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## ORIGINAL ARTICLE

# Playing video games for more than 3 hours a day is associated with shoulder and elbow pain in elite young male baseball players

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**Background:** The effect of lifestyle factors on elbow or shoulder pain in young baseball players remains unclear. This study examined the association of game playing and television viewing with elbow or shoulder pain among elite young baseball players.

**Methods:** Study participants were young baseball players (age, 9-12 years) who participated in the National Junior Sports Clubs Baseball Festival in 2017. The national tournament invited 16 teams (totaling 210 players) selected based on the results of the regional qualifying tournaments. Self-reported questionnaires were mailed to all players before the tournament. Multiple logistic regression analyses were used to assess the association of video game playing and television viewing behavior with elbow or shoulder pain.

**Results:** Among the 210 players polled, 200 male players were included in the analysis. The prevalence of elbow or shoulder pain was 30.0%. Playing video games for  $\geq 3$  hours/day was significantly associated with elbow or shoulder pain vs. spending  $< 1$  hour/day playing video games (odds ratio, 5.59; 95% confidence interval, 1.44-21.64;  $P = .013$ ). The amount of time spent watching television was not significantly associated with the prevalence of elbow or shoulder pain.

**Conclusions:** Playing video games for  $\geq 3$  hours/day was associated with elbow or shoulder pain among elite young male baseball players. These findings highlight the effect of lifestyle on elbow and shoulder pain and should be taken into consideration by players, coaches, parents, and clinicians for the prevention of elbow and shoulder pain.

**Level of evidence:** Level III; Cross-Sectional Design; Epidemiology Study

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The Tohoku University Graduate School of Medicine Ethics Committee on Research of Human Subjects approved the study protocol (approved number: 2017-1-215).

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Throwing-related injuries to the elbow and shoulder are common in baseball players.<sup>10,19,20</sup> Baseball players with elbow and shoulder symptoms are at higher risk of serious injuries such as ulnar collateral ligament injury, osteochondritis dissecans, and superior labrum anterior and posterior lesions.<sup>5,7,11</sup> Prevention of throwing-related injuries in young baseball players has become a topic of interest because several studies reported that the prevalence of serious injuries in this population has been increasing every year.<sup>9,10,28</sup> The prevalence of elbow and shoulder injuries in elite young baseball players is estimated to be higher than that in the general population of baseball players.<sup>27,30</sup>

Several studies of elbow and shoulder injuries in young baseball players have described extrinsic risk factors, including position (pitcher or catcher),<sup>22,34</sup> pitch count,<sup>16,19,20,27</sup> pitch type (fastball, curveball, or slider),<sup>19,25,28,43</sup> maximum pitch velocity,<sup>16,27</sup> and playing on multiple teams in the same season.<sup>20,43</sup> Among extrinsic factors other than those related to playing baseball, lifestyle behaviors are considered important risk factors for musculoskeletal pain among children.<sup>2,15</sup> However, little has been reported on the association of lifestyle behaviors with elbow or shoulder pain among young baseball players.

In recent years, children have been adopting a more sedentary lifestyle.<sup>39</sup> Several studies have examined the association of screen time behaviors with musculoskeletal pain among children.<sup>14</sup> In other recent studies involving young athletes, excessive video game playing was associated with musculoskeletal pain, including low back pain, whereas television viewing was not.<sup>35,42</sup> Sedentary behaviors are known to increase postural defects in children.<sup>24,29</sup> Because poor posture, including increased thoracic kyphosis, has been associated with throwing-related injuries,<sup>32</sup> we hypothesized that playing video games and watching television would be associated with a higher incidence of shoulder and elbow pain in elite young baseball players.

The purpose of this study was to examine the association of screen time behaviors, including video game playing and television viewing, with elbow and shoulder pain among elite young baseball players.

## Materials and methods

### Study design and participants

The study enrolled young baseball players (age, 9-12 years) who participated in the National Junior Sports Clubs Baseball Festival held from August 3 to August 6, 2017. This national tournament is an annual event taking place in summer and sponsored by the Japan Junior Sports Clubs Association, which is the largest youth sports association in Japan. In 2017, the national tournament involved 16 baseball teams selected from among 6,378 teams (122,517 players) that had passed the regional qualifying tournaments. The number of pitch innings per game was limited to  $\leq 7$ , per the guidelines of the Japan Junior Sports Clubs Association. The participants were

recruited from among players registered in the tournament (up to 14 players per team).

A self-reported questionnaire and informed consent forms (for the player and their parents) were mailed to all selected players in July 2017 (1 month before the tournament). The players were requested to fill the questionnaire themselves. Of the 210 tournament participants, 206 sent the consent forms and questionnaire before the tournament. Female players were excluded because their small number precluded statistical analysis ( $n = 6$ ). Finally, 200 male players were included in the analysis.

### Outcome variables

The main outcome measure was elbow or shoulder pain, which was defined as a self-reported history of elbow or shoulder pain in the throwing arm during the 12 months leading up to the study.<sup>30</sup> Participants who answered “yes” to either of the following questions were considered to have elbow or shoulder pain: (1) “Have you had elbow pain in the throwing arm during the past 1 year?”; and (2) “Have you had shoulder pain in the throwing arm during past 1 year?”.

### Exposure: screen time behavior

Time spent playing video games and viewing television was evaluated using the self-reported questionnaire. The questions related to screen time were “How many hours do you play video games (including handheld game consoles and smartphone games) in a day?” and “How many hours do you watch TV (including digital video disks) in a day?”. The participants were asked to choose 1 of the following responses:  $< 1$ ,  $1$  to  $< 2$ ,  $2$  to  $< 3$ ,  $3$  to  $< 4$ , and  $\geq 4$  hours. For the present analysis, we categorized participants into 4 groups for each exposure variable of interest, namely, video game playing ( $< 1$ ,  $1$  to  $< 2$ ,  $2$  to  $< 3$ , and  $\geq 3$  hours/day) and TV viewing ( $< 1$ ,  $1$  to  $< 2$ ,  $2$  to  $< 3$ , and  $\geq 3$  hours/day).

### Covariates

Data regarding the following covariates were obtained using the self-reported questionnaire: age, self-reported height and weight,<sup>10</sup> playing position,<sup>13,34</sup> and number of hours per day spent practicing<sup>21</sup> and sleeping.<sup>42</sup> The participants could report the playing positions by choosing 1 or more of the following options: pitcher, catcher, infielder, and outfielder.

The number of hours of practice was ascertained by asking the participants “How many hours do you practice in one day on weekdays?” and “How many hours do you practice in one day on weekends?”, to which the participants could respond by choosing 1 of several options for weekdays (no practice,  $\leq 1$  hour,  $> 1$  to 2 hours,  $> 2$  to 3 hours, and  $> 3$  hours) and weekends ( $\leq 2$ ,  $> 2$  to 3,  $> 3$  to 4,  $> 4$  to 5,  $> 5$  to 6, and  $> 6$  hours), respectively. The number of hours spent sleeping was calculated from the reported wake-up time and bedtime.

These variables were categorized according to their distribution and clinical significance, as appropriate: playing position (pitchers vs. position players), number of hours spent practicing each week (on weekdays,  $\leq 2$  vs.  $> 2$  hours; on weekends,  $\leq 6$  vs.  $> 6$  hours), and number of hours spent sleeping each day ( $< 9$  vs.  $\geq 9$  hours).

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