

Sleep problems among junior high school students with major depressive disorder

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Objective: The aim of this study is to clarify the differences in the sleep quantity and quality between adolescent patients with major depressive disorder (MDD) and controls.

Methods: There were two groups of subjects: a depressed group of 79 students with MDD and the control group of 1,297 students. A self-report based survey was conducted. The self-report form used the Depression Self Rating Scale (DSRS) and an original sleep survey form comprised of questions about total sleep time and sleep problems: difficulty initiating sleep, difficulty maintaining sleep, subjective sleep insufficiency, daytime sleepiness, and non-restorative sleep. The effects of gender and diagnosis on the DSRS scores, total sleep time, waking time, sleep-onset time, and the scores of sleep problems were analysed.

Results: While no statistically significant differences related to total sleep time were observed between the depressed group and the control group, sleep-onset time and waking time were both statistically significantly later for the depressed group than those in the control group. The scores related to difficulty initiating sleep and difficulty maintaining sleep were also significantly higher for the depressed group than those in the control group.

Conclusion: Qualitative aspects of sleep problems among adolescent patients with MDD became evident. These problems were characterized by the abnormalities in the quality of sleep rather than total sleep time. It was clarified that among these problems, difficulty initiating sleep and difficulty maintaining sleep were the relatively specific problems for patients with MDD.

Key words: depression, sleep disorders, child, adolescent, questionnaire survey

Introduction

More than 30,000 suicides have been reported in Japan annually, and it has been repeatedly pointed out that one of the major risk factors for suicide is related to depression.¹ Approximately 50%-70% of children and adolescents who commit suicide have had a mood disorder.² And males outnumber females in children and adolescent suicide statistics. Recently, it has been clarified that depression occurs not only in adults, but also in children and adolescents.³ And there is a direct relationship between gender and depressive symptoms in children and adolescents.^{3,4} Therefore, clinical concerns have been increasing for both early detection and early intervention for depression in children and

adolescents.⁴

Some unique characteristics of the major depressive disorder (MDD) in childhood and adolescence are described in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR), which indicates that depressive feelings may be expressed in ill-tempered feelings such as irritation. To help clinicians implement prompt intervention, including appropriate medication, for MDD in children and adolescents, the clinical characteristics of MDD, which have strong diagnostic value, should be clarified. Sleep problems have been recognized as a basic symptom of MDD only in adults. To date, to our knowledge, only a few studies on sleep quantity and quality problems in children and adolescents with MDD have been reported.

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However, sleep problems have been evaluated as a significant precursor in cases of attempted suicide among children and adolescents.^{5,6} The average total sleep time is related to depressive symptoms in adolescents.⁷ The clinical profile differs between depressed children with and without sleep disturbance, with those suffering with insomnia or hypersomnia being most severely depressed.⁸

These previous studies suggested that sleep problems in children and adolescents is an important clinical issue that cannot be overlooked. In the diagnostic criteria of the DSM-IV-TR for Major Depressive Episode, the item relating to sleep problems is as follows: insomnia or hypersomnia nearly every day. We aimed to clarify more qualitative aspects of sleep problems in adolescent patients with MDD. Therefore, the objective of this study was to clarify differences in the sleep quantity and quality between adolescent patients with MDD and controls.

Subjects and Methods

Subjects

There were two subject groups of junior high school students: the MDD group and the control group. The MDD group was composed of 79 junior high school students diagnosed with MDD according to the DSM-IV-TR, and the control group was composed of 1,297 public junior high school students. From September 4, 2008, to March 31, 2010, all 79 individuals in the MDD group (28 boys, 51 girls; age, 13.9 ± 0.9 years [mean \pm standard deviation (SD)]; range, 12-15 years) were examined and diagnosed as having MDD according to the DSM-IV-TR. These diagnoses were made by psychiatrists, who had specialized in child and adolescent psychiatry, and were working in the department of child and adolescent psychiatry, of the Kohnodai Hospital, National Center for Global Health and Medicine. This study excluded students with coexisting mental disorders including: mental retardation, pervasive developmental disorders, eating disorders, attention deficit/hyperactivity disorders, or oppositional defiant disorders.

The subjects in the control group were recruited according to the following method. We explained the outline of this study to members of the educational committee in Ichikawa City and obtained their approval for performing a survey of public junior high school students. For enrollment in the study, a consent form, an assent form, and a questionnaire were distributed to 8,512 students at public junior high schools in Ichikawa City by their teachers at schools from September 20 to September 30, 2008. First, a documented explanation

about the survey was given to 8,512 students. After written informed assents and consents were obtained from 1,322 children and their parents, the completed questionnaires were collected at the schools. There were 1,297 students who returned valid questionnaires. Therefore, the control group consisted of 1,297 junior high school students who attended public junior high schools (609 boys, 688 girls; age, 13.9 ± 0.9 years; range, 12-15 years).

The Kohnodai Hospital is located in the city of Ichikawa, and its service area is mainly Chiba prefecture, which includes Ichikawa and the eastern part of the Tokyo metropolis. Therefore, it can be presumed that the socioeconomic status of the control group was similar to that of the patient group who lived in Ichikawa, although we have no real data about the socioeconomic status of either group.

Methods

A questionnaire survey was conducted on the subjects in the control group, with questions regarding depression and sleep on a self-report form. The form consisted of the Japanese version of the Depression Self-Rating Scale (DSRS)⁹ and a sleep questionnaire developed by the authors. The MDD group completed the DSRS and the sleep questionnaires during the initial examination as routine screening tools at the child and adolescent psychiatry outpatient clinic of the Kohnodai Hospital. Therefore, not only the researchers of the present study but also all the staff members in our hospital have access to the DSRS, sleep data, and other clinical data, from the patients' medical records.

The data of the DSRS and the sleep questionnaire in the MDD group were obtained from the patients' clinical records. Along with the subjects' documented informed assent, their parents or guardians also gave informed consent for participation in the study. This study was approved by the ethics committee of the National Center for Global Health and Medicine.

The DSRS is an 18-item measure of depressive symptoms for children.⁹ Murata et al.³ standardized the Japanese version of the DSRS. The DSRS is comprised of 18 questions in which children are asked to answer "always," "sometimes," or "never" to each question. For questions related to depression, the responses of "always," "sometimes," and "never" are given 2, 1, and 0 points, respectively. Half of the 18 questions are reverse questions that have negative correlations with depression; therefore, the responses of "always," "sometimes," and "never" for these items are given 0, 1, and 2 points, respectively. The total score is the sum of the scores for

the 18 items. The scale ranges from 0 to 27, with higher scores indicating a greater severity of depressive symptoms. According to Murata et al.,³ the cut-off of total points for depression in the DSRS in Japan is 16 points.

The sleep questionnaire included items related to total sleep time, waking and sleep-onset times, and five categories of sleep abnormalities. For total sleep time, the subject was asked to write the total usual daily sleep hours, usual wake-up time and the time that the subject usually goes to sleep. Regarding sleep abnormalities, the subject was asked to rate the following five items: difficulty initiating sleep, difficulty maintaining sleep, subjective sleep insufficiency, daytime sleepiness, and non-restorative sleep. The subject was asked to rate each item according to the four categories of "always," "sometimes," "rarely," and "never," which were given 3, 2, 1, and 0 points, respectively.

Statistical analysis

Results are expressed as SD of DSRS by gender and

diagnosis (the MDD group, the control group). The effects of gender and diagnosis on the total DSRS scores were analysed using two-way analysis of variance (ANOVA). The effects of gender and diagnosis on total sleep time, waking time, and sleep-onset time on weekdays vs. weekends and holidays were also analysed by using two-way ANOVA. Regarding sleep abnormalities, the mean score was calculated for each category of sleep abnormalities, and the effects of gender and diagnosis on the scores were analysed using two-way ANOVA. Furthermore, the likelihood ratios of each item of sleep abnormality for MDD were calculated.

The statistical analyses were conducted using PASW Statistics 18 (SPSS, Chicago, IL, USA). P values of <0.05 were considered to indicate statistical significance.

Results

The DSRS

The mean DSRS scores were 10.7 ± 6.2 for the control group and 20.6 ± 7.0 for the MDD group. Two-way

Table 1. DSRS by the MDD and the control groups

| | MDD group | | | Control group | | | P | | |
|------|-----------|------|-----|---------------|------|-----|-------|--------------------|---------|
| | Mean | SD | n | Mean | SD | n | | | |
| DSRS | Male | 18.5 | 5.8 | 28 | 10.1 | 5.7 | 608 | Gender × Diagnosis | ns |
| | Female | 21.8 | 7.3 | 51 | 11.3 | 6.5 | 688 | Gender | < 0.05 |
| | Total | 20.6 | 7.0 | 79 | 10.7 | 6.2 | 1,296 | Diagnosis | < 0.001 |

DSRS, Depression Self Rating Scale; MDD, major depressive disorder; ns, not significant

Table 2. Total sleep time, waking time, and sleep-onset time by the MDD and the control groups (weekdays)

| | MDD group | | | Control group | | | P | |
|------------------|-----------|-----|----|---------------|-------|-------|--------------------|---------|
| | Mean | SD | n | Mean | SD | n | | |
| Total sleep time | | | | (hr) | (hr) | | | |
| Males | 7.2 | 1.9 | 28 | 7.3 | 1.1 | 608 | Gender × Diagnosis | ns |
| Females | 7.1 | 2.2 | 51 | 7.1 | 1.2 | 688 | Gender | ns |
| Total | 7.1 | 2.1 | 79 | 7.2 | 1.1 | 1,296 | Diagnosis | ns |
| Waking time | | | | (Time) | (Min) | | | |
| Males | 7:18 | 132 | 28 | 6:18 | 42 | 608 | Gender × Diagnosis | ns |
| Females | 7:06 | 132 | 51 | 6:12 | 42 | 688 | Gender | ns |
| Total | 7:12 | 132 | 79 | 6:12 | 42 | 1,296 | Diagnosis | < 0.001 |
| Sleep-onset time | | | | (Time) | (Min) | | | |
| Males | 23:30 | 102 | 28 | 22:48 | 66 | 608 | Gender × Diagnosis | ns |
| Females | 25:54 | 702 | 51 | 23:00 | 66 | 688 | Gender | < 0.01 |
| Total | 25:00 | 544 | 79 | 22:54 | 66 | 1,296 | Diagnosis | < 0.001 |

ANOVA of the DSRS scores was conducted to examine gender and diagnosis differences. The means and SDs for the scores of the DSRS are shown in Table 1. Results of the ANOVA indicated that the difference of gender and diagnosis significantly affected the DSRS scores. The MDD group reported higher scores on the DSRS than those in the control group ($F = 160.2$, $P < 0.001$). And the female students reported higher DSRS scores than did the male students ($F = 9.1$, $P < 0.05$). There were no significant correlations found regarding the ANOVA results of the DSRS scores.

The sleep questionnaire

The mean of the weekday total sleep time was 7.2 ± 1.1 for the control group and 8.5 ± 1.5 for the MDD group. The means of the weekend and holiday total sleep time were 8.5 ± 1.1 for the control group and 8.7 ± 2.8 for the MDD group. The means and SDs for the weekday total sleep time vs. the weekend and holiday total sleep time are shown in Tables 2 and 3. Results of the ANOVA indicated that the effects of gender and diagnosis were not statistically significant for the weekday or the weekend and holiday total sleep time.

The means and SDs for the waking time and the sleep-onset time are also shown in Tables 2 and 3. The means for the weekday waking time and sleep-onset time were $6:12 \pm 42$ and $22:54 \pm 66$, respectively, for the control group and $7:12 \pm 132$ and $25:00 \pm 544$, respectively, for the MDD group. The means for the weekend and holiday waking time and sleep-onset time were $8:12 \pm 96$ and $23:18 \pm 78$, respectively, for the control group

and $10:00 \pm 210$ and $24:12 \pm 126$, respectively, for the MDD group.

The ANOVA results indicated that the MDD diagnosis did not significantly affect weekday or weekend and holiday total sleep time. The weekday and weekend and holiday waking time were significantly later in the MDD group than that in the control group ($F = 80.1$, $F = 72$, $P < 0.001$). The weekday and weekend and holiday sleep-onset times were significantly later in the MDD group than those in the control group ($F = 35.2$, $F = 38.9$, $P < 0.001$). The weekday sleep-onset times were significantly later in the female students compared with the male students ($F = 5.96$, $P < 0.01$).

Quality of sleep

The means and SDs for the five categories of sleep abnormalities, i.e., difficulty initiating sleep, difficulty maintaining sleep, subjective sleep insufficiency, daytime sleepiness, and non-restorative sleep, are shown in Table 4. The ANOVA results indicated that the difference of diagnosis significantly affected the difficulty initiating sleep and the difficulty maintaining sleep.

The odds ratio and risk ratio for MDD were also calculated for the five sleep abnormalities of difficulty initiating sleep, difficulty maintaining sleep, subjective sleep insufficiency, daytime sleepiness, and non-restorative sleep (Tables 5 and 6). From these results, students who answered "always" on both the questions on the difficulty initiating sleep and the difficulty maintaining sleep showed significantly higher values in both the odds ratio and the risk ratio for patients with

Table 3. Total sleep time, waking time and sleep-onset time by the control and the MDD group (weekend and holidays)

| | MDD group | | | Control group | | | P |
|------------------|-----------|-----|----|---------------|-------|-------|-----------------------|
| | Mean | SD | n | Mean | SD | n | |
| Total sleep time | | | | (hr) | (hr) | | |
| Males | 8.9 | 2.9 | 28 | 8.5 | 1.5 | 608 | Gendar × Diagnosis ns |
| Females | 8.6 | 2.8 | 51 | 8.6 | 1.5 | 688 | Gendar ns |
| Total | 8.7 | 2.8 | 79 | 8.5 | 1.5 | 1,296 | Diagnosis ns |
| Waking time | | | | (Time) | (Min) | | |
| Males | 9:48 | 204 | 28 | 8:00 | 102 | 608 | Gendar × Diagnosis ns |
| Females | 10:12 | 210 | 51 | 8:18 | 90 | 688 | Gendar ns |
| Total | 10:00 | 210 | 79 | 8:12 | 96 | 1,296 | Diagnosis < 0.001 |
| Sleep-onset time | | | | (Time) | (Min) | | |
| Males | 24:12 | 120 | 28 | 23:12 | 78 | 608 | Gendar × Diagnosis ns |
| Females | 24:12 | 132 | 51 | 23:24 | 78 | 688 | Gendar ns |
| Total | 24:12 | 126 | 79 | 23:18 | 78 | 1,296 | Diagnosis < 0.001 |

Table 4. Sleep problems by the control and the MDD group

| | MDD | | | Control | | | P |
|--------------------------------|------|------|----|---------|------|-----|-----------------------|
| | Mean | SD | n | Mean | SD | n | |
| Difficulty initiating sleep | | | | | | | Gender × Diagnosis ns |
| Male | 2.14 | 1.16 | 28 | 1.07 | 1.12 | 608 | Gender ns |
| Females | 2.00 | 1.25 | 50 | 1.24 | 1.18 | 682 | Diagnosis <0.001 |
| Difficulty maintaining sleep | | | | | | | Gender × Diagnosis ns |
| Males | 1.11 | 1.21 | 28 | 0.58 | 0.97 | 609 | Gender ns |
| Females | 1.27 | 1.28 | 50 | 0.57 | 0.98 | 687 | Diagnosis <0.001 |
| Subjective sleep insufficiency | | | | | | | Gender × Diagnosis ns |
| Males | 0.96 | 1.32 | 28 | 1.21 | 1.20 | 607 | Gender <0.001 |
| Females | 1.71 | 1.29 | 51 | 1.48 | 1.26 | 682 | Diagnosis ns |
| Daytime sleepiness | | | | | | | Gender × Diagnosis ns |
| Male | 2.00 | 1.22 | 28 | 1.69 | 1.24 | 609 | Gender n |
| Female | 2.06 | 1.18 | 51 | 1.88 | 1.22 | 687 | Diagnosis ns |
| Non-restorative sleep | | | | | | | Gender × Diagnosis ns |
| Male | 1.64 | 1.32 | 28 | 1.40 | 1.26 | 598 | Gender <0.01 |
| Female | 1.16 | 1.18 | 51 | 1.20 | 1.19 | 687 | Diagnosis ns |

Table 5. The likelihood ratios of each sleep abnormality for MDD in male students

| | RR | RR 95% CI | OR | OR 95% CI |
|--------------------------------|------|------------|------|------------|
| Difficulty initiating sleep | | | | |
| Always | 7.23 | 3.21-16.29 | 4.79 | 2.81-8.14 |
| Sometimes | 4.91 | 1.56-15.48 | 4.35 | 1.59-11.88 |
| Rarely | 0.5 | 0.21-1.19 | 0.62 | 0.33-1.19 |
| Never | 0 | - | 0 | - |
| Difficulty maintaining sleep | | | | |
| Always | 4.91 | 1.56-15.48 | 4.35 | 1.59-11.88 |
| Sometimes | 1.52 | 0.56-4.13 | 1.43 | 0.63-3.25 |
| Rarely | 1.57 | 0.70-3.55 | 1.39 | 0.80-2.42 |
| Never | 0.35 | 0.16-0.78 | 0.58 | 0.35-0.96 |
| Subjective sleep insufficiency | | | | |
| Always | 0.59 | 0.14-2.54 | 0.62 | 0.16-2.40 |
| Sometimes | 1.43 | 0.63-3.23 | 1.29 | 0.74-2.25 |
| Rarely | 0.21 | 0.06-0.69 | 0.29 | 0.10-0.85 |
| Never | 2.75 | 1.28-5.89 | 1.87 | 1.26-2.78 |
| Daytime sleepiness | | | | |
| Always | 2.18 | 1.00-4.76 | 1.72 | 1.06-2.78 |
| Sometimes | 0.81 | 0.35-1.87 | 0.86 | 0.48-1.57 |
| Rarely | 0.64 | 0.27-1.53 | 0.73 | 0.38-1.40 |
| Never | 0.69 | 0.16-2.97 | 0.71 | 0.18-2.76 |
| Non-restorative sleep | | | | |
| Always | 3.16 | 1.29-7.77 | 2.62 | 1.32-5.22 |
| Sometimes | 0.75 | 0.33-1.69 | 0.83 | 0.48-1.44 |
| Rarely | 0.68 | 0.29-1.62 | 0.76 | 0.40-1.46 |
| Never | 0.93 | 0.35-2.51 | 0.95 | 0.42-2.13 |

Table 6. The likelihood ratios of each sleep abnormality for MDD in female students

| | RR | RR 95% CI | OR | OR 95% CI |
|--------------------------------|------|------------|------|-----------|
| Difficulty initiating sleep | | | | |
| Always | 6.66 | 3.68-12.07 | 3.89 | 2.76-5.48 |
| Sometimes | 0.63 | 0.29-1.36 | 0.69 | 0.36-1.32 |
| Rarely | 0.42 | 0.21-0.83 | 0.54 | 0.32-0.92 |
| Never | 0.48 | 0.21-1.09 | 0.55 | 0.27-1.12 |
| Difficulty maintaining sleep | | | | |
| Always | 3.63 | 1.30-10.10 | 3.37 | 1.32-8.60 |
| Sometimes | 3.23 | 1.74-6.02 | 2.49 | 1.62-3.83 |
| Rarely | 1.38 | 0.73-2.62 | 1.27 | 0.80-2.04 |
| Never | 0.23 | 0.12-0.43 | 0.44 | 0.28-0.69 |
| Subjective sleep insufficiency | | | | |
| Always | 2.5 | 1.28-4.90 | 2.12 | 1.27-3.53 |
| Sometimes | 0.79 | 0.43-1.44 | 0.86 | 0.58-1.28 |
| Rarely | 0.75 | 0.40-1.42 | 0.82 | 0.52-1.30 |
| Never | 0.85 | 0.38-1.95 | 0.87 | 0.43-1.78 |
| Daytime sleepiness | | | | |
| Always | 1.7 | 0.96-3.01 | 1.38 | 1.00-1.91 |
| Sometimes | 0.57 | 0.29-1.13 | 0.66 | 0.39-1.13 |
| Rarely | 0.86 | 0.45-1.62 | 0.9 | 0.57-1.42 |
| Never | 0.96 | 0.29-3.21 | 0.96 | 0.31-3.00 |
| Non-restorative sleep | | | | |
| Always | 1.64 | 0.74-3.63 | 1.54 | 0.78-3.02 |
| Sometimes | 0.53 | 0.24-1.14 | 0.6 | 0.31-1.15 |
| Rarely | 1.01 | 0.56-1.81 | 1 | 0.69-1.45 |
| Never | 1.26 | 0.68-2.33 | 1.18 | 0.77-1.80 |

RR, risk ratio; CI, confidence interval; OR, odds ratio

MDD than did the students who gave other answers to each of these two questions.

Discussion

The quantity and quality of sleep among junior high school students with major depressive disorder

Because of this study, three characteristics of sleep behaviour in Japanese male and female junior high school students with MDD became evident. The results showed that the mean of DSRS in both groups were significantly higher in the female students than in the male students. This result had also been reported in previous studies.^{3,4}

The second attribute is that the sleep phase of adolescents with MDD is delayed, with a tendency to wake up later. And the sleep on-set time of female students in both groups was also later than that of male students. However, this study did not reveal the reason for the delayed sleep on-set time in females.

The last attribute is related to problems with the quality of sleep, with difficulty initiating sleep and difficulty maintaining sleep being more pronounced in male and female adolescents with MDD. Since adolescents whom indicated that they "always" have these sleep abnormalities have a high risk of MDD, it could be said that these two sleep abnormalities would be important factors in diagnosing MDD in male and female adolescents. In other words, the present study suggests that problems with the quality of sleep such as the difficulty initiating sleep and the difficulty maintaining sleep, may be considered as diagnostically important clinical symptoms of MDD.

In interpreting the delayed sleep phases, the difficulty maintaining sleep and the difficulty initiating sleep, it should be noted that some children diagnosed with MDD refused to attend school in this study period. However, there was no significant difference in total sleep time compared to normal male and female adolescents. We presumed that the onset of a depressive state could lead to these life patterns and the delayed sleep phases, which might induce the development of the qualitative sleep abnormalities such as the difficulty initiating sleep and the difficulty maintaining sleep. While the possibility of a coexisting delayed sleep phase syndrome (DSPS) has to be taken into account in adolescents with MDD, it remains unclear whether depression preceded the onset of DSPS or vice versa in the subjects in the present study.

Furthermore, there were a few adolescents who had the sleep abnormalities of subjective sleep insufficiency and non-restorative sleep in both genders and groups, suggesting that expressing the feeling and/or awareness

of these types of sleep abnormalities in childhood or adolescence to others, may be difficult. The more daytime sleepiness in the control group might be explained by the busy schedules of normal junior high school students that include not only routine school study schedules but also after-school club activities and cram schools. Therefore, it may be likely that because of MDD, adolescents are more often absent from school, their waking times become later, and they spend their days at home doing time-killing activities such as playing video games, meaning that they may not actually be tired all day long.

The results of this study revealed that the MDD group had poorer quality of sleep such as delay of sleep phases, than did the control group, but did not have abnormal sleep time. In contrast, previous studies reported that the average total sleep time is related to depression.^{7,8} The reason for the difference between our study and the previous studies may be explained by the difference in our research focus and methods. For example, most of the previous research focused on total sleep time, and only few studies focused on the quality of sleep. In the present study more detailed information related to sleep quality in adolescents with MDD was collected. In the present study, we endeavoured to advance and deepen the understanding of sleep problems in MDD in adolescents.

It is an important issue that two qualitative sleep abnormalities of the difficulty initiating sleep and the difficulty maintaining sleep could indicate diagnostically useful symptoms for the differential diagnosis of MDD in children and adolescents. By focusing on sleep problems, clinicians can make a more accurate diagnosis of MDD in children and adolescents, and make better informed decisions on the introduction of medication and psychotherapy to children and adolescents with MDD harboring problems such as increased thoughts of suicide.¹⁰

Limitations of this study

The subjects of this study were only Japanese junior high school students, and elementary school students were not enrolled. Since the junior high school students are already close to adulthood, the results of this study do not reflect the characteristics of MDD in all school-age children. Students with mental disorders were not excluded from the control group; therefore, we could not compare the MDD group with a healthy control group.

Moreover, this study did not include items related to other clinical symptoms characterizing MDD in childhood and adolescence such as frustration and irritation, indicating that further examination is warranted regard

in the correlation between the characteristics of MDD in this age group and sleep problems.

In this study, we have no real data about the socioeconomic status of either group. Therefore, we cannot exclude the possibility that the method for recruiting two sample groups in different ways, introduced potential biases in the samples.

Further studies will need to be conducted among subjects with a broader age range, introducing more objective measures to evaluate qualitative and quantitative aspects of sleep such as activity monitor devices or night-time polysomnography. These future studies should elucidate which abnormality precedes the other, MDD or DSPS, in a prospective study of children with these two abnormalities.

Conclusions

Because of this study, qualitative aspects of sleep problems among Japanese male and female junior high school students with MDD became evident. The characteristics of sleep recognized in this study were more related to the quality of sleep than to total sleep time, and among those, the difficulty initiating sleep and the difficulty maintaining sleep were observed as significant characteristic symptoms.

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