Original Article

Sleep quality and characteristics of college students who use prescription psychostimulants nonmedically

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Abstract

Objective: Although psychostimulants have been shown to affect sleep in experimental studies, the relation between nonmedical psychostimulant use and sleep has not been examined. Our goal was to describe the sleep quality and characteristics of college students who use psychostimulant medications nonmedically.

Methods: We surveyed 492 college students about their sleep quality and psychostimulant use characteristics. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI); psychostimulant use and characteristics were measured via a survey developed for this study.

Results: College students who self-reported current or a history of nonmedical psychostimulant use reported worse subjective sleep quality, sleep disturbance, and global PSQI scores than nonusers. The most commonly reported reason for nonmedical psychostimulant use was to improve work performance and concentration.

Conclusions: These data demonstrate worse sleep quality among nonmedical psychostimulant users. The likely consequence of increased daytime sleepiness helps to confirm the known public health concern of nonmedical prescription psychostimulant use among college students.

Keywords: Prescription Psychostimulant Sleep quality Emerging adult Characteristics Nonmedical use

1. Introduction

Adolescence and young adulthood is accompanied by sleep pattern changes that often result in decreased sleep quality and consequent increased daytime sleepiness. Biological changes during this period include a delayed circadian phase shift causing the tendency to stay up later at night. Early school start times, extracurricular activities, part-time jobs, and increased freedom to self-select bedtimes also contribute to poor sleep habits among adolescents and young adults. College students report average weekday sleep durations between 7.0 and 7.2 h despite requiring about 9 h for optimal functioning. Low sleep quality, sleep disturbances, and at least occasional sleep dissatisfaction are prevalent among most college undergraduates.

The college environment provides increased exposure to alcohol and drugs, the use of which may exacerbate sleep problems among students. Although prescription psychostimulants such as methylphenidate, dextroamphetamine, and mixed-salt amphetamines are intended for use among those with attention deficit hyperactivity disorder (ADHD) they are also readily available to those without prescriptions. DeSantis, Webb and Noar found that nearly 85% of college students reported that it is “very easy” or “somewhat easy” to illegally obtain prescription stimulants, thus these medications are often used illicitly. Prevalence of such illicit psychostimulant use ranges from 5% to 43% among samples of college students, with amphetamine use being most common.

The most frequently reported route of administration among nonmedical users is oral administration; nasal administration is the next most common route and has been reported among 14.7–38.1% of nonmedical users. When psychostimulants are crushed and nasally inhaled, the nasal mucosa allows absorption directly into the bloodstream, increasing bioavailability and abuse potential due to the nearly immediate reinforcing effects of dopamine release. This finding in particular emphasizes the public health issue of nonmedical psychostimulant use.

Common motives for undergraduate student use of prescription psychostimulants include increasing alertness and concentration, improving academic work and performance, staying awake longer to study or while using other drugs, to “get high”, weight control, and to counteract the effect of other drugs. Although college students also report that avoiding sleep is a major motivator for abusing prescription psychostimulants, the relation between...
sleep quality and nonmedical psychostimulant use has been understudied.

Thus, the purpose of the current study was to characterize sleep quality among college students who use prescription psychostimulant medications nonmedically compared to nonusers. We expected nonmedical psychostimulant users to report poorer sleep quality than nonusers based on a vicious cycle. Namely, sleep-deprived individuals prefer psychostimulants, and sleep-deprived individuals use psychostimulants to avoid sleep.

A secondary study goal was to characterize the nonmedical users’ sources for obtaining these drugs, routes of administration, types of prescription psychostimulants used, and motives for use. Though the secondary characteristics have been described in previous studies, the current study is the first to address these measures concurrent with sleep quality.

2. Methods

The study was approved by the Office of Research Compliance (IRB) at West Virginia University. Data collection occurred during an 8 week period from mid-October through mid-December 2007. Undergraduate students ≥18 years living in university housing or enrolled in an undergraduate psychology class were invited to complete the online survey. To maintain anonymity, a cover letter that explained consent was used in place of a signed consent form. Because these data were anonymous, we are unable to report response rates. Age and grade point average (GPA) were assessed categorically so participants could not be retrospectively linked to their survey responses. Online safeguards were in place to allow students to participate only once.

To date no survey regarding nonmedical psychostimulant use has been validated. Our questions regarding use and motives were based on several previously published studies of college-age samples. Because previous research has found that members of campus sororities and fraternities are more likely to engage in nonmedical psychostimulant use, we included this measure in the demographics section of the survey. In addition, photographs of each dose of each drug were provided as a visual reference. Participants were categorized as nonmedical lifetime users, prescription users, or nonusers. Nonmedical lifetime users were operationally defined as those who answered “yes” to the question, “Have you used prescription stimulants for non-medical use?” Those who answered “no” to this question, but endorsed use of specific drugs, which were presented with both generic (e.g., methylphenidate, mixed-salt amphetamine, dextroamphetamine and modafinil) and trade names (e.g., Ritalin, Adderall, Dexedrine, DextroStat, Provigil and Nuvigil) were considered prescription users. This question, posed after the portion of the survey concerning lifetime use of psychostimulants, was not elucidated for participants to permit self-selection as nonusers or nonmedical users. Because medically approved use was not assessed, prescription users were excluded from analyses. Only participants who endorsed any lifetime use were asked to complete the final portion of the survey, with questions concerning duration of use, method of administration, whether they thought it was acceptable to use these drugs, and methods for obtaining the drugs, and motives for drug use.

The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. The PSQI consists of 19 survey questions related to sleep habits within the past month including average sleep duration, latency, and specific sleep-related problems such as reasons you have had trouble sleeping, administration of medications to help you sleep, and daytime sleepiness. These questions are grouped to form seven component scores each with a range of 0–3: sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medications, and daytime dysfunction. These component scores are then summed for a global sleep quality score (range 0–21) with higher scores reflecting worse sleep quality during the previous month. The PSQI demonstrates good diagnostic sensitivity and specificity. Clinical cutoffs of >5 and >5 for the PSQI have both been used, for this study, global PSQI score ≥5 was used as the cutoff between good and poor sleep quality, consistent with a previous study of college-age students.

2.1. Sample

Five hundred sixty-six students completed the online survey. Two participants were excluded because of incomplete data and 72 were excluded because they could not be unequivocally classified as nonmedical users or non-users. Analyses were based on the final sample of 492 participants.

2.2. Statistical analyses

SPSS version 16.0 was used to analyze data. Descriptive statistics were calculated and categorical comparisons between nonusers and nonmedical users were made using chi-square analyses. Pairwise deletion was used for any missing data, and Cohen’s d was used to determine effect sizes for statistically significant group differences.

3. Results

Among the 492 participants, 14.4% reported lifetime nonmedical psychostimulant use. Table 1 shows that there were differences between groups for year in school, GPA, fraternity/sorority affiliation, and living arrangement.

Half (50.2%) of all respondents were freshmen. The majority of nonusers (53.4%) were freshmen, while the majority of nonmedical users (66.5%) were divided between the freshmen (31.0%) and sophomores (35.2%). Analyzed separately by class, we found that 8.9% of freshmen respondents reported being nonmedical users, 18.4% of sophomore respondents reported nonmedical use, 23.5% of junior respondents reported nonmedical use, 15% of senior respondents reported nonmedical use, and although the sample of those in their fifth or higher year of college was low (n = 12), 33% reported nonmedical psychostimulant use.

A greater proportion of nonmedical users were in lower GPA categories than nonusers. Divided by GPA categories, we found that 5.7% of GPA 3.5–4.0 respondents reported nonmedical use, 15% of GPA 3.0–3.49 respondents reported nonmedical use, 21.6% of GPA 2.5–2.99 respondents reported nonmedical use, and among those with GPAs ≤2.49, 17% reported nonmedical use.

Only 8.8% of the sample (n = 44) was affiliated with a sorority or fraternity. However, among the sorority or fraternity-affiliated sample, 31.8% reported nonmedical use, compared to 13.9% of those without sorority or fraternity affiliation.

Among the whole sample, 95% lived in either a university residence hall or a personal residence. The majority (65.3%) of nonusers lived in residence halls, whereas nonmedical users were divided between living in residence halls (45.7%) and in a personal residence (50.7%). Among those who lived in the residence halls, 10% reported being nonmedical users, whereas 22% who lived in a personal residence reported nonmedical use.

Frequency of nonmedical use of each drug is shown in Table 2. Among nonmedical users, mixed-salt amphetamine was the most frequently used drug.

The average global PSQI score for all study participants (6.5 [±2.9]) was above the ≥5 cutoff for poor sleep quality. To examine
was recoded as a categorical variable below the 25th percentile in college, ethnicity, membership in sororities or fraternities, and data were entered as covariates into the model (age, gender, year and global sleep quality as independent measures. Demographic dant use on academic performance, we ran a factorial ANOVA with users also had worse component scores for subjective sleep quality users had significantly worse global PSQI scores, and nonmedical covariates in this analysis. Lifetime nonmedical psychostimulant dent variables. Demographics variables were not included as component PSQI component, a MANOVA was conducted with use Frequency of psychostimulant use among nonmedical users.

Table 1
Demographic and educational characteristics for lifetime nonmedical users and nonusers (N = 492).

<table>
<thead>
<tr>
<th></th>
<th>Nonmedical users (n = 71)</th>
<th>Nonusers (n = 421)</th>
<th>χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>91.5%</td>
<td>91.1%</td>
<td>0.12</td>
</tr>
<tr>
<td>African</td>
<td>2.8%</td>
<td>3.6%</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5.6%</td>
<td>5.3%</td>
<td>0.87</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>64.8%</td>
<td>70.3%</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>35.2%</td>
<td>29.7%</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>4.99</td>
</tr>
<tr>
<td>18–20 years</td>
<td>77.5%</td>
<td>85.3%</td>
<td></td>
</tr>
<tr>
<td>21–24 years</td>
<td>22.5%</td>
<td>13.3%</td>
<td></td>
</tr>
<tr>
<td>25 + years</td>
<td>0.0%</td>
<td>1.4%</td>
<td></td>
</tr>
<tr>
<td>Year in school</td>
<td></td>
<td></td>
<td>15.51**</td>
</tr>
<tr>
<td>Freshman</td>
<td>31.0%</td>
<td>53.4%</td>
<td></td>
</tr>
<tr>
<td>Sophomore</td>
<td>35.2%</td>
<td>26.4%</td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td>21.1%</td>
<td>11.6%</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>7.0%</td>
<td>6.7%</td>
<td></td>
</tr>
<tr>
<td>5th year + GPA</td>
<td>5.6%</td>
<td>1.9%</td>
<td>13.02**</td>
</tr>
<tr>
<td>3.5–4.0</td>
<td>9.9%</td>
<td>27.6%</td>
<td></td>
</tr>
<tr>
<td>3.0–3.49</td>
<td>46.5%</td>
<td>44.4%</td>
<td></td>
</tr>
<tr>
<td>2.5–2.99</td>
<td>36.6%</td>
<td>22.4%</td>
<td></td>
</tr>
<tr>
<td>2.0–2.49</td>
<td>5.6%</td>
<td>4.9%</td>
<td></td>
</tr>
<tr>
<td>Below 2.0</td>
<td>1.4%</td>
<td>0.7%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sorority or fraternity affiliation</th>
<th>Nonmedical users (n = 77)</th>
<th>Nonusers (n = 421)</th>
<th>χ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>No affiliation</td>
<td>18.3%</td>
<td>7.1%</td>
<td>9.48**</td>
</tr>
<tr>
<td>Living arrangement</td>
<td>3.2%</td>
<td>92.9%</td>
<td></td>
</tr>
<tr>
<td>Residence hall</td>
<td>43.7%</td>
<td>65.3%</td>
<td></td>
</tr>
<tr>
<td>Personal residence</td>
<td>50.7%</td>
<td>29.9%</td>
<td></td>
</tr>
<tr>
<td>With parents/family</td>
<td>1.4%</td>
<td>4.3%</td>
<td></td>
</tr>
<tr>
<td>Sorority/fraternity house</td>
<td>4.2%</td>
<td>0.5%</td>
<td></td>
</tr>
</tbody>
</table>

** p < 0.01.
*** p < 0.001.

Table 2
Frequency of psychostimulant use among nonmedical users.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Never (%)</th>
<th>Used but not in past year (%)</th>
<th>Used in past year (%)</th>
<th>Used in past month (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylphenidate</td>
<td>77.5%</td>
<td>7.0%</td>
<td>7.0%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Mixed-salt amphetamine</td>
<td>19.7%</td>
<td>11.3%</td>
<td>18.3%</td>
<td>50.7%</td>
</tr>
<tr>
<td>Dextroamphetamine</td>
<td>93.0%</td>
<td>4.2%</td>
<td>0.0%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Modafinil</td>
<td>98.6%</td>
<td>0.0%</td>
<td>1.4%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 3
PSQI component scores for lifetime nonmedical users versus nonusers.

<table>
<thead>
<tr>
<th></th>
<th>Nonusers</th>
<th>Users</th>
<th>df</th>
<th>F</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective sleep</td>
<td>0.25 (0.64)</td>
<td>0.62 (0.85)</td>
<td>1490</td>
<td>18.15**</td>
<td>0.49</td>
</tr>
<tr>
<td>Sleep latency</td>
<td>1.35 (0.92)</td>
<td>1.46 (0.86)</td>
<td>1490</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>Sleep duration</td>
<td>1.14 (0.88)</td>
<td>1.15 (0.86)</td>
<td>1488</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Habitual sleep efficiency</td>
<td>0.51 (0.83)</td>
<td>0.55 (0.73)</td>
<td>1485</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Sleep disturbance</td>
<td>1.23 (0.47)</td>
<td>1.36 (0.51)</td>
<td>1489</td>
<td>4.26*</td>
<td>0.27</td>
</tr>
<tr>
<td>Use of sleep medications</td>
<td>0.35 (0.63)</td>
<td>0.35 (0.68)</td>
<td>1490</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Daytime dysfunction</td>
<td>1.58 (0.75)</td>
<td>1.66 (0.77)</td>
<td>1490</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>Global PSQI</td>
<td>6.40 (2.90)</td>
<td>7.17 (2.85)</td>
<td>1489</td>
<td>4.25*</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Note: Provided for each group are means (standard deviation) and effect sizes (Cohen’s d).
* p < 0.05;
** p < 0.01.
*** p < 0.001.

Among the 71 participants who endorsed nonmedical psycho-stimulant use, oral administration was reported more frequently (89.7%) than nasal administration (29.4%), (χ²[1] = 18.7, p < 0.001). There was not a significant difference on global sleep quality between nonmedical users who reported having ever used nasal administration versus those who used only oral administration (p = 0.50).

Participants were instructed to mark all applicable motives and methods of administration. The most frequently endorsed motives for nonmedical psychostimulant use were to enhance study/work performance (41.4%), increase concentration (28.6%), to get high (10.0%), for social reasons (10.0%), to increase alertness (8.6%), curiosity/experimentation (7.1%), counteract other drugs (2.9%), and other (7.1%). “Other” included “to relax,” “weight loss,” “to help me study,” “to get things accomplished around the house,” “for both concentration and alertness for long drives,” and “makes me feel more confident and social”.

Nonmedical users’ methods for obtaining prescription psychostimulants were valid prescription for a friend who gave the drug to the participant (59.2%), from an acquaintance (39.7%), valid prescription for a friend who sold the drug to the participant (17.6%), valid prescription for a family member (8.8%), and valid prescriptions for falsified symptoms (1.5%).

4. Discussion

Nonmedical psychostimulant users reported worse subjective and overall sleep quality and more sleep disturbance than nonusers. Students reporting high GPAs were less likely to use psychostimulants nonmedically. In fact, the results of this study indicate that the effect of nonmedical use on GPA is stronger than either the effect of sleep quality or interaction of nonmedical use and sleep quality on GPA. This result suggests that research examining sleep and sleep quality among emerging adults should include measures of nonmedical psychostimulant use.

The proportion of nonmedical use during each year of college shows that freshmen and sophomores are the least likely to be users. These younger students are also more likely to live in a residence hall, which probably explains our findings that students in residence halls were less likely to be nonmedical users than those living in personal residences. Perhaps the increased monitoring in residence halls plays a part in lower rates of nonmedical use differences between nonmedical users and nonusers’ global and component PSQI component, a MANOVA was conducted with use category as the independent variable and PSQI scores as the dependent variables. Demographics variables were not included as covariates in this analysis. Lifetime nonmedical psychostimulant users had significantly worse global PSQI scores, and nonmedical users also had worse component scores for subjective sleep quality and sleep disturbance (Table 3). To evaluate the impact of sleep and nonmedical psychostimulant use on academic performance, we ran a factorial ANOVA with GPA as the dependent variable, and both nonmedical use status and global sleep quality as independent measures. Demographic data were entered as covariates into the model (age, gender, year in college, ethnicity, membership in sororities or fraternities, and place of residence). Because several missing cells prevented us from running global sleep quality as a continuous measure, it was recoded as a categorical variable below the 25th percentile.
among freshmen and sophomores than among upper level students. Additionally, participants reporting the highest GPAs were least likely to be nonmedical users even though commonly supported motives for use are related to studying and productivity. These results also support research demonstrating higher rates of nonmedical use among sorority and fraternity members than nonmembers.18

Nonmedical psychostimulant use was related to worse subjective sleep quality even after excluding variance due to demographic measures. No differences were found in global sleep quality based on method of drug administration (nasal versus oral), nor did we find a main effect of global sleep quality on GPA or an interaction between nonmedical use and global sleep quality on GPA. In line with previous research, we determined that most nonmedical users obtained the drugs from friends and acquaintances.16,28 Overall, respondents used mixed-salt amphetamine and methylphenidate most often. Oral administration of psychostimulant was most common; the proportion of users who reported nasal administration was 27%.

4.1. Nonmedical psychostimulant use and sleep

Despite the average global PSQI score being above the generally accepted clinical cutoff for this age group9, which is not uncommon15,29, we found that nonmedical users had significantly worse subjective sleep quality, sleep disturbance, and global sleep quality than nonusers. Specifically, the component scores in this study (nonusers mean = 0.92, range = 0.25–1.58; nonmedical users mean = 1.02, range = 0.35–1.66) were higher than among healthy control adults in the United States (mean = 0.52, range = 0.20–0.70),27 Singapore (mean = 0.62, range = 0.02–1.09),30 and Japan (mean = 0.51, range = 0.39–0.66).31,32 During further investigation of nonmedical use and sleep with academic performance, we found no main effect of sleep or interaction effect of use and sleep quality on GPA. However, we did find a main effect of use status on GPA suggesting that sleep quality, which is generally poor among college students, is playing a smaller role in academic outcomes than nonmedical psychostimulant use. Therefore, future studies examining sleep quality among emerging adult use should consider nonmedical psychostimulant use in addition to general demographic information.

These findings may suggest a pattern of behavior—not necessarily of current nonmedical psychostimulant use, but of poor sleep among people who have used these drugs. Alternatively, there may be a general propensity toward nonmedical use of psychostimulants among students at risk for sleep disturbance. Finally, a cycle of nonmedical psychostimulant use may exist to combat effects of the medications. Specifically, we speculate that decreased sleep quality from psychostimulant use might prompt further misuse of these drugs. Students report using psychostimulants to reduce need for sleep for a variety of reasons,14 though this study demonstrates no significant differences in sleep duration among nonmedical users and nonusers. It is possible that the lack of differences in sleep duration between the groups is due to nonmedical users developing a tolerance for psychostimulants.11

Though not unexpected, high scores on the PSQI among this population are of specific concern because lack of sufficient and/ or restorative sleep leads to poor academic performance.32–35 Though no relation between sleep quality and GPA was found, it is possible that reported GPA for this study does not reflect current sleep disturbance because the PSQI corresponds to the previous month and GPAs are calculated based on all previous grades earned. Moreover, transforming PSQI scores into categorical data resulted in loss of variance, further inhibiting our ability to confirm previous findings.

4.2. Motives for use and sources for obtaining psychostimulants

Nonmedical psychostimulant users’ report poorer sleep than nonusers and nonmedical users reported using psychostimulants to enhance work performance and improve concentration in our studies and others.23,36; these findings support the notion that students’ ultimate goal may be to prevent sleep with these drugs to improve academic performance.

The current study also extends the current literature by determining that participants predominantly reported obtaining psychostimulants from friends or acquaintances, similar to previous research.16,28 Thus, not only is nonmedical use facilitated by prescribed users, but prescribed users who need these medications for a health condition may not be taking their prescription medications. Further, it is unlikely that accurate dosage specifications are provided to nonmedical users of psychostimulants, increasing risk of overdosing. Information about the route of obtaining these drugs may help focus educational programs aimed to reduce nonmedical psychostimulant use.

4.3. Limitations

A major limitation of this study is the lack of random sampling, resulting in a sample with a large proportion of females, freshmen, and sophomores, which may not generalize to other university populations. In addition, the anonymous survey used to encourage honest responding meant we were unable to track participation rate. Another major limitation is that information concerning other stimulants (e.g. nicotine and caffeine) or illicit drugs was not collected, nor were participants screened for ADHD, anxiety, or depression. Lack of this information limits our ability to attribute variance in sleep measures exclusively to psychostimulant use and prevents analyses of psychostimulant use in participants with preexisting disorders.

Because nonmedical use was not experimentally manipulated, no cause-effect relations between use and sleep can be determined. The cross sectional design also did not allow evaluation of the temporal association between nonmedical use and sleep quality. Furthermore, use of self-report limits the amount and type of information we can infer about students’ sleep and sleep patterns; though parents and adolescents have sufficiently estimated sleep characteristics such as bedtimes and wake times, they were unreliable in predicting sleep onset latency, frequency of night awakenings, and total sleep time.37,38 It is also possible that nonmedical users believe their sleep quality is worse because their motive for nonmedical use stimulants is to stay awake longer.

4.4. Future directions

The priority for future research in this area should be the relation between nonmedical psychostimulant use and objective sleep measured via actigraphy or polysomnography during periods when nonmedical use is closely monitored. In addition, frequency of psychostimulant use should be included in future surveys as well as measures of behavioral and affective disorders in an attempt to examine any influence they may have on nonmedical use. Finally, future studies could be extended to measure the effect of medical use of psychostimulants on sleep and sleep quality.

5. Conclusions

Despite these limitations, the current study takes a first step at bridging an important gap in knowledge between nonmedical psychostimulant use and sleep quality. We hope these results will encourage use of experimental designs, as well as further field
assessments, to incorporate objective assessment of these drugs to further describe the effects of nonmedical psychostimulant use on sleep and consequences such as drowsy driving and risk behaviors, mood disturbance, and academic outcomes.

Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of interest associated with this article can be viewed by clicking on the following link: doi:10.1016/j.sleep.2011.01.012.

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References