Does Daytime Sleepiness Predict Exercise and Physical Function in Older Adults?

Approximately 15% of community-dwelling older adults are frequently sleepy according to the National Sleep Foundation’s (NSF) Sleep in America Poll. In one study (Gooneratne et al. 2003), sleepiness had a moderate to large negative effect on the following domains of the Functional Outcomes of Sleep Questionnaire: social outcomes = 0.65; general productivity = 0.59; vigilance = 0.75; and activity level = 0.83 (P-values <0.005).

To clarify the relationship between sleepiness and physical exercise and physical function in older adults, researchers conducted a secondary analysis of data gathered from the NSF’s Sleep in America Poll (Chasens et al 2007). Participants (n = 1506) were community-dwelling older Americans (55–84 years) randomly chosen from geographically representative...
According to this review, there are two types of factors that increase one’s risk of traffic accidents due to sleepiness. The first group is comprised of endogenous factors, or individual characteristics, and the second group is comprised of exogenous factors, or environmental conditions. These factors, which often occur together, create a many-fold increase in one’s risk of a traffic accident. The endogenous factors most often cited as increasing sleep-related traffic accidents include:

- Excessive daytime sleepiness
- Inattention due to sleepiness
- Obstructive sleep apnea
- Narcolepsy
- Sleep deprivation
- Poor sleep hygiene
- A change in the wakefulness-sleep circadian rhythm
- Sudden sleep attacks
- “Dozing off” or “micro sleep”
- The use of certain medications

Drinking alcohol prior to driving exacerbates any potential sleep-related endogenous factor that may be present and further increases the risk of a traffic accident. The exogenous factors noted in the review as contributing to an impaired driving state are the concentration of the traffic and the type of driving (highway vs. city), irregular work hours, night work, duration of driving time, and the total number of hours worked. These factors can have an effect on the individual characteristics listed earlier. The interaction between the two types of factors further increases the risk of sleep-related traffic accidents. For example, irregular work hours, an exogenous factor, can lead to a forced change in the wakefulness-sleep circadian rhythm, an endogenous factor.

It is noted that the number of workers employed on shift work/night work have increased considerably over the past decade.

About 20% of the workers in industrialized nations are shift workers, and 25% of the Canadian work force and 1/3 of the Swedish work force are scheduled for shift work.

The writers credit the technological progress we have witnessed in the past 20 years as a contributor to the need for more night workers. Because most people naturally want to be active during the light part of a 24-hour period and want to be at rest during the dark part of the same period, working the second or third shift forces an artificial alteration in the body’s natural rhythm. While driving home from a second or third shift, especially if one has stopped for a drink to “unwind,” the body is fighting against its natural inclination to sleep. “This is illustrated by the fact that significantly more accidents are reported when driving home after a night shift compared to a day shift.”

An interesting study was conducted in Brazil and focused on professional drivers (truck drivers, bus drivers, taxi drivers). The study points out the very real dangers that sleep disorders present when coupled with driving: “Thirty percent of truck drivers in Brazil were found to be at high risk for sleep apnea and almost 40% met the criteria for obstructive sleep apnea/hypopnea syndrome (OSAHA)” (p. 866). A more recent study reported that drivers with sleep apnea have a seven-fold increased risk of being involved in a traffic accident than drivers who are healthy (p. 866). The results of these two studies leads one to realize just how dangerous it is for professional drivers with sleep disorders to be traveling the roads for long distances and during night hours and for the rest of the population who is traveling alongside of these potentially impaired drivers.

Individuals who are diagnosed with sleep disorders are often prescribed medications to keep them awake during the day and to help them sleep all night. These individuals also experience an increased risk of traffic accidents. Twenty-two percent of Americans surveyed in a study involving more than a thousand respondents reported that they regularly took some type of sleep aid (an over-the-counter or a prescription-only product) (p. 867). Another study looked at the effect of sleep aids (in particular benzodiazepine hypnotics) on driving performance. The morning after taking the sleep aid, after a full night’s sleep, many patients experienced driving impairment comparable to having a blood alcohol level that exceeded the legal limit for safe driving (p. 867).
Daytime Sleepiness continued from page 1

households with listed telephone numbers.

The researchers measured the level of sleepiness that interfered with activities of daily living; frequency of physical exercise that “increases the heart rate or improves the muscles, bones, or overall fitness”; and physical function such as the ability to walk, push, pull, stoop, crouch or kneel; write, and handle small objects. Information was also elicited on the presence of other sleep disorders and medical conditions. Subjects’ background variables and perceptions of health were noted.

Results
Eighty percent of the sample was between 55 and 75 years of age. Fifty-eight percent were women, 63.9% were married, and 91.3% were Caucasian. Women had significantly lower rates of exercise frequency and physical functional ability than men (P< 0.05). The relationship between age and self-rated health, exercise frequency, exercising for recreation, or sleep quality was not statistically significant. Although increased age had a small detrimental effect on physical function (r = 0.16, P< 0.05), it was not significantly associated with decreased sleep quality or increased frequency of daytime sleepiness.

Co-Existing Medical Conditions
Increased age was significantly associated with the number of co-existing medical conditions (r = 0.24, P <0.001). Those with multiple co-existing medical conditions had higher frequencies of daytime sleepiness and lower exercise frequency (P < 0.001 for both). Forty percent of the sample was overweight (BMI 25–29) or obese (22% BMI 30 +). Almost 50% of the sample considered their overall health “excellent” or “very good,” while 12.8% described their health as “fair” and 4.7% as “poor.” Medical conditions reported were: “heart disease (18.2%), hypertension or high blood pressure (47.3%), arthritis (46.4%), diabetes (16.3%), cancer (13.6%), stroke (5.6%), lung disease (13.2%), depression (16%), osteoporosis (13.7%), memory problems or forgetfulness (11.4%), enlarged prostate (22% of males).”

Sleep Disorders and Sleepiness
Most respondents (77%) reported “good,” “very good,” or “excellent” sleep quality. Sleepy subjects compared to non-sleepy subjects had significantly lower global sleep quality and self-rated health (P< 0.001) and reported significantly more frequent insomnia, symptoms of OSA (frequent snoring, pauses in breathing, nocturia*), and symptoms of restless leg syndrome (P-values < 0.05). Commonly cited sleep complaints were: frequent (several times a week to nightly) waking during the night (33%), awaking not refreshed (26.7%), snoring (32%), nocturia (64.8%), and excessive daytime sleepiness (14.8%).

Sleepiness and Exercise Frequency
Increasing age was not significantly related to exercise frequency in the study sample (P = 0.99); more women than men reported exercising two or fewer times per week. Those with co-existing medical conditions, higher BMI, and difficulty walking one-half mile were less likely to exercise frequently (all P-values <0.001). Respondents who exercised three or more times a
Assessment of Disability in Narcolepsy: A Study in Italy

Narcolepsy can have a disabling effect depending on the severity of the condition and the gap between its onset and diagnosis and treatment. Early and timely diagnosis can reduce the psychosocial impact of the disorder as the patient learns to cope with the many diverse effects of narcolepsy; however, disability is an illusive concept to measure because of its various ramifications, including the physical, mental, and social aspects of life. Some patients with narcolepsy may be sufficiently disabled to qualify for disability benefits, yet professionals may not perceive them as disabled and patients often have a difficult time when they apply for disability benefits. There is no standardized measure to assess disability in narcolepsy.

Researchers in Italy investigated the medical aspects of work disability on 15 patients with narcolepsy. Four Medical Commissions (MC), each composed of three legal medicine specialists and one occupational specialist, from three cities observed all 15 patients and made a determination as to their degrees of disability and levels of handicap and whether or not they should receive benefits and if they should be reported to the Driving Authority to have their drivers’ licenses revoked. The patients were interviewed on the same day in random order. After the interviews were completed and the MCs had rated the subjects, four of the authors of the study completed an information session about narcolepsy for the MC doctors. The MCs were then given the opportunity to revise their results. At this time, they were also given the results of the patients’ questionnaires. The following questionnaires and methods were used in eliciting information on disability:

- Italian version of the ESS
- A validated 16-point version of the Bologna questionnaire on sleepiness
- Italian questionnaire on cataplexy
- 20-item Zung self-rating depression scale
- Italian version of the SF-36 Health Survey using the 2-component summary scales
- A medical questionnaire
- An unvalidated questionnaire on daytime naps
- Structured telephone interview.

Results
The level of judgment differed among the four MCs on the % of disability (p< .001) and the severity of handicap (p=. .0007) and slightly on the need to inform the driving authority (p= .032). The only factors that were correlated with the determined disability % were age, the Italian questionnaire on cataplexy, and the Medical Component Summary of SF-36. Among all 4 MCs, interobserver reliability on disability % ranged from Kappa value of –0.10 to .35 ("fair agreement"). Interobserver reliability is consistency of observation or measurement between two or more observers or researchers. No consensus was reached among MCs on any one patient. The handicap level had an interobserver reliability that ranged from Kappa value –0.26 to .36 ("fair agreement"). A Kappa value could not be calculated for reporting to the driving authority. Raw agreement data ranged from 73% - 100%. After the informational/training session, the MCs still differed on the level of judgment on disability, handicap, and the need to inform the driving authority. Only one MC statistically increased its percentages of disability after the session. This had no statistically significant effect on the interobserver reliability.

Discussion
Low interobserver reliability was found among MCs on both disability and handicap decisions that did not improve with a training session on narcolepsy. The four MCs failed to agree on which benefits to award to patients, but did not have as much trouble identifying the presence of a disability. The MCs determination of disability matched quite well with the patients’ self-assessment of symptoms, suggesting that patient determination of disability and symptom severity could be reliable. The MCs’ judgment on excessive daytime sleepiness correlated only with the number of daytime naps and the Bologna questionnaire on sleepiness. This is not surprising as it has been shown that different scales reflect different aspects of subjective sleepiness. The MCs were inclined to report almost all patients to the driving authority for termination or restrictions on their drivers’ licenses. There has been very little research done in this area. Studies confirm that MSLT (Multiple Sleep Latency Test) cannot predict driving risk in narcoleptic patients.

Overall, this study determined that the MCs could determine and agree
week reported better sleep quality and less frequent daytime sleepiness (P-values <0.001) than those who exercised less often.

Age had no association with exercise frequency, sleep quality, or self-rated health, although it was weakly associated with difficulty walking one-half mile (r = 0.16, P < 0.001). High BMI was associated with low exercise frequency, and subjects who exercised less (2 times per week) were more likely to report symptoms of insomnia, snoring, restless legs, and daytime sleepiness, as well as poorer sleep quality (all P-values <0.001). Both long (more than 8.5 hours) and short (fewer than 7 hours) sleepers were likely to have low exercise frequency (P<0.05); however, when controlled for daytime sleep duration, daytime sleepiness was associated with low exercise frequency (OR = 1.379, P = 0.037). Daytime sleepiness predicted low exercise frequency while controlling for age and body mass index (BMI) (OR = 1.40, 95% CI 1.031–1.897, P = 0.031).

Sleepiness and Physical Function
A greater number of subjects with impaired physical functioning (32%) reported sleepiness compared to 11.4% of those with good physical function. Overall, physical function was significantly lower in sleepy subjects (t = 8.1, d.f. = 250, P = 0.001). Frequent daytime sleepiness predicted impaired physical function (OR = 2.76, 95%CI = 0.237–0.553, P = 0.001) after controlling for age, BMI, income, and number of co-morbid conditions.

Conclusion
The authors point out certain limitations in the study design:

Increasing age was not significantly related to exercise frequency in the study sample…. Those with co-existing medical conditions, higher BMI, and difficulty walking one-half mile were less likely to exercise frequently.

A cross-sectional survey does not allow one to study the cause of the findings. Do people who do not exercise tend to have daytime sleepiness? Response rate was low (25%).

The subjects had to rely on memory to answer questions which can bias the results.

Most of these limitations are inherent in survey research. Despite these limitations, the results are significant for the overall findings that are consistent with other studies. The conclusion was that “daytime sleepiness in older adults is associated with physical functional impairments and decreased exercise frequency.” Contrary to our beliefs and perceptions, increasing age in healthy older persons in this study was not significantly related to frequency of sleep disturbances or to daytime sleepiness. The authors note that “sleepiness in the elderly may be associated with deconditioning and declines in physical function” as suggested by Gooneratne et al. 2003. Other studies have found a strong association between excessive daytime sleepiness and exercise in older adults. These results are valuable in treating older adults, since sleep disorders can be treated to promote sleep quality and improve daytime alertness, leading to greater physical function and exercise. Clinicians have an important role in attending to sleepiness in older adults. Exercise and physical function can promote healthy aging and thus reduce functional impairment associated with the aging process and improve the quality of life of older persons.

* Nocturia is urination at night.

Reference

Further reading
Narcolepsy presents with a classic tetrad of excessive daytime sleepiness (EDS), cataplexy, hypnagogic/hypnopompic hallucinations, and sleep paralysis. Markedly disturbed nocturnal sleep is another hallmark of the disease; in fact, it is more prevalent than cataplexy, but was not originally recognized as one of the classic symptoms of narcolepsy. Quality of life studies suggest that the impact of narcolepsy is equal to that of Parkinson’s disease.

The article goes on to list and briefly describe the symptoms of narcolepsy: EDS, cataplexy, nocturnal sleep disruption, hypnagogic or hypnopompic hallucinations, sleep paralysis, and automatic behavior. Further, the article discusses how a diagnosis of narcolepsy is made, and it describes the tests used: polysomnography and MSLT (multiple sleep latency test); an assessment of CSF hypocretin (cerebrospinal fluid) as many patients with narcolepsy have very low levels of CSF hypocretin; and HLA (histocompatibility human leukocyte antigen). A strong correlation exists between narcolepsy and the HLA sub type DQB1*0602. The subtype is also common in the general population, about 20%, and one is cautioned to remember the old adage “correlation is not causation.”

The authors maintain that effective treatment includes both non-pharmacologic and pharmacologic strategies. The non-pharmacologic strategies include structured nocturnal sleep, structured daytime naps, avoidance of irregular sleep-wake schedules, counseling/assistance, and driving caution. Pharmacologic treatments are a description of medications for EDS and cataplexy, including stimulants, modafinil, sodium oxybate, and other medications to treat cataplexy such as antidepressants.

Future directions/treatments include the exploration of the CNS histamigergic system that has long been known to play an important role in alertness. Additionally, hypocretin agonists are under development. Immunotherapy, successful only in a few case reports, is mentioned as a novel therapy.

In the early perspectives on narcolepsy, it was thought to be primarily a disease of REM sleep. This hypothesis appears too simplistic. The authors discuss recent evidence that supports the view that narcolepsy is a condition of vigilance-state disturbance, whereas cataplexy is being viewed as a result of a hypocretin deficiency. The strong association between HLA type and narcolepsy with cataplexy would seem to suggest that narcolepsy is an autoimmune disease, although the classic signs of autoimmune disorder (inflammation, no auto-antibodies, etc.) are not present in narcolepsy with cataplexy.

The authors conclude that, while much has been learned, there is still a long way to go in understanding narcolepsy and other diseases with EDS as a symptom.

Reference

This article is adapted from a review paper by Black et al. 2005 in which the authors discuss the symptoms and management of narcolepsy.
The review states that the type of driving coupled with the concentration of automobiles on the road plays a role in the risk of sleep-related traffic accidents. City driving with heavy traffic increases one’s risk of a sleep-related accident compared to city driving on relatively empty streets. The opposite is true of highway driving. An increase in the concentration of traffic on highways decreases the chance of a sleep-related accident. The authors of this article believe this has something to do with the monotony of driving on an empty highway (sleep inducing) and the attention required when surrounded by many vehicles that reduces one’s feeling of sleepiness (p. 866).

The authors offer many suggestions to reduce the number of sleep-related traffic accidents. The most effective method for a sleepy driver is to pull over to the side of the road or into a rest stop for a nap or to rest when overwhelmed by a feeling of sleepiness. A Gallup poll completed in 2002 indicates that this is exactly what most drivers do (p. 868). The authors also believe a public health campaign (perhaps similar to the one regarding the effects of alcohol on driving performance) is needed to alert the public to the dangers of “sleepy driving.” Individual attention to one’s sleep patterns and sleep duration, avoidance of long solo driving trips, and regular exercise which improves the quality and efficacy of sleep are all suggestions offered to decrease one’s risk of a traffic accident due to sleepiness. The authors also note that if industry would better plan the changing shifts of its night workers with respect to sleep patterns, many people would be less impaired when they took to the roads on the way home from work.

Reference
Did you know that............

Bruxism (nocturnal tooth grinding) is a common condition in which a person clenches or grinds his/her teeth during sleep. When it occurs regularly, it may be associated with moderate to severe dental damage, facial pain, and disturbed sleep. Bruxism may be associated with daytime stress, so try to relax in the hours before bedtime to reduce stress levels and maintain a regular soothing bedtime routine to ease symptoms. Tooth grinding during sleep may be linked with sleeping on your back. Try to sleep on your side.

National Sleep Foundation Email January 21, 2009

Recent research shows moderate declines in hcrTR2 expressions in hypocretin-ligand deficient subjects with narcolepsy. These declines were not likely to be progressive and complete. The relative preservation of hcrTR2 expression suggests that hypocretin based therapies may be a novel therapeutic option in human narcolepsy-cataplexy.

As a rule, I always look for what others ignore.                                      —Marshall McLuhan

Some people have a foolish way of not minding, or pretending not to mind, what they eat. For my part, I mind my belly very studiously and very carefully, for I look upon it that he who does not mind his belly will hardly mind anything else.  —Samuel Johnson


Narcolepsy is a chronic sleep disorder of neurological origin. It’s main symptoms are (1) excessive daytime drowsiness with a tendency to sleep at inappropriate times; (2) cataplexy (sudden loss of strength in the muscles generally provoked by strong emotions or stress); (3) sleep paralysis and (4) hypnagogic hallucinations (extremely vivid dreams or images). Disturbed nighttime sleep, problems with memory, and fatigue are common complaints of people with narcolepsy.

The Narcolepsy Institute is committed to providing comprehensive care to people with narcolepsy by integrating the medical, social, psychological, and spiritual dimensions of health in a spirit of kindness and respect toward all, irrespective of race, creed, ethnicity, or social class; that the recipients of care may realize their potential and live productively in joy, peace, harmony, and dignity.

Activities of the Narcolepsy Institute include: screening, information, referral, counseling, conducting professionally led support groups, advocacy, and public as well as professional education. The program is partially funded by the New York State Office of Mental Retardation and Developmental Disabilities.

The contents of this publication are not intended to provide advice for individual problems nor to replace medical advice. Readers are urged to consult with their professionals before initiating self-therapy. We welcome comments and suggestions about the contents of the newsletter.