electronic sports, high school players, questionnaire, physical complaints, acupuncture*

I. Introduction

In Japan, the annual rate of acupuncture therapy, which includes “those who are currently undergoing therapy" and “those who are not currently undergoing therapy but have had it within the past year," was approximately 7.5% in the fiscal year (FY) 2002 to FY2012 and declined after FY2013 to 4.6% in FY2017 and 4.0% in FY2018, according to a report by Yano et al. (2020)[1)]. Most people who undergo acupuncture therapy are middle-aged or older adults. By contrast, the number of young people tends to be small[2)]. Interestingly, some high school athletes have sought acupuncture therapy[3-5)], and the rate is higher among top players [3,4)]. In this study, we focused on esports, where the number of younger players is increasing.

Over the last 20 years, video games have evolved from playing alone at home to competing with others via the Internet. This is called electronic sports or esports. Many esports tournaments have been established worldwide with large amounts of prizes. For example, an American teenager won USD 3 million (approximately JPY 300

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million) [6]. In 2021, the global esports market was valued at over USD 1.08 billion[7]. Thus, the number of esports competitors is expected to increase continuously.

In Japan, esports became popular since 2018. Esports was listed as a new activity in the 2020 proposal "Evidence-based sports for diverse humankind'[8]. The Ministry of Economy, Trade, and Industry (METI) and Ministry of Education, Culture, Sports, Science, and Technology (MEXT) have started supporting esports. An esports tournament for high school students is held annually with the support of MEXT. The 2020 Esports High School Championship included participants from 1,779 schools. There has been a movement to incorporate esports into official school activities. Some schools already have esports classes and esports clubs, whereas others offer esports as part of science or computer clubs. Undoubtedly, the number of high-school-aged esports players is increasing.

Esports includes various games, and esports players often manipulate their characters in the game using a mouse and keyboard. In one game, esports players collaborate with their team members to destroy the opponent's home base, while in another game, they battle to survive, and the last one standing wins.

Although esports are popular, there are also concerns regarding the physical and psychological effects that they may have on players. Esports requires only a few dynamic physical movements, mostly in a sitting posture. These mainly involve extremely frequent repetitive fine movements of the fingers[9].

Elite players require considerable practice to acquire high-level skills. Takakura et al.[10] reported that their medical staff provided acupuncture to 12 Japanese professional male esports players; in the study, esports players were training for 10-16 h each day, and the authors treated them with acupuncture, totaling 99 treatments that addressed 358 complaints, including shoulder pain, neck pain, low back pain, arm/wrist pain, upper back pain, lower leg and/or foot pain, and eye fatigue. Acupuncture may be helpful for high school esports players with such symptoms.

It is unknown whether esports affect the physical condition of high-school-aged players. Unlike adulthood, the growth period comprises a period of substantial biomechanical growth, which affects the bones, muscles, ligaments, and cartilage. Hence, improper loading may impede healthy growth and affect subsequent quality of life[11].

If the players experience any discomfort or have any complaints following exertion during competitions, they must receive proper care to protect their health. In this study, we surveyed high-school-aged esports players to investigate their esports situation, physical complaints, and care routines.

II. Materials and Methods

The study protocol was approved by the University of Tsukuba Human Ethics Committee (East 2020-71, East 2020-83). In this study, the participants were high school students (range: 15-18 years old). The questionnaire did not contain any emotionally distressed items. We contacted the teachers of high schools that participated in the 2020 Esports High School Championship. If the high school teacher agreed with the purpose of the study, the teacher provided his/her students with the study's details, including the questionnaire. The students were free to choose whether to participate in the survey. The survey was conducted from November to December 2020.

Data were collected anonymously using an unpaid self-report electronic questionnaire that was distributed upon agreement. The first page of the survey described the purpose of the study and stated that the responses would be anonymous, and that by sending the completed survey, the respondent agreed that the responses could be used in the study.

The questionnaire items were created by the authors with reference to previous research[12,13] (Appendix 1). The survey included questions about age, sex, sleep time, major games played, weekly play schedule, daily play duration, physical complaints and sites, self-care methods for physical condition, and medical consultation and/or treatment.

The results were collected, and the means and standard deviations were calculated. A logistic regression analysis was conducted as a sub-analysis to examine the relationship between the incidence of complaints and sleep or play duration. The complaint sites were categorized and tabulated as headache/eye fatigue, neck/shoulder, upper extremity, lower back, and lower extremity fatigue.

To compare the trends between players from high-ranking schools (high schools that advanced to the finals) and general schools, Wilcoxon's rank sum test was used to consider age, sleep time, and play duration in the two groups, and a chi-square test was used to consider complaints and care status.

Statistical analysis was performed using SPSS Statistics version 27 (IBM, Armonk, NY, USA), and the significance level was set at $p < 0.05$.

III. Results

Using opportunistic sampling, we requested the participation of 13 schools. Five schools consented to participate, and we received responses from 43 high school students (mean age =16.2±1.0 years old, male:female 40:3).

Survey form

・ The actual survey is conducted in Japanese.
・ The layout of the actual survey is such that each question can be answered on a single page on a personal computer or smartphone.

1. Please tell me your age.
   - 15 years old
   - 16 years old
   - 17 years old
   - 18 years old
   - Other (fill in)

2. Please tell me your gender.
   - male
   - Woman
   - Unanswered

3. Which is your dominant hand?
   - right hand
   - left hand
   - Ambidextrous

4. What time do you go to bed?
   - 21:00
   - 22:00
   - 23:00
   - 0:00
   - 1:00
   - 2:00
   - 3:00

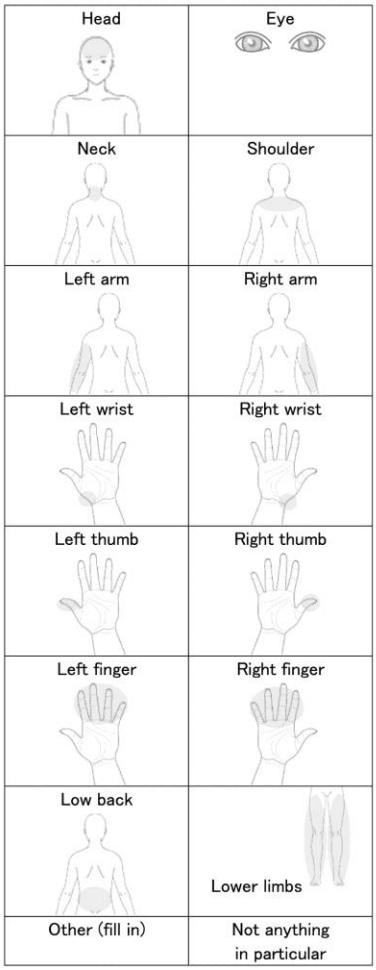
5. What time do you wake up?
   - 5:00
   - 6:00
   - 7:00
   - 8:00
   - 9:00
   - 10: 00

6. Please tell me esports you mainly play.
   - League of Legends
   - Rocket league
   - Fortnite
   - Clash Royale
   - Other (fill in)

7. How many times a week do you play esports?
   - Once a week
   - Twice a week
   - 3 times a week
   - 4 times a week
   - 5 times a week
   - 6 times a week
   - 7 times a week

8. How many hours a day do you play esports?
   - 1 hour
   - 2 hours
   - 3 hours
   - 4 hours
   - 5 hours
   - 6 hours
   - 7 hours
   - 8 hours
   - 9 hours
   - 10 hours

9. Please tell me if you feel tired or painful when playing esports.
   * multiple selections possible



10. Do you go to the hospital for physical fatigue and pain?
    *multiple selections possible
    - Not anything in particular
    - go to a massage shop
    - go to an acupuncture and moxibustion clinic
    - go to an osteopathic clinic
    - go to a hospital, orthopaedics
    - Other (fill in)

11. Do you take care of your body like the one below?
    * multiple selections possible
    - Not done
    - Muscle training
    - Stretch
    - Hand
    - warm
    - cool
    - Massager (electric)
    - Massager (vibration)
    - Other (fill in)

Game

The students primarily played the League of Legends (25 players), Fortnite (seven players), Rocket League (four players), and other games (seven players).

Play schedule

The mean play duration was 4.5±2.3 h/day and 5.8±1.7 days/week. The accumulated time spent on esports was 27.8±16.9 h/week. The play duration per day varied from 1 h (three players), 2 h (five players), 3 h (seven players), 4 h (eight players), 5 h (seven players), 6 h (eight players), 7 h (one player), 8 h (one player), and 10 h (three players). The most frequent duration was 4-6 h and the maximum duration was 10 h.

The number of days devoted to esports per week was one (two players), two (two players), four (two players), five (nine players), six (six players), and seven days (22 players). Half of the players played seven days a week with no breaks.

The cumulative duration spent on esports per week was less than 10 h (eight players), 10-20 h (five players), 20-30 h (15 players), 30-40 h (five players), 40-50 h (six players), 50-60 h (one player), and 70 h (three players).

Sleep

Players reported sleeping before 0:00 (10 players), at 0:00 (14 players), 01:00 (nine players), 02:00 (eight players), or 03:00 (one player). One player responded that the bedtime was uncertain.

Sleep durations varied from 5 h (seven players), 6 h (13 players), 7 h (10 players), 8 h (eight players), 9 h (two players), 10 h (one player), 11 h (one player), to indefinite (one player).

Physical complaints

The physical complaints by body parts are shown in Figure 1.

Complaints (multiple answers permitted) included headaches (9 players), eye fatigue (20 players), pain in the neck (17 players), shoulder (19 players), right arm (six players), left arm (two players), right wrist (six players), left wrist (one player), right thumb (two players), lower back (13 players), and leg (three players).

The complaints were subsequently grouped as follows: Headaches/eye strain (21 players), neck/shoulder pain (23 players), upper limb pain (12 players), lower back pain (13 players), and lower limb pain (three players).

The complaint sites were zero (nine players), one (nine players), two (14 players), three (nine players), and four (two players). Overall, 34 players (79.0%) had at least one complaint.

Sub-analysis of factors related to physical complaints

We analyzed the relationship between the occurrence of each complaint (one or more complaints: headaches/eye fatigue, pain in the neck and shoulder, lower back, upper limb, and lower limb) and sleep, duration of play per day, and number of days per week of esports. Neck and

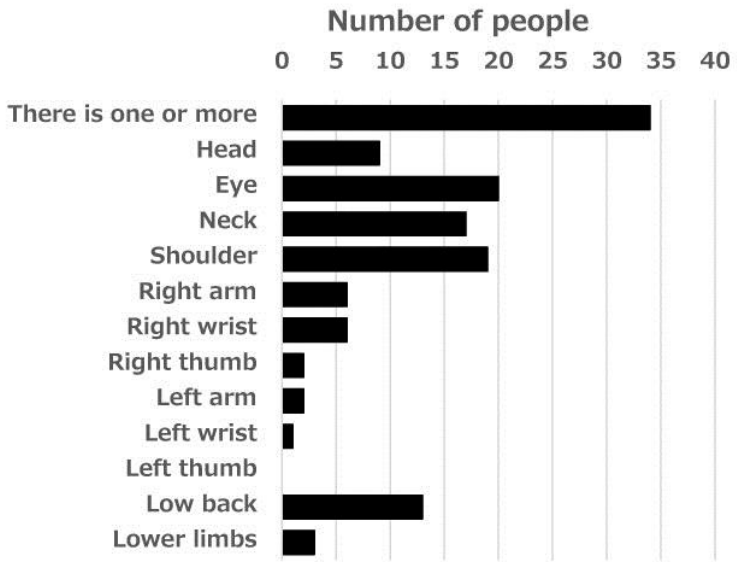


Figure. 1 Questionnaire results of Physical complaints by site of high school esports players (multiple answer:N=43)

shoulder pain and sleep time (OR=2.3, CI: 1.0-5.3, p=0.047) were the only significant associations.

We compared the high-ranking school players (n=21) and general school players (n=20) and found that the following factors were significantly different between the high-ranking and general schools: sleep duration 6.4±1.5 hours / 7.2±1.1 hours ($p < 0.05$), daily esports duration 5.2±2.3 hours / 3.9±2.1 hours (no significant difference), weekly esports duration 6.4±0.9 days / 5.2±2.0 days ($p < 0.05$), and duration of play per week 34.1±17.2 hours / 21.9±14.2 hours ($p < 0.05$).

The complaint sites did not differ between players from high-ranking schools and those from general schools. The number of complaints was 19/15, headache 6/3, eye 10/10, neck 6/10, shoulder 11/8, right arm 4/2, left arm 1/1, right wrist 4/2, left wrist 0/1, right thumb 1/1, lower back 7/6, and foot 2/1.

Self-care and medical treatments

Medical treatment and self-care are shown in Figure 2. None of the players had attended any medical consultations. Three players underwent Judo or massage therapy. None of the patients had undergone acupuncture.

Thirty-three participants engaged in self-care routines to address complaints. The self-care routines consisted of multiple answers: stretching (22 players), self-massage (14 players), exercise (12 players), warm-up (nine players), cool-down (two players), and massage (two players).

IV. Discussion

This survey targeted competitive high school-aged esports players who engaged in school teams and tournaments.

Play schedule

The duration of play varied from to 21-30 hours a week (15 players), 30-40 hours (five players), and 40-50 hours (six players). Three players engaged in esports for 70 h per week. Research on general sports engagement among middle and high school students (Kamada et al., 2016)[14] has shown that students spend an average of 16.9 hours per week on extracurricular physical sports, and the top 5% spend more than 27 hours per week on these activities. In 2018, the Sports Agency established guidelines for athletic activities and recommended[15] that growing middle and high-school students rest one or two days per week and spend less than 16 hours per week in physical sports. Although esports cannot be aptly compared to physical sports, the duration of play among the esports players in the current study was longer than that of students who engaged in physical sports.

MEXT found that 47.0% of high school students go to bed after midnight (12:00 a.m.) [16], but the percentage in the present study was 74.4%. We did not investigate the time of day or night when the players played esports, but they tended to go to bed late. It has been reported that the access and use of media devices around bedtime were significantly associated with inadequate sleep quantity,

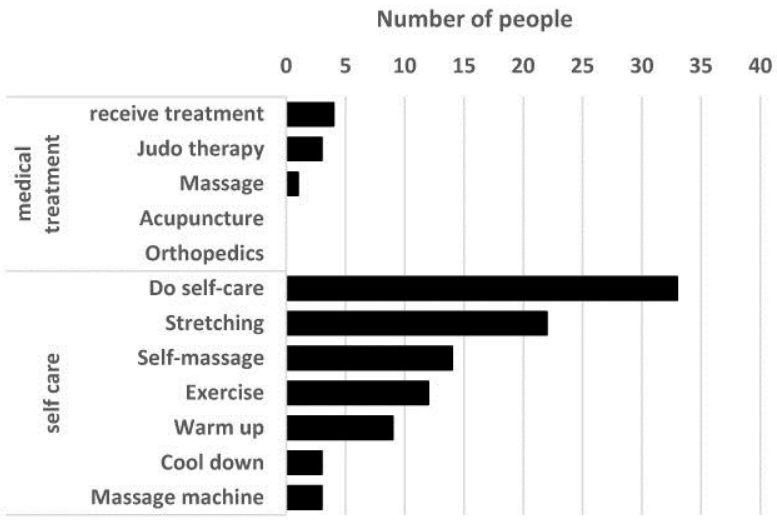


Figure.2 Questionnaire results of Self-care and Medical treatments by site of high school esports players (multiple answer:N=43)

poor sleep quality, and excessive daytime sleepiness[17]. Since esports participation can occur at any time regardless of location (home or other venues), the play schedule may affect sleep.

Physical complaints

A survey of college students in the United States and Canada reported incidences of eye fatigue (55%), neck and back pain (42%), wrist pain (36%), and hand pain (32%)[12]. In a survey of Danish players, musculoskeletal pain involving the back (31.3%), neck (11.3%), shoulders (11.3%), forearms (7.5%), wrists (6.3%), headache (3.7%), and others were reported[13]. In this study, the players reported headache/eye strain (48.8%), neck and shoulder pain (53.5%), upper-limb pain (27.9%), lower-back pain (30.2%), and lower-limb pain (7.0%). The results demonstrated that high school-aged esports players experienced physical complaints similar to those experienced by sports players in previous studies.

Kamada et al. (2016)[14] conducted a study on musculoskeletal pain in 2,403 students (45.3% participated in organized sports) from junior high and high schools in Shimane Prefecture. Students' complaints were related to the neck (2.4%), lower back (8.5%), upper limbs (9.5%), and lower limbs (15.4%). A higher percentage of the students who participated in sports activities had lower extremity symptoms. Compared to the general population, esports players reported more upper-body complaints and fewer lower-extremity symptoms. This may be due to prolonged sitting and overuse of the hands in esports.

The characteristics of esports include: (i) "fast and sustained finger movement in a sitting position," and (ii) "play until a late hour of the night," (iii) "react to unexpected actions from the opponent on screen." Furuya et al. (2006) [18] surveyed high school students majoring in piano and found that 29 of 63 (46%) experienced hand or finger pain. These data suggest that the frequent use of fingers may cause physical symptoms, including pain. Okinaka et al. (2021) [19] studied the effects of key-hitting speed and static stretching, and noted that there were limited data on the fingers. This aspect of competitive esports should be examined in future studies.

Sub-analysis

We expected students who spent more time playing to experience more complaints. However, the results did not indicate a relationship between these two factors.

Lindberg et al. (2020) [13] reported that esports players who experienced symptoms took time off from playing, which resulted in a shorter duration of play. From our results, it is unclear whether the complaints occurred because of the prolonged duration of play or if the duration of play was reduced because of the symptoms. It is also unknown whether the duration of play was longer because there were no physical complaints. In the future, a detailed longitudinal study is warranted to clarify the relationship between the occurrence of complaints and duration of play. There was a difference in the amount of sleep and play between the high-ranking schools and general schools, but there was no difference in terms of physical complaints. Esports competitions have a short history, and as they develop into competitive sports, these results may not be relevant.

The causal relationships and long-term effects of esports are unknown. Therefore, further investigation is necessary.

Care for physical complaints among esports players

As with the collegiate esports players in a previous study[12], none of the high school-aged esports players in the current study attended any medical consultation with orthopedics. However, 77% of players implemented at least one self-care method. This finding suggests that participants were highly interested in physical care. However, it remains unknown whether self-care strategies are effective, safe, or properly implemented. Healthcare professionals, not only medical doctors, but also massage and acupuncture therapists, should be engaged to assist with the players' self-care to implement appropriate strategies.Professional-facilitated healthcare management plans for the prevention of severe complaints or injuries would also be useful.

Acupuncture and esports

Acupuncture therapy has long been used in conventional sports to treat and prevent sports injuries and disabilities, and to maintain conditions and fitness[20]. Acupuncture is also recognized by high school athletes[21].

Aoki et al.[3] surveyed 952 track and field students. Of the students, 272 (32.7%) had undergone acupuncture treatment. Furthermore, acupuncture was used more frequently as the level of competition increased.

A survey by Hanaoka et al. (2013)[5] indicated that 20 (10.6%) of 189 high school swimmers underwent acupuncture therapy. The primary purpose of treatment was to assist swimmers with fatigue recovery and conditioning. In another study, Aoki et al.[4] conducted a survey that indicated that 22 of 247 (8.9%) high school wrestlers used acupuncture therapy.

Outside sports, Hasegawa et al.[22] surveyed high school brass band members and found that 45 members had orthopedic complaints and 12 (7.5%) members attended acupuncture and moxibustion/judo therapy clinics. Symphonic band club members are similar to esports players because both groups are less prone to trauma, unlike sports. Furthermore, musicians and esports players tend to practice for long hours to achieve various goals, such as preparing for competition.

Although there may be differences depending on the nature of the competition and the environment, some high-school students utilize acupuncture treatment.

The use of computer equipment tends to cause stiff shoulders by maintaining the same posture for a prolonged time. This and the vicious cycle of poor posture due to excessive tension in the neck and shoulders along with eye fatigue, may further aggravate the tension in neck and shoulders, causing stiffness[23]. Symptoms including stiff shoulders, lower back pain, eye strain, and headaches may be improved by acupuncture[24-27]. Acupuncture therapy was often used until now[2, 28].

Takakura et al.[10] reported that when acupuncture was provided to professional esports players, the players experienced less pain and fatigue and felt more relaxed after treatment.

Similar to traditional athletes, when symptoms arise due to excessive practice, rest is the first-line therapy for esport players. However, to achieve success in competitions or achieve their best performance record, athletes and esports players may prioritize practice over rest. Thus, esports players may need coordinated care, similar to what athletes do.

Sports players, acupuncture schools and organizations, and schools for the blind have collaborated to promote the use of acupuncture by providing support volunteers to assist in national sports competitions and high school athletic activities[29,30]. Medical teams that support sports players have also been proposed[12]. Currently, acupuncture is not commonly utilized by high school-aged sports players. In the future, acupuncturists may play an important role in the healthcare of high-school esports players.

Limitations

This survey was small and limited to players engaged in esports as high school activities. The style and duration of play differ greatly, depending on the characteristics of each game.

V. Conclusions

High-school-aged esports players experience eye fatigue, neck pain, shoulder pain, hip pain, and hand complaints. They engage in esports for prolonged periods and tend to stay late into the night. None of the players in this study used acupuncture therapy to address their physical complaints. However, the symptoms they reported were those for which acupuncture therapy was indicated. Acupuncture may be considered as a potential modality that can assist in alleviating the physical complaints of esports players.

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Conflict of interest

There is no conflict of interest.

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