



Original Article

Comparison of sleep status among three Japanese national wheelchair basketball teams

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Abstract. [Purpose] Sufficient sleep is required for maximal performance and good mood. Japan has three national wheelchair basketball teams: Top male, Top female, and Under-23 (U23) male teams. Using these team members as model, this study investigated the difference of sleep status of wheelchair basketball players by age and gender. [Subjects and Methods] There were 44 participants: 14 in the Top male team (29.5 ± 5.2 years), 18 in the Top female team (30.6 ± 9.2 years), and 12 in the U23 team (19.1 ± 2.0 years). Sleep status was assessed with the Pittsburgh Sleep Quality Index (PSQI); higher scores indicate poor sleep quality. [Results] PSQI scores in the Top male and female teams were higher than in the U23 team. The Top teams showed shorter sleep duration and worse sleep efficacy than the U23 team. Time spent in bed and sleep duration in the female team were shorter than in the Top male and U23 teams. More male players reported “feel too hot” as the reason for sleep disturbance than female players. [Conclusion] Players in the Top Japanese national wheelchair basketball teams had poorer sleep status than U23 players. Among female players, the reason for insomnia was less sleep duration. For males, the reason for insomnia was “feel too hot.”

Key words: Sleep status, Japanese wheelchair basketball national team, Pittsburgh Sleep Quality Index (PSQI)

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INTRODUCTION

Athletes need sufficient sleep for maximal physical and technical performance¹⁻³⁾. Adapted sports such as wheelchair basketball require similar physical and technical levels of performance to regular basketball. Few reports are available on sleep status among wheelchair basketball players^{4, 5)}. Sleep status of male and female wheelchair basketball players in Japanese national teams was reported to be worse than in people of similar age and gender in the general Japanese population^{4, 5)}. In addition, there is a relationship between sleep and mood states in athletes^{3, 6, 7)}. We previously found that mood state was most frequently correlated with sleep variables among female wheelchair basketball players in a Japanese national team⁵⁾. In particular, vigor was the mood state most frequently correlated with sleep status⁵⁾, suggesting sufficient sleep is required for a good mood state.

There are three age- and gender-based Japanese national wheelchair basketball teams: the Top male team, the Top female

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Table 1. Participants' profiles

	Top male (n=14)	Top female (n=18)	U23 male (n=12)
Age (years)	29.5 ± 5.2	30.6 ± 9.2	19.1 ± 2.0*
Classifying (n)			
1	3	5	3
2	5	5	3
3	3	3	3
4	3	5	3
Disease (n)			
Spinal cord injury	6	6	4
Spina bifida	3	3	1
Scoliosis	0	1	0
Cerebral palsy/Paraplegia	0	1	1
Myopathy/Neuropathy	0	2	1
Amputation	3	0	1
Congenital lower limb loss	1	0	3
Arthropathy	1	5	1

Age are presented as the mean ± SD.

*p<0.05.

team, and the Under-23 male team. However, there has been no comparison of sleep status among these three teams. Possible causes of sleep disturbance are also unknown. Determining the sleep status of players in each team is necessary to understand their mood state, and is important to improve the teams' physical and technical performance. Using these team members as model, this study investigated the difference of sleep status of wheelchair basketball players by age and gender. Clarifying the sleep status of wheelchair basketball players may help in developing sleep assistance strategies to optimize athlete performance and psychological mood status.

SUBJECTS AND METHODS

Participants' profiles are summarized in Table 1. The 44 participants included 14 male wheelchair basketball players from the top national male team (Top male group), 18 female players from the top national female team (Top female group), and 12 from the under-23 male national team (U23 male group). The mean age was 29.5 ± 5.2 years in the Top male group, 30.6 ± 9.2 years in the Top female group, and 19.1 ± 2.0 years in the U23 male group. Players in the U23 male group were significantly younger than the Top male (p<0.001) and Top female groups (p<0.001). There were no significant differences in other background factors (classification and disease) among the three groups. All participants provided informed consent. This study was approved by the Human Ethics Review Committee of Ibaraki Prefectural University of Health Sciences (Approval No. 485 and e45).

We assessed sleep status during the past 1 week using the Pittsburgh Sleep Quality Index (PSQI)⁸. The PSQI comprises 19 self-rated questions and calculates seven sleep components: latency, subjective quality, duration, efficiency (sleep duration per total time in bed), disturbance, use of sleep medication, and daytime dysfunction. A higher PSQI score indicates poorer sleep status; a person with a score above 5.5 is regarded as having insomnia⁹. Sleep status was compared among the three groups, between two age groups (Top male and female groups vs. U23 male group), and by gender (males [Top male and U23 male groups] vs. Top female group). The investigation was conducted on the first day of training camp: June, 2014 for the Top male group, November, 2015 for the Top female group, and June, 2017 for the U23 male group. This timing corresponded with training seasons for the national team.

To compare sleep status among the three groups, we used one-way analysis of variance, with Bonferroni/Dunn as a post hoc test. Student's t-tests were used for comparisons between two groups (i.e., age and gender). For categorical data, we used χ^2 tests. The level of significance was set at p<0.05. SPSS Version 24.0 (IBM Corp., Armonk, NY, USA) was used for the statistical analyses.

RESULTS

The results are summarized in Table 2. The percentage of players with insomnia (PSQI score over the 5.5 cutoff point) was 42.9% in the Top male group, 55.6% in the Top female group, and 25.0% in the U23 male group. Comparison among the three groups showed that sleep duration was shorter in the Top female group than in the U23 male group, and sleep efficacy was worse in the Top male group than in the U23 male group.

Comparison by age showed the PSQI scores in the Top groups (Top male and female groups) were higher than in the U23 male group. In addition, the Top groups had shorter sleep duration and worse sleep efficacy than the U23 male group. Comparisons by gender showed that time spent in bed and sleep duration were shorter in females than males (Top male and

Table 2. Sleep states on 3 groups

	Top male (n=14)	Top female (n=18)	U23 male (n=12)
Sleep items			
Sleep quality (range: 0–3) [†]	1.50 ± 0.65	1.22 ± 0.81	1.17 ± 0.58
Sleep latency (min) [†]	24.93 ± 21.46	18.28 ± 27.84	15.42 ± 11.17
Time spent in bed (hours)	7.48 ± 1.27	6.57 ± 1.26 [#]	7.25 ± 0.94
Sleep duration (hours)	6.51 ± 0.91 ⁺	5.83 ± 1.03 ^{*+[#]}	7.10 ± 0.82
Sleep efficiency (%)	87.84 ± 9.30 ^{*+}	89.66 ± 11.07 ⁺	97.40 ± 4.01
Sleep disturbances (range: 0–27) [†]	3.43 ± 2.79	2.44 ± 2.62	2.33 ± 2.31
Daytime dysfunction (range: 0–6) [†]	1.21 ± 1.58	1.06 ± 1.21	0.83 ± 1.19
PSQI score (range: 0–21) [†]	5.79 ± 3.02 ⁺	5.72 ± 2.85 ⁺	3.83 ± 2.55
Insomnia (PSQI >5.5 points) (n (%))	6 (42.9)	10 (55.6)	3 (25.0)
Hypnotic medication use (n (%))	0 (0.0)	1 (5.6)	0 (0.0)
Reasons for sleep disturbance (≥1 times/week) (n (%))			
Cannot get to sleep within 30 minutes	4 (28.6)	6 (33.3)	4 (33.3)
Wake up in the middle of the night or early morning	6 (42.9)	4 (22.2)	3 (25.0)
Have to get up to use the bathroom	3 (21.4)	3 (16.7)	1 (8.3)
Cannot breathe comfortably	0 (0.0)	0 (0.0)	0 (0.0)
Cough or snore loudly	2 (14.3)	0 (0.0)	0 (0.0)
Feel too cold	0 (0.0)	2 (11.1)	0 (0.0)
Feel too hot	5 (35.7) [#]	1 (5.6)	4 (33.3) [#]
Have bad dreams	0 (0.0)	0 (0.0)	0 (0.0)
Have pain	2 (14.3)	2 (11.1)	0 (0.0)
Other reasons	0 (0.0)	0 (0.0)	1 (8.3)
Go to bed on and after 0:00 AM (n (%))	9 (64.3)	10 (55.6)	9 (75.0)
Wake up before 7:00 AM (n (%))	3 (21.4)	11 (61.1) [#]	4 (33.3)

M: male; F: female; PSQI; Pittsburgh Sleep Quality Index.

Sleep items and PSQI score are presented as the mean ± SD.

[†]A high score on each variable indicates poor sleep status.

*p<0.05: among 3 group, ⁺p<0.05: Top vs. U23, [#]p<0.05: M vs. F.

U23 male groups). More female players reported they “wake up before 7:00 AM” than male players. The percentage of male players that gave “feel too hot” as a reason for sleep disturbance was higher than in the female group.

DISCUSSION

In the Japanese wheelchair basketball national team, the sleep status of players in the Top male and female groups was significantly poorer than that of players in the U23 male group. Approximately half of the players in the Top groups suffered from insomnia. Players in the Top groups may be exposed to more excessive physical and mental stress than those in the U23 male group, which may negatively affect sleep. Players in the Top groups are also required to have a higher level of skill, which means that practice time increases and there are greater expectations around game victories. Athletes are more likely to have nervousness and insomnia before an important game¹⁰). In adults, total sleep time and sleep efficiency are reported to significantly decrease with age, whereas waking after sleep onset significantly increases with age¹¹). However, sleep status among Top players in the Japanese national wheelchair basketball team was worse than in the Japanese general population of similar age^{4, 5}), whereas sleep status in the U23 male group was similar to that in the Japanese general population of similar age¹²). Players in the two Top groups need measures to improve insomnia. Moreover, it is necessary to record changes in sleep status as players in the U23 male group move to the Top group, and to consider countermeasures to maintain sufficient sleep state.

Among players in the Top female group, less sleep duration due to early wake-up time was the main reason for insomnia. For this situation, although we don't have determinant reason, we have some suggestions. Female athletes need more grooming time than male athletes, and they would be required the role as wife and/or mother which include preparing cooking and caring child. Although these burdens of daily life are common issues for female athletes, it could be more burden for wheelchair athletes because of their physical disability. Some supports from family and public service may be needed to moderate their burdens of daily life. In a situation of partial sleep deprivation, short naps had a beneficial effect on decreasing sleepiness and increasing sprint performance¹³). Short naps may be also effective for players in the Top female group. Among the male players, the main reason for sleep disturbance was “feel too hot.” Moreover, sleep efficacy in the Top male group was worse than that in U23 male group, although there was no significant difference between the groups in “time spent in bed.” This suggests that players in the Top male group take longer before sleep onset after going to bed than those in the U23 male group. This may explain why “feel too hot” was the cause of sleep disturbance among Top male players rather than U23 players. Most players in this study worked during the daytime and typically trained at night. Vigorous exercise before sleep

can interfere with falling asleep because of enhanced physiological excitement¹⁴). Additionally, vigorous performance in athletes with higher ability may dramatically increase core body temperature. Top male athletes may experience less lowering of body temperature than Top female athletes. To moderate core body temperature and physical arousal level among Top male athletes, it is important that vigorous physical training finishes as early as possible before bedtime. Alternatively, a cooling procedure may be needed for Top male athletes to lower body temperature. Effective methods to improve sleep are needed to help wheelchair basketball players achieve optimal performance.

This study has some limitations. First, the sample size was small, and we obtained data from top wheelchair athletes only. Although we investigated the top players in this study, this tendency may be common to other wheelchair players. Therefore, it is necessary to clarify the differences in sleep status of different athletes and athletes at various competition levels using a larger sample size. Second, sleep variables were assessed with a self-reported questionnaire that might have introduced recall/reporting bias. Finally, this study was cross-sectional, and continuous investigation is necessary.

In conclusion, Top players in the Japanese national wheelchair basketball team had poorer sleep status than U23 players. The reason for insomnia among female players can be less sleep duration because of early wake-up time, and that for the males can be “feel too hot” due to body temperature not lowering.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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