

## **Excerpts from a variety of articles or studies that found health benefits of motion, for various conditions in several categories.**

Compiled by John Huff • 641 472 6651 • Floating Bed Co • [www.floatingbed.com](http://www.floatingbed.com) 2023.

These are grouped into topic sub-headings:

**General info, Motion Sickness, Post-Operative Recovery, Mother-Infant, Autism, Vestibular, Stress, Elders / Overall Fitness and Health, and Misc.**

These are not well organized, and they are not in order of relevance or importance.

The studies or articles cited involve use of various devices and modalities, such as rocking beds (occasionally), chairs, etc.

**Table 1. Hazards of Immobility**

Medscape® <a href="http://www.medscape.com">www.medscape.com</a>	
<b>System</b>	<b>Complication</b>
Respiratory	Pneumonia, atelectasis, pulmonary embolism
Cardiovascular	Postural hypotension, cardiac muscle atrophy, deep vein thrombosis
Skin	Pressure ulcers
Renal	Calculi, nephritis
Hematological	Anemia
Gastrointestinal	Constipation and fecal impaction
Metabolic	Glucose intolerance, negative nitrogen balance
Musculoskeletal	Osteoporosis, muscle atrophy, contractures
Neurological	Depression, psychosis

Source: Am J Crit Care © 2007 American Association of Critical-Care Nurses

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### 1. General Information and/or Conditions

**Chronic Fatigue Syndrome - Recognizing NASA's rocking results, it was later determined that rocking was also the best solution for CFS patients.**

Rocking provides easy, non-weight bearing, rhythmic motion and does a very important job in autonomic tone for a population that has difficulty accomplishing exercise. (Chronic Fatigue Syndrome affects approximately half a million people in the US.) (Reference not cited.)

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### **Use of the rocking bed in the treatment of neurogenic respiratory insufficiency**

<http://qjmed.oxfordjournals.org/content/87/7/423.abstract>

1. [R.M. CHALMERS](#),
2. [R.S. HOWARD](#),
3. [C.M. WILES\\*](#) and
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1. Address correspondence to Dr R.S. Howard, Department of Neurology, St Thomas' Hospital, Guy's and St Thomas' Hospital Trust, London SE1 7EH
  - Received March 7, 1994.
  - Accepted July 19, 1994.

**Abstract**

**Summary** We describe 53 patients who received ventilatory support with a rocking bed. Diagnoses included previous poliomyelitis (30), muscular dystrophy (12), motor neurone disease (4), adult-onset acid maltose deficiency (4) and a miscellaneous group (3). Patients presented with respiratory insufficiency characterized by diaphragm weakness, progressive nocturnal hypoventilation and/or acute or chronic respiratory failure. Domiciliary rocking beds were used by 43 patients for a mean of 16.0 years (range 1 month to 35 years). Most patients were able to breathe adequately by day when sitting or standing, but needed assistance by rocking bed for 6–11 h when lying down for sleep. The rocking bed was well-tolerated, and associated with both symptomatic relief and amelioration of arterial blood gas abnormalities. Seventeen of these 43 patients discontinued its use, either because of discomfort (9) or increasing respiratory insufficiency (8). The rocking bed is a valuable adjunct in the management of the respiratory insufficiency associated with neuro-muscular disease.

- [© Oxford University Press](#)
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### **Reduction in Obstructive Breathing Events During Body Rocking: A Controlled Polygraphic Study in Preterm and Full-Term Infants**

<http://pediatrics.aappublications.org/content/96/1/64.abstract>

1. [J. Groswasser](#),
2. [M. Sottiaux](#),
3. [E. Rebuffat](#),
4. [T. Simon](#),
5. [M. Vandeweyer](#),
6. [I. Kelmanson](#),
7. [D. Blum](#),
8. [A. Kahn](#)

± Author Affiliations

1. *Pediatric Sleep Unit, University Children's Hospital, Free University of Brussels, Belgium*

### Abstract

*Objective.* To investigate the effect of body rocking on infant respiratory behavior during sleep.

*Methods.* Eighteen infants with documented obstructive sleep apneas were studied. There were eight premature infants with persistent bradycardias and 10 infants born full-term, admitted after an idiopathic apparent life-threatening event. No cause for the obstructive apneas was found. The infants were recorded with polygraphic techniques during two successive nights. They were randomly assigned to a rocking or a nonrocking mattress. The conditions were reversed the following night, in a crossover design.

*Results.* In both groups of infants, no significant difference was seen between the two consecutive nights for most of the variables studied: total sleep time, the proportion of non-rapid-eye-movement and rapid-eye-movement sleep, the number of arousals, the number and maximal duration of central apneas, the frequency of periodic breathing, the level of oxygen saturation, and heart rate. During the nonrocking nights, all infants had repeated obstructive breathing events. In seven of the eight preterm infants and in nine of the 10 full-term subjects, body rocking was associated with a significant decrease in the frequency of obstructive events. During rocking, in the preterm infants the obstructions fell from a median of 2.5 to 1.8 episodes per hour ( $P = .034$ ). In the full-term infants, rocking reduced the obstructive events from a median of 1.5 obstructions per hour to 0.7 ( $P = .005$ ). No difference was seen for the duration of the obstructive episodes.

*Conclusion.* In preterm and full-term infants prone to obstructive sleep apneas, gentle side-to-side body rocking is associated with a significant decrease in the frequency of upper-airway obstructions.

- Received April 20, 1994.
- Accepted September 30, 1994.
- Copyright © 1995 by the American Academy of Pediatrics

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[Sleep](#). 1990 Dec;13(6):533-7.

### Effects of otolithic vestibular stimulation on sleep.

<http://www.ncbi.nlm.nih.gov/pubmed/2281251>

[Woodward S](#), [Tauber ES](#), [Spielmann AJ](#), [Thorpy MJ](#).

### Source

Department of Psychiatry, Wayne State University School of Medicine, Detroit, Michigan.

### Abstract

This study evaluated the effects of otolithic vestibular stimulation in the form of a linearly accelerated parallel swing on nighttime sleep parameters and daytime sleep tendency in eight normal subjects. The protocol consisted of one adaptation night following by two motion nights, one adaptation night followed by

two stationary nights, and two Multiple Sleep Latency Tests (MSLT), one motion and one stationary. On the motion nights, there was a decrease in stage 2 percentage as well as a facilitative effect on sleep latency on the last night. In addition, an increase in the number of rapid eye movements (REMs) per night was found without a significant alteration of REM sleep amount or latency. No significant differences were found between the motion and stationary MSLT days.

PMID:

2281251

[PubMed - indexed for MEDLINE]

[J Clin Sleep Med.](#) 2010 Aug 15;6(4):315-21.

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## **Extending the functional cerebral systems theory of emotion to the vestibular modality: a systematic and integrative approach.**

<http://www.ncbi.nlm.nih.gov/pubmed/19254081> (unclear, semi-related -I still must read it.)

[Carmona JE](#), [Holland AK](#), [Harrison DW](#).

### **Source**

Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA. jcarmona@vt.edu

### **Abstract**

Throughout history, vestibular and emotional dysregulation have often manifested together in clinical settings, with little consideration that they may have a common basis. Regarding vestibular mechanisms, the role of brainstem and cerebellar structures has been emphasized in the neurological literature, whereas emotion processing in the cerebral hemispheres has been the focus in psychology. A conceptual model is proposed that links research in the 2 disparate fields by means of a functional cerebral systems framework. The claim is that frontal regions exert regulatory control over posterior systems for sensation and autonomic functions in a dense, interconnected network. Impairment at levels within the system is expected to influence vestibular and cognitive processes depending on the extent of frontal regulatory capacity. M. Kinsbourne's (1980) shared cerebral space model specifies the conditions under which dysfunction of the vestibular modality will influence higher cognitive levels. A position on laterality and associative relations within the right hemisphere is proposed to explain links among dizziness, nausea, and negative emotion.

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PMID:

19254081

[PubMed - indexed for MEDLINE]

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## **Varicose Veins**

There is research on the use of rocking to stimulate circulation, improve muscle tone, and to help prevent and cure varicose veins. Many pregnancy support articles and web sites recommend rocking in a rocking chair to prevent the development of varicose veins. (Reference not cited.)

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### **Effects of Continuous Passive Motion and Elevation on Hand Edema**

<http://ajot.aotapress.net/content/44/10/914.short>

The purpose of this study was to evaluate the efficacy of the use of continuous passive motion (CPM) of the digits in combination with limb elevation to reduce hand edema. The effects of 30 min of CPM of the digits with the limb elevated were compared with the effects of 30 min of limb elevation alone. Each of 16 subjects with hand edema of varied etiology received both treatments, one on each of 2 consecutive days. Measures of hand volume, finger circumference, and finger stiffness were taken before and after each treatment. Analyses comparing mean percentage change scores for both treatments showed large and significant treatment effects for all three dependent measures. The findings indicate that, for this sample, CPM with limb elevation was a more effective treatment for the reduction of hand edema than limb elevation alone. The results of analyses performed on a subgroup of 11 subjects with hemiplegia were similar, thus suggesting that CPM with limb elevation may be an effective method by which to reduce hand edema for this patient population.

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### **Continuous passive motion in hand rehabilitation**

<http://poi.sagepub.com/content/17/2/130.abstract>

This paper reviews the literature comparing the results obtained in applying regimes involving motion with those involving rest following injury or surgery. The deleterious effects of immobilisation are compared to those obtained under conditions of passive motion and intermittent passive motion. It is concluded that continuous passive motion (CPM) represents an improvement on intermittent motion. Models of CPM machines are described and some results presented.

It is proposed that “intelligent” CPM would represent a further improvement in technique and a prototype machine for this purpose and some preliminary results are described.

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<https://news.westernu.ca/2022/08/passive-exercise-offers-same-brain-health-benefits-as-active-movements-study/>

**passive exercise leads to increased cerebral blood flow and improved executive function, providing the same cognitive benefits as active exercise**, a new study by kinesiology graduate students from Western has found. Published in *Psychophysiology*, the study is the first to look at whether there would be benefits to brain health during passive exercise where a person’s limbs are moved via an external force ...

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Physiological Impact and Clinical Relevance of Passive Exercise/Movement

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6687564/>

Passive exercise/movement, simply defined as the manipulation of the body or a limb (e.g. leg) without voluntary effort or muscle contraction, has a long and rich history in medicine and physiology.

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## 2. Motion Sickness

Case studies of motion sickness suggests that balance training and habituation (reducing or modifying one's response to a stimulus that causes motion sickness) may help diminish the symptoms of the condition. The use of habituation for the treatment of motion sickness is based on the theory that when an individual prone to motion sickness is repetitively exposed to the stimulus that causes motion sickness (such as driving in a car or riding on an elevator) **in a controlled, supervised fashion**, they will become used to (habituate) that stimulus. Over time, the stimulus will no longer evoke the motion sickness response, and symptoms will diminish.

### Biofeedback Training and Relaxation

In a study of 55 pilots who had to stop flying due to symptoms of motion sickness, **76% of them successfully overcame their motion sickness and were able to return to work after participating in a biofeedback training and relaxation program.** Biofeedback instruments recorded skin temperature and changes in muscle tension while the pilots were exposed to a stimulus that caused motion sickness (sitting in a tilting, rotating chair). While in the chair, the pilots performed various relaxation techniques, such as deep muscle relaxation and mental imagery. Over time, the pilots became used to the rotating chair, and they no longer felt sick because they learned to relax.

### Cognitive Behavioral Therapy

The goal of cognitive behavioral therapy is to alleviate the anxiety that some people experience simply thinking about movement or motion sickness. In a study of 50 pilots who occasionally experienced motion sickness, 86% of them successfully overcame their symptoms after cognitive behavioral therapy. During this therapy, individuals are exposed to a provocative stimulus (**such as a tilting, rotating chair**) in a slow and controlled fashion until they experience some symptoms of motion sickness, but not until the symptoms become overwhelming. As the individual performs better and better on the rotating chair, they build confidence, reducing their anxiety.

#### References:

Dobie TG, May JG. Cognitive-behavioral management of motion sickness. *Aviat Space Environ Med.* 1994;65(10 Pt 2):C1-C20.

Jozsvai EE, Pigeau RA. The effect of autogenic training and biofeedback on motion sickness tolerance. *Aviat Space Environ Med.* 1996; 67(10):963-968.

Rine RM, Schubert MC, Balkany TJ. Visual-vestibular habituation and balance training for motion sickness. *Phys Ther.* 1999;79:949-957.

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(Reference not cited.)

A common hypothesis for the cause of motion sickness is that it evolved as a defense mechanism against neurotoxins.[6] The area postrema in the brain is responsible for inducing vomiting when poisons are detected, and for resolving conflicts between vision and balance. When feeling motion but not seeing it (for example, in a ship with no windows), the inner ear transmits to the brain that it senses motion, but the eyes tell the brain that everything is still. As a result of the disconcertance, the brain will come to the conclusion that one of them is hallucinating and further conclude that the hallucination is due to poison ingestion. The brain responds by inducing vomiting, to clear the supposed toxin.

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PHYS THERAPY Journal  
Vol. 79, No. 10, October 1999, pp. 949-957

### **Visual-Vestibular Habituation and Balance Training for Motion Sickness**

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MC Schubert, PT, is a doctoral student and a graduate research assistant in the physical therapy program at the University of Miami.

TJ Balkany, MD, is Hotchkiss Distinguished Professor of Otolaryngology, Neurological Surgery and Pediatrics, The Ear Institute, Department of Otolaryngology, University of Miami, Miami, Fla

**Background and Purpose.** This case report describes physical therapy for motion sickness in a 34-year-old woman. The purpose of the report is twofold: (1) to provide an overview of the literature regarding motion sickness syndrome, causal factors, and rationale for treatment and (2) to describe the evaluation and treatment of a patient with motion sickness. **Case Description and Outcomes.** The patient initially had moderate to severe visually induced motion sickness, which affected her functional abilities and prevented her from working. Following 10 weeks of a primarily home-based program of visual-vestibular habituation and balance training, her symptoms were alleviated and she could resume all work-related activities. **Discussion.** Although motion sickness affects nearly one third of all people who travel by land, sea, or air, little documentation exists regarding prevention or management.

Studies of animals and humans with motion sickness and interventions to reduce it have indicated that habituation, a reduction or modification in response to the provoking stimulus, **can be achieved with repetitive visual and vestibular stimuli.**

Key Words: Habituation • Motion sickness • Physical therapy • Sensory conflict theory

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### 3. Post-Operative Recovery

#### CHILDBIRTH

Title: Rock away the pain.  
Authors: Gutfeld, G. Rao, L.  
Source: Prevention; Apr92, Vol. 44 Issue 4, p15, 2p, 1 illustration  
Document Type: Article  
Subject Terms: \*CHILDBIRTH

Abstract: Reports the results of a study researchers performed on the effects of rocking, along with modified diet, medications and suppositories, on 290 women who had just given birth by cesarean section. Rocking's effect on the alleviation of intestinal gas; A sooner departure for mothers from the hospital; How the rocking motion proves beneficial.

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In an article in the "Physical Therapy Review" 40:818, 1960; a study of women who had cesarean sections showed a faster recovery if they spent an hour a day rocking. A follow-up study in Galveston, Texas in December of 1990 followed women who had cesarean sections and showed that rocking mothers had less gas pains, walked faster, and left the hospital one day sooner than non-rocking mothers. This article was published in the "Journal of Prenatal Nursing" on December 24, December 1990. Hmm. Could that be why rockers are a standard in maternity wards today?

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#### Knee Replacement Surgery

Orthopedic surgeons have long recommended rocking as a later phase of those who are recuperating from knee replacement surgery.

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#### Post-Operative Recovery & "Speed Healing"

**Speed Healing - Studies conducted at the Medical College of Virginia have shown that 'kinetic therapy' (the constant, gentle motion rocking in a rocking chair) can dramatically speed healing in severely ill patients.**

Dr Heinrich Addleheim of the Kinetic Therapy Clinic says that with regular rocking, "the body settles into a natural rhythm that harnesses incredible powers of recuperation and regeneration". We've seen cases of patients recuperating from heart attack and stroke - without any trace of



permanent damage - simply because they used a rocking chair while they were recovering. I've seen people bedridden with arthritis who were up and around inside a week after regular use of the rocking chair. It can be used to cure colds, flu, diabetes and even some types of cancer. It's not just a piece of furniture - it's a remarkable medical device." **The positive effects of rocking on recovering stroke patients are confirmed by a March 2006 Ottawa Clinical Study.**

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**Post-Op Ileus Recovery** - Ileus is a condition in which there is an absence of muscular contractions of the intestine which normally move the food through the digestive system and can result in an intestinal obstruction. The article above also suggested the use of rocking chairs in recovery of other gas inducing surgeries which is the reason Robert Massey chose a similar subject for his PhD. dissertation. He was in charge of nursing at the University of Texas M.D. Anderson Cancer Center in Houston. His study was on the effects of rocking on post operative Ileus Duration (return of bowel function) subjective pain and time to discharge following cancer related abdominal surgery. His findings which will be published in August showed post operative Ileus function returned 16.8 hours earlier than normal recoveries. In most hospital settings that could shorten the hospital stay by one day!

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From PubMed  
[http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=7922294&opt=Abstract](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7922294&opt=Abstract) QJM. 1994 Jul;87(7):423-9

**Use of the rocking bed in the treatment of neurogenic respiratory insufficiency.**

**Chalmers RM, Howard RS, Wiles CM, Spencer GT.**  
Lane-Fox Unit, St Thomas' Hospital, London, UK.

We describe 53 patients who received ventilatory support with a rocking bed. Diagnoses included previous poliomyelitis (30), muscular dystrophy (12), motor neurone disease (4), adult-onset acid maltase deficiency (4) and a miscellaneous group (3). Patients presented with respiratory insufficiency characterized by diaphragm weakness, progressive nocturnal hypoventilation and/or acute or chronic respiratory failure. Domiciliary rocking beds were used by 43 patients for a mean of 16.0 years (range 1 month to 35 years). Most patients were able to breathe adequately by day when sitting or standing, but needed assistance by rocking bed for 6-11 h when lying down for sleep. The rocking bed was well-tolerated, and associated with both symptomatic relief and amelioration of arterial blood gas abnormalities. Seventeen of these 43 patients discontinued its use, either because of discomfort (9) or increasing respiratory insufficiency (8). The rocking bed is a valuable adjunct in the management of the respiratory insufficiency associated with neuromuscular disease.

PMID: 7922294 [PubMed - indexed for MEDLINE]

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**Rocking bed and prolonged independence from nocturnal non-invasive ventilation in neurogenic respiratory failure associated with limb weakness**

<http://pmj.bmjournals.com/cgi/content/abstract/80/944/360>

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**Management of young children's acute pain and anxiety during invasive medical procedures.**

- Kuttner L.

B.C. Children's Hospital, University of British Columbia, Vancouver, Canada.

Post-Op Recovery in Pediatric Patients - The British Columbia Children's Hospital of Vancouver, Canada uses kinesthetic methods including Rocking Chair Therapy for post operative relief from acute, painful medical procedures. And for pediatric patients, this pain reduction technique is synergistic with analgesics and has long term benefits for pediatric patients. These pain reduction techniques are synergistic with analgesics and have long-term benefits for pediatric patients.

PMID: 2657691 [PubMed - indexed for MEDLINE]

Profiles Healthc Mark. 1992 Jul-Aug;(48):45-7.

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**Sudden infant death syndrome and possible relation to vestibular function.**

**Farrimond T.**

University of Waikato, New Zealand.

Some infants seem to be born with a degree of respiratory centre immaturity which in combination with other problems such as illness, head colds, exposure to cold, air or smoke, may result in cessation of breathing.

**Vestibular stimulation by rocking has been shown to be beneficial for premature babies in reducing apnea. There also appear to be other benefits,** resulting in more rapid maturation of the nerve cells of the cerebellum which is still developing during the first six months of life.

**The suggestion is made that crib deaths may be reduced by the use of automatically rocking cribs, particularly during the night when most deaths occur.**

PMID: 2251079 [PubMed - indexed for MEDLINE]

Pediatrician. 1989;16(1-2):39-44.

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Paediatricians in Cartagena, a port Caribbean city located north of Colombia implemented a new and modern technique called "hammock-therapy", as a method to help premature babies.

The "hammock-therapy" has been given to dozens of babies born before nine months of gestation and so far has given excellent results.

"Here we use hammocks and this way we avoid lacerations," Dr Rodriguez, a paediatrician who implemented the therapy two years ago, told AP Television.

Speaking about the benefits of the hammocks, Dr Rodriguez said, "we make the babies sleep longer which helps to their growing and development."

## Rocking Studies, General

The hammocks are brought from Morroa in the province of Sucre and San Jacinto in the province of Bolivar. The hammock-therapy consists of introducing a small hammock about 50 to 60 centimetres inside the incubator and then places the premature baby inside it.

"I'm the mother of a baby that is here and I think the therapy and that the medical personnel are giving to the babies in the incubators is very good because the baby has responded very well after that," said Yannis Morales, a mother of a premature baby.

Hammocks are attractive to parents because according to Rodriguez, "we also avoid the apnea, a very common disease in premature babies," adding, "so this way it contributes to the benefits of premature babies."

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**NOT** a concluded study yet, but notes during a talk with C Lutynski, who is in the middle of a research project which looks promising thus far, titled:

**"Investigation of wave motion as a stress intervention method for Stage III breast cancer women."**

Precious Passage wave cancer research

Carline Lutynski 860/889-3424, [precious\\_passage@yahoo.com](mailto:precious_passage@yahoo.com)

Dr. Scott Kurtzman, director of surgery at Waterbury Hospital, is project investigator of the study. The general idea is to quantify how wave motion therapy, or simply, time spent on a boat, helps breast cancer patients alleviate stress.

"There is some scientific background showing that possibly in humans, but at least in animals, stress reduces the immune system," he said.

Kurtzman said the approach could work for other types of cancer and illnesses, but that breast cancer was a logical place to start.

The institutional review board of the UConn Health Center approved the study. Studies must go thru review board now. This was expedited but since they had no device, they had to use a boat. She believes the pre-natal explanation is central to the benefits.

Cellular memory is one factor. Another is, during the last trimester immune system killer cells form, infant premies re-create womb environment they continue growth, not killer cell assays, but did growth continue, rocking environment they did continue growth. Womb features rocking, vestibular motion, no light, warmth heartbeat, fluid sounds, mother breathing tiny motion, infants 13 sec period, reduce adrenal stress, in medical community no connection except behavior, ie how does that effect lymph.

She recommends A&P (Anatomy & Physiology) in college. She has degree in civil engineering & metallurgy. The results creates an ah-ha experience, humbling, seeing quasi-independent systems. Look at references in the animal kingdom, omni-pendulums. Look back to cell memory. Her boat also had a gyrosensor.

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## 4. Infancy and Child Development , Motherhood

Effect of a rocking bed on apnoea of prematurity

SJ Tuck, P Monin, C Duvivier, T May and P Vert

<http://adc.bmjournals.com/cgi/content/abstract/archdischild;57/6/475>

We describe a rocking bed for use in incubators. Its effect was studied in 12 preterm infants with idiopathic apnoea, using each as his own control.

**All but one had less apnoea when the bed was rocking than when it was still. Apnoea associated with a significant fall in transcutaneous PO2 was less frequent, and fewer interventions were needed to terminate apnoeic attacks.**

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The infant's developmental outcomes were evaluated by the Denver Developmental Test in terms of social, emotional and motor development. The mother-child attachment and the calming effect on infant were assessed and evaluated as well. The infant's responses to stimuli were also analyzed. The participating infants stopped crying and showed calming effects when rhythmic patting and rocking were applied. They also had a capacity of conditioned learning by kicking back in response. The enriched infants smile, hold their heads up and sit and stand earlier than the control group. They also showed good emotion and better performance in mother-child attachment. The findings in this study suggest that infants have an ability to learn in inutero and that the prenatal tactile sensation (rocking) vestibular enrichment may be an effective way promote an infant's social, emotional and motor development.

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Numerous articles in "Mothering" magazine extol the benefits of rocking for mother and child. Rocking soothes fussy babies and relaxes mothers. It stimulates the balance mechanism of the inner ear. It assists an infant's biological development and ability to be alert and attentive.

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At the University of Waikato in New Zealand rocking stimulation has been shown to be beneficial for premature babies in reducing apnea (see SIDS).

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Labor, Delivery and Recovery - Lamaze International advocates that moving freely in labor improves a woman's sense of control and decreases her need for pain medication. In choosing a care provider one of the things they suggest in the birthing room is a rocking chair.

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Post Partum Weight Loss - Also, good news for post partum weight loss: rocking burns about 150 calories an hour and will help mothers recover more rapidly from the experience of childbirth (also from "Mothering" magazine).

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### **Vestibular Function and SIDS (Sudden Infant Death Syndrome)**

Vestibular Function - The vestibular system helps the body maintain its "postural equilibrium". It relates to or effects the perception of body position and movement and is essential in coordinating the position of the head and the movement of the eyes. The vestibular system resides in the inner ear.

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SIDS and VF - At the University of Waikato in New Zealand there have been studies relating vestibular function to SIDS (Sudden Infant Death Syndrome). Rocking stimulation has been shown to be beneficial for premature babies in reducing apnea.

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## **Pregnancy & Delivery**

### **The effects of prenatal tactile and vestibular enrichment on human development**

Auteur(s) / Author(s)

PANTHURAAMPORN C. (1) ; DOOKCHITRA D. (1) ; SANMANEECHAI M. (1) ;

Author(s) Affiliation(s)

(1) Department of Obstetrics and Gynaecology, Hua Chiew Hospital, Bangkok, THAILANDE

Abstract

To investigate the influence of prenatal tactile and vestibular intervention on infant's social, emotional and motor development and to evaluate the maternal-child attachment after participated the prenatal activity. The 120 pregnant women were trained to stroke their abdomen, pat rhythmically on fetus' bottom and rock themselves on the rocking chair 10-15 minute each everyday throughout pregnancy. The infant's developmental outcome were evaluated by Denver developmental test in term of social, emotional and motor development. For an assessment of the mother-child attachment and the calming effect on infant were evaluated by evaluation sheet. The infant's response to stimuli were also analysed. The participated infants stopped crying and showed calming effect when rhythmic patting and rocking were applied after birth, they also have a capacity of conditional learning by kicking back in response. The enriched infants showed smile, head up, sit

and stand earlier than the control group. They also showed good emotion and better performance in mother-child attachment.

**These findings in this study suggest that the infants have an ability of learning in utero, and the prenatal tactile / vestibular enrichment may be an effective way to promote infant's social, emotional and motor development.**

Revue / Journal Title

The International journal of prenatal and perinatal psychology and medicine ISSN 0943-5417

Source / Source

1998, vol. 10, no2, pp. 181-188 (20 ref.)

We are all familiar with the theories and results of using cradles and rockers to calm babies and ease them off to sleep. We have run across research proposing that the rocking of babies by their mothers is not only soothing, but crucial in the bonding process between mother and child.

Prenatal Benefits - At the Department of Obstetrics and Gynecology at the Hua Chiew Hospital in Bangkok, Thailand, authors Panthuraamphorn C. Dookchitra D., and Sanmaneechai M. composed a study and compiled their findings in a book “Effects of Prenatal Tactile and Vestibular Enrichment on Human Development”. Their purpose was to investigate the influence of prenatal tactile and vestibular intervention on an infant’s social, emotional and motor development and to evaluate maternal-child attachment after participation in the prenatal activity. One hundred and twenty women in the study were trained to stroke their abdomen, pat rhythmically on the fetus’ bottom and rock themselves in a rocking chair 10-15 minutes each day throughout their pregnancy. **Anne Ayres, an American nerve psychologist, recommends that at the start of the 10th week of pregnancy, women should rock 5 to 10 minutes twice a day. Her belief is that rocking promotes the development of the fetal nervous system.**

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## 5. Autism & Sensorial

Sensory Integration (SI) - SI is the ability to take in information through your physical senses (touch, movement, smell, taste, vision, and hearing) and put it together with prior information (stored) and make a meaningful response.

Sensory Integrative Dysfunction (SID) - SID is a disorder in which sensory input is not integrated or organized appropriately in the brain. Main symptoms of SID look like symptoms of other disabilities that include Fragile X, ADHD, ADD, Autism, Pervasive Development Disorder (PDD), and Tourette Syndrome.

Sensory Integration Therapy (SIT) - SIT is a theory used by occupational therapists. It is one approach used by therapists as part of a comprehensive and individualized intervention program. Its principles have been recommended for and applied to autism learning disabilities, attention problems, and developmental problems like Fragile X. Rocking in a rocking chair is one of the calming activities that are recommended. Sensory integration intervention is based on a

neurophysiological view of autism. The late A. Jean Ayres, Ph.D. of the US developed the theory and practice of sensory integration. She believed every autistic child should have a rocker in his room.

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The ARI (Autism Research Institute), always evaluating all forms of therapy, in recent years has seen an increase in interest of SIT for autistic adults and children. In treatment evaluation questionnaires that were administered, parents give sensory integration a very high percentage of 69% approval, with the highest of 47 therapies being Behavior Modification at 83%. Impressive.

Lorna Jean King (OTR, FAOTA) is one of the pioneers of Sensory Integration Therapy, lectures internationally, and is the Founder and Director of the Center for Neurodevelopmental Studies, Inc. in Phoenix, Arizona. When interviewed by the ARI she was asked about the importance of providing security and setting a calm tone in the home environment, especially after a busy day of schooling or therapy. She responded by saying "It may be as simple as having a rocking chair in their room".

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Fragile X - Fragile X is a family of genetic conditions which impacts individuals and families in different ways. Fragile X Syndrome is the most common form of inherited mental impairment and is sometimes referred to as Mental Retardation. Sensory impairment or sensory processing difficulties are often a part of the puzzle. Rocking in a rocking chair is a recommended part of therapy, cited for its calming effects.

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In September of 2006, The American Library Association offered a workshop at their annual conference entitled "Welcoming Special Needs Children at Your Library". Lindsey Biel OCR/L, presenter and co-author of Raising a Sensory Smart Child suggests incorporating rocking chairs into the environment for it's soothing and repetitive motion for children with a range of disorders.

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### Proprioceptive system

The Proprioceptive System helps children (and adults) to locate their bodies in space. Autistic children often have have poor proprioception and will need help to develop their coordination. Therapy may include playing with weights, bouncing on a trampoline or a large ball, skipping or pushing heavy objects.

### Vestibular system

The Vestibular System is located in our inner ear. It responds to movement and gravity and is therefore involved with our sense of balance, coordination and eye movements. Therapy can include hanging upside down, rocking chairs, swings, spinning, rolling, somersaulting, cartwheels and dancing. All these activities involve the head moving in different ways that stimulate the vestibular system. Be careful to observe the child carefully to be sure the movement is not over stimulating.

Back and forth movement appears less stimulating than side-to-side movement. The most stimulating movement tends to be rotational (spinning) and should be used carefully. Ideally activities will provide a variety of these movements. A rocking motion will usually calm a child while vigorous motions like spinning will stimulate them. Merry-go-rounds, being tossed on to cushions or jumping trampolines can be real favorites with some children. Experimenting and careful introduction of each activity is the way to go.

<http://www.autism-help.org/family-physical-exercise-autism.htm>

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## **6. Vestibular Adaptation and Rehabilitation**

Baylor College of Medicine  
Greg Ator, M.D.  
May 21, 1992

A patient presenting with vague disequilibrium and occasional episodic vertigo is a common occurrence in the general otolaryngology clinic. These patients often have mild progressive symptoms without spontaneous resolution. Traditional treatment methods have relied upon medication such as Antivert® and Valium® and perhaps Cawthorne type exercises in an attempt to encourage central nervous system adaptation and rehabilitation. I will briefly describe vestibular physiology, as it relates to compensation, and discuss the design and efficacy of a program of vestibular rehabilitation.

The function of the vestibular system is to transduce head acceleration into a signal the brain can interpret.

Exercise is important in vestibular compensation in that immobility has been demonstrated to prevent dynamic compensation from occurring.

The importance of exercise in vestibular rehabilitation is not new, having first been described by Cawthorne and Cooksey in 1946. They noted that patients who exercised early after a unilateral ablation did better and they did so faster than patients who did not exercise. This clinical observation in support of modern experimental evidence provides the basis for rehabilitation; CNS compensation is facilitated by exercises with visual and somatosensory stimulation.



A specific, tailored program is developed to address the particular deficits. The treatment strategy relies on the following factors: balance retraining for postural control mechanisms; eye and head coordination with progressively more difficult visual tracking tests; **habituation therapy**; and a general conditioning program.

Indications for rehabilitation therapy include patients with: movement induced dizziness or poor compensation after a unilateral vestibular injury; status post head injury; the elderly patient with vague disequilibrium; and poor compensation or recurrent symptoms after surgery.

Several large series have been published recently detailing results from vestibular rehabilitation programs. Horak and Shemway reported a prospective study of twenty-five subjects with a peripheral vestibular disorder and symptoms greater than six months duration. These patients were divided into three treatment groups.

The first group underwent a tailored program of twice weekly outpatient exercises. The second group was given a regiment of general (Cawthorne) exercises. Finally, a third group was given medications such as Antivert® and Valium® only.

**The results are encouraging in that the patients who were on medication alone showed no objective improvement on posturography scores, but in the patients who had a tailored vestibular exercise regiment, there was a statistically significant increase in the posturography scores indicating improvement in compensation. A subjective dizziness index also showed significant improvement with the vestibular exercise program while no improvement was seen with the general exercise program and approximately 50% improvement with the medication alone group.**

A prospective study from Shepard et al at the University of Michigan of 98 patients with diagnoses including peripheral, central, and mixed etiologies. These patients participated in a tailored program with twice daily home therapy lasting ten to fifteen weeks. Results showed a reduction in symptoms scores in 87% with complete resolution of symptoms in 36%. Patients with head injury accompanied by postural problems, but with normal visual and somatosensory systems, and those with secondary gain did the worst. Patients with episodic motion dysfunction had the best prognosis for improvement with this protocol.

**In summary, vestibular rehabilitation is an important treatment modality for patients with vestibular dysfunction who are not surgical candidates. An increasing proportion of our society, the elderly, are often prime candidates for vestibular rehabilitation therapy. It appears that patients with peripheral vertigo with classical symptoms, especially of an episodic variety will definitely benefit from a vestibular rehabilitation program but also patients with a vague disequilibrium and probable central etiology for this condition may also benefit from vestibular rehabilitation therapy.**

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## 7. Stress, overall fitness, and / or Elders

### Seniors 'rocking' to good health. Columbia Hospital, Milwaukee, WI.

[No authors listed]

PMID: 10120011 [PubMed - indexed for MEDLINE]

Am J Sports Med. 1989 Mar-Apr;17(2):187-96.

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### Rock 'Til You Drop

24 April 1998

If heavy metal leads to senile dementia, elderly headbangers could do worse than head down to Kirkhaven nursing home in Rochester, USA. For as studies there have shown, residents who rock around the clock are both happier and healthier.

"The more they rocked, the better they felt," says nurse researcher Nancy Watson of Rochester University, speaking of a six-week study presented at the Eastern Nursing Research Society. "There's a stereotype of older people on a porch happily going back and forth in their rocking chairs. It turns out that the activity really does bring some peace of mind to many folks."

Benefits of zealous rocking for residents suffering from dementia include emotional well-being and an improved sense of balance. Patients who rock incessantly even tend to request less medication to ease their daily aches and pains. "It's been very well documented with infants that a gentle repetitive motion has a soothing effect," says Watson. "We've shown that the same is true in an older population that is emotionally distressed."

With some 1.6 million people currently in US nursing homes — more than half of whom suffer from some form of dementia — expect "rocking-chair therapy" to become the latest vogue. Good news for residents and nursing home staff .

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### Rock Your Stress Away

Studies suggest the humble, low-tech rocker can ease the stress and anxiety brought on by our high pressure,

## Rocking Studies, General

high-tech lives. Research has long confirmed what new mothers learn very quickly: rocking soothes babies, possibly because the motion mimics the sensation of being carried in the womb. The gentle back and forth of rocking transforms crying into cooing and magically changes a wakeful infant into one who sleeps...well, like a baby. But less has been known about rocking's effect on adults.

One recent study reveals the welcome news that rocking is as good for grandma and grandpa as it is for baby. Researchers recently conducted a study to examine the effect of rocking on nursing home residents who were suffering from dementia due to Alzheimer's disease or other causes. For six weeks, the 25 men and women rocked from 30 to 80 minutes every day. Subsequently, the rocking mechanism was disabled on the platform rockers and the result was observed.

During the first six weeks, nearly half the study group exhibited less anxiety, disorientation, tension and depression. Those who rocked 80 minutes per day showed the most dramatic difference, requesting pain medication less often and having fewer episodes of anxiety and depression. Researchers noted that those who achieved the greatest benefit were those who rocked for the longest amount of time over the course of the day, not necessarily during one sitting. They also noticed that when emotionally distraught residents were helped into rocking chairs and began rocking, the motion immediately calmed them.

An additional benefit was observed: rocking improved the balance of the study group, possibly because the rocking motion helps stimulate the body's ability to maintain balance.

Though researchers have not documented rocking's effect on adults in mid-life, evidence suggests that it must be as soothing for baby boomers as it is for their parents and children. Demand for rocking chairs has soared during the past few decades, and the plain wooden rocker has diversified to suit the tastes of both the chic set and couch potatoes, in the process spawning a whole category of furniture. "We don't sell as many of the old-fashioned maple Boston rockers as we did in the past," says Nick Cardi, "but we do sell a lot of Shaker-style and painted rockers, and in upholstered furniture, swivel rockers and glider rockers. Twenty years ago we had five or six different styles and now we're all over the place." The Cardi brothers conclude, "The population is rocking."

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## Rochester News

MEDIA CONTACT: Tom Rickey, (585) 275-7954, or Nancy Watson, (585) 273-2518

*April 27, 1998*

### **As Elders Rock, Emotional Burden of Dementia Eases**

Nursing home residents who have dementia can literally rock away their anxiety and depression, nurse researchers have found, simply by rocking back and forth in a rocking chair for about an hour or two a day. Patients who rocked the most in a research study even requested less medication to ease their daily aches and pains, and their balance improved.

Nurses from the University of Rochester School of Nursing presented the work at a meeting of the Eastern Nursing Research Society April 23-25 in Rochester.

## Rocking Studies, General

"There's the stereotype of older people on a porch happily going back and forth in their rocking chairs," says nurse researcher Nancy Watson. "It turns out that the activity really does bring some peace of mind to many folks.

"It's been very well documented with infants that a gentle repetitive motion has a soothing effect. We've shown that the same is true in an older population that is emotionally distressed."

In a study funded by the New York State Department of Health, Watson studied 25 nursing home residents diagnosed as having dementia, either due to Alzheimer's disease or other causes. Nurses at Kirkhaven, a nursing home in Rochester, closely monitored patient behavior for the six weeks residents rocked and compared it to their behavior during six weeks when the rocking mechanism on the chairs was disabled.

During the weeks they rocked, most residents' psychological and emotional well-being improved, says Watson, an assistant professor in the University's School of Nursing and an expert in gerontological nursing research, an area where the University is ranked among the top 10 nationwide.

"Right away, nursing aides noticed the most dramatic effect: The chair served to calm someone down when he or she was emotionally upset. The aide helped the resident to the chair and got them rocking, and it calmed the patient right down."

In the study, residents rocked for anywhere from half an hour to two and a half hours each day for five days a week. While not all the residents improved, those who rocked the most improved the most, Watson says. "The more they rocked, the better they felt."

Behaviors like crying or expressions of anxiety, tension, and depression dropped in 11 patients, 10 of whom rocked more than 80 minutes a day. Such behaviors fell anywhere from slightly to almost one-third.

Several patients also requested less pain medication during weeks they rocked, Watson says; generally, those who rocked the most asked for pain medication less often, ranging from a very slight reduction to two or three fewer requests per week. Patients who rocked less asked for at least as much pain medication, and sometimes more.

Zealous rockers also improved their balance, a huge concern among the elderly population, where a fall often leads to drastically scaled-back quality of life. Watson says it's possible that the gentle rocking motion helped stimulate the residents' vestibular system, which helps maintain balance.

Residents used platform-style rocking chairs that work like conventional rockers but have a super-stable, immobile base and move back and forth very easily. Aides gradually introduced residents to the chairs, encouraging but not pushing residents to rock.

Watson's co-investigators were Mary Hauptmann, director of nursing at Kirkhaven, and Carol Brink, associate professor of clinical nursing at the University. Also taking part were Bethel Powers, associate professor of nursing; Eileen Root Taillie, project director; Margaret Lash, project nurse; and nurse researcher Thelma Wells, formerly of the University and now at the University of Wisconsin.

Watson says that nursing home staff and loved ones of residents who seem happier and less anxious have been very interested in the research. She says rocking-chair therapy could become an important treatment

tool for the approximately 1.6 million people in U.S. nursing homes, more than half of whom suffer from some form of dementia.

"Rocking provides a worthwhile, mild form of exercise for these people," says Watson. "It would be difficult to take every patient for a walk, for instance, but residents can rock themselves, and many are happy to do so, given a little encouragement. This is an easy step to improve the quality of life for people in nursing homes."

PR 185, MS 0

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Glider chairs are now commonly recommended by health officials for people with anxiety, high blood pressure, back injuries, chronic back problems and pregnant women.

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From an article in Furniture Insider:

As science is beginning to discover, the use of rocking chairs has clear-cut health benefits. In babies, rocking recreates the soothing rhythm of being in the womb. For older folks, rocking stimulates blood flow and facilitates the gentle, rhythmic contraction and relaxation of back muscles.

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## Passive motion, passive motion machines.

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Am. Journal Respir. Crit. Care Med., Volume 162, Number 5, November 2000, 1747-1751

### **Passive Motion of the Extremities Modifies Alveolar Ventilation during Sleep in Patients with Congenital Central Hypoventilation Syndrome**

DAVID GOZAL and NARONG SIMAKAJORNBOON

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<http://ajrccm.atsjournals.org/cgi/content/full/162/5/1747>

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Passive motion of lower extremities (PMLE) elicits significant increases in alveolar ventilation (V A) in awake children with congenital central hypoventilation syndrome (CCHS), who have absent or near absent ventilatory responses to hypercapnia. We hypothesized that PMLE would improve V A during non-rapid eye movement (NREM) sleep. To study this, six patients with CCHS (0.2 to 7 yr of age) were disconnected from mechanical ventilatory support during Stage III-IV NREM, and their feet were passively moved at the ankle, either manually or with a motorized device strapped to their feet at 40 to 50 strokes/min. Holding of the feet without motion served as control (C). From a total of 74 successful trials not associated with sleep state changes, PETCO<sub>2</sub> decreased from  $58.9 \pm 3.5$  to  $40.9 \pm 2.6$  mm Hg with PMLE (n = 58; p < 0.001), whereas end-tidal carbon dioxide (PETCO<sub>2</sub>) increased in C (n = 16;  $58.8 \pm 3.1$  to  $60.3 \pm 3.7$  mm Hg; PMLE versus C: p < 0.001). PMLE increased respiratory frequency from  $10.2 \pm 1.9$  to  $21.2 \pm 2.7$  breaths/min (p < 0.0001). We conclude that PMLE during NREM increases V A possibly via activation of mechanoreceptor-afferent pathways rather than by respiratory entrainment. We speculate that such effect may provide future noninvasive ventilatory support strategies in patients with CCHS and mild phenotypic expression of their disease.

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Central chemoreceptors are considered to be important controllers of ventilation during states associated with moment-to-moment changes in metabolic requirements such as exercise or sleep (1). Children with the congenital central hypoventilation syndrome (CCHS) have markedly abnormal central chemosensory function during sleep states (2), which persists during wakefulness (3, 4). More specifically, although alveolar hypoventilation will develop during any state, its severity will be greatest during non-rapid eye movement (NREM) sleep and improve during REM sleep and quiet wakefulness (5). This state dependency of ventilatory output may lead to relatively adequate spontaneous daytime ventilation in children with more mildly affected CCHS, who will, however, require mechanical ventilatory support during sleep.

In recent years, transition from invasive mechanical ventilation to nasal mask ventilation has been reported in older patients with CCHS who were selectively nocturnal ventilator-dependent (6). However, a recent report of a 9-mo-old infant who has received adequate noninvasive ventilatory support for > 2 yr suggests that nasal mask ventilation or other forms of noninvasive ventilation may be a viable option in selected cases at younger ages (10).

The observation of parents that children with CCHS develop significant hypoventilation during wakefulness when sustaining a motor quiescent state such as watching television has been further confirmed in the laboratory and shown to display dependencies on mental activity (11) and degree of limb motion (12, 13).

## Rocking Studies, General

The latter was shown to ameliorate gas exchange during exercise at intensities below the anaerobic threshold (13) as well as during passive limb motion at rest (12), possibly via activation of limb mechanoreceptors or respiratory entrainment.

In the present study, we hypothesized that activation of mechanoreceptors by passive motion of the extremities during quiet sleep would elicit increases in alveolar ventilation in children with CCHS.

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### Patients

Patients with CCHS who were being clinically followed at the Tulane or Kosair Children's Hospital Comprehensive Sleep Medicine Center were invited to participate in the study, which received institutional experimental human subject committee approval. The diagnosis of CCHS was based on recently reviewed criteria (14) and included: (1) persistent evidence of sleep hypoventilation ( $\text{PaCO}_2 > 60$  mm Hg); (2) the onset of symptoms usually occurred during the first days of life and always before the first birthday; (3) absence of primary pulmonary disease or neuromuscular dysfunction, which could explain the hypoventilation; and (4) no evidence of cardiac disease. In addition, evidence for a markedly attenuated response to hypercapnia was obtained in all participating children days to months prior to their participation in the study. The hypercapnic ventilatory response was measured during quiet or NREM sleep using the hyperoxic rebreathing method. The cuff of the tracheostomy tube was inflated and the tube connected to a calibrated and heated pneumotachograph and a one-way rebreather valve (Hans Rudolph, Kansas City, MO) as previously described (17). In brief, end-tidal carbon dioxide tension ( $\text{PETCO}_2$ ) was sampled continuously at the expiratory port and analyzed using an infrared microcapnometer (Columbus Instruments, Columbus, OH). Airflow was measured from a pressure transducer (Validyne Corp., Northridge, CA) connected to the pneumotachograph, and breath-by-breath VT was obtained by analog integration of the flow signal. Physiologic signals were digitally acquired into a MacIntosh PC at 125 Hz sampling frequency using MacLab Digital Acquisition Software (AD Instruments, Castle Hill, Australia), and a peak-trough detection algorithm (Wavemetrics, Lake Oswego, OR) was subsequently applied for calculation of minute ventilation (VE). Ventilatory responses to hypercapnia were expressed as the slope of VE versus  $\text{PETCO}_2$  corrected for body weight and are therefore expressed as ml/min/mm Hg/kg.

Children with CCHS were studied in the sleep laboratory. Studies were performed in a quiet dark room, and no sleep deprivation or sedation was used. The children were accompanied by a parent or legal caretaker who gave his or her informed consent, and the two older children also assented to participate.

Polysomnographic signals were digitally acquired on a computerized polysomnography system (Alice 3; Healthdyne, Marietta, GA), and the following parameters were recorded: electroencephalogram (C3/A2; C4/A1; Cz/Oz); right and left electrooculogram (EOG); submental electromyogram (cEMG); electrocardiogram; chest and abdominal wall motion (piezoelectric transducers); airflow (thermistors) and  $\text{PETCO}_2$  were measured at the tracheostomy by infrared capnometry (SC-300; Pryon, Menomonee Falls, WI); arterial oxygen saturation ( $\text{SaO}_2$ ) by pulse oximetry (Nellcor N-200, Nellcor, Van Nuys, CA), and the



## Rocking Studies, General

oximeter waveform; Transcutaneous PCO<sub>2</sub> (TcPCO<sub>2</sub>) and PO<sub>2</sub> (TcPO<sub>2</sub>) were also monitored throughout the night (Tina 3; Radiometer, Copenhagen, Denmark).

### Protocol

Children were allowed to fall asleep while connected to their mechanical ventilator via a tracheotomy and using their routine ventilator settings. In the two patients in whom mechanical motion of the extremities was also performed, an electrically motorized mechanical device was strapped while the children were awake (see below).

Sleep state was visually monitored on screen, and Stages III-IV of NREM sleep were recognized by the presence of dominant delta wave activity as defined by Rechtschaffen and Kales (18). For infants, sleep was partitioned into quiet sleep (QS), active sleep, and undetermined sleep (19), and both passive motion of the lower extremities (PMLE) and control trials were always performed during QS. Arousals were defined as recommended by the American Sleep Disorders Association Task Force report (20).

When patients entered Stage III-IV of NREM sleep or QS, the ventilator was disconnected, and supplemental oxygen was administered to maintain SaO<sub>2</sub> > 95% at all times. PETCO<sub>2</sub> was allowed to drift upwards until it reached values > 55 mm Hg, at which point in time PMLE was conducted for as long as 3 min, or discontinued if an arousal or a shift to a lower stage of NREM sleep occurred. As control, similar epochs were selected, but no motion was applied to the extremities. At the end of each trial, children were reconnected to the ventilator for at least 5 min. PMLE was performed by one of the investigators, moving the child's feet at the ankle level either manually (46 trials; up- and down-flexion of the foot in a total angle of ~ 45 degrees) or with a hydraulic electrically motorized device strapped to the child's feet prior to lights out (12 trials). The device consisted of a foot platform in which the subject's foot was positioned and strapped with velcro bands. The foot platform was lifted by one of two hydraulic pistons, such that the ankle and the distal portion of each foot would alternatively move upwards or downwards. In both instances, a frequency of > 40 but < 50 strokes/min was adopted as dictated by a light-emitting pacesetter. For control trials, the feet were held by the investigator with no motion being applied. The order of one PMLE and one control trial was randomized. If arousal occurred during any phase of the trial, the data were discarded. All children had at least one PMLE and one control trial for each night. However, because of the variable number nights that each child spent in the sleep laboratory (one to three nights) and the different number of Stage III-IV of NREM sleep epochs, the number of successful PMLE trials for each child ranged from four to 12.

### Data Analysis

Results are presented as mean  $\pm$  SEM. Changes in respiratory rate, PETCO<sub>2</sub>, TcPCO<sub>2</sub> and TcPO<sub>2</sub> were quantitated before and after the onset of the experimental condition (PMLE or control) for at least 30 s. Measurements obtained during manual and mechanical PMLE were initially analyzed separately. Because the responses to manual and mechanical PMLE did not differ, the data were pooled for presentation purposes. Student's paired two-tailed t tests were applied for statistical comparisons of changes occurring within each experimental condition, whereas differences between the two experimental groups were compared by one-way analyses of variance followed by the Newman-Keuls post-hoc test. A p value of < 0.05 was considered to achieve statistical significance.

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Six children with CCHS completed a total of 74 successful trials not associated with EEG changes compatible with arousal or shifts to Stage I-II, over a period of one to three nights. In addition, 16 trials had to be aborted because of EEG or behavioral arousal. The various clinical characteristics for these patients are shown in Table 1. All patients received ventilatory support via tracheostomy and positive pressure mechanical ventilation. All patients exhibited symptoms at or shortly after birth. However, the final diagnosis of CCHS was not reached in some children until several months later (Table 1).

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TABLE 1

CLINICAL CHARACTERISTICS OF SIX CHILDREN WITH CCHS UNDERGOING PASSIVE MOTION OF LOWER EXTREMITIES DURING QUIET SLEEP

An illustrative example of the effect of PMLE on ventilation in a child with CCHS is shown in Figure 1. Indeed, after patients with CCHS were disconnected from mechanical ventilatory support, PETCO<sub>2</sub> gradually increased from  $33.8 \pm 1.4$  to  $58.9 \pm 3.5$  mm Hg ( $p < 0.0001$ ) over a period of 3 to 5 min, and despite the increase in PETCO<sub>2</sub>, there were no discernible changes in ventilation or EEG-defined sleep state. Upon application of PMLE, PETCO<sub>2</sub> decreased to  $40.9 \pm 2.6$  mm Hg in 58 trials ( $p < 0.001$ ), whereas PETCO<sub>2</sub> increased from  $58.8 \pm 3.1$  to  $62.1 \pm 3.7$  mm Hg in the 16 trials in which no passive motion was applied (control versus PMLE:  $p < 0.001$ ) (Figure 2). Similar changes in TcPCO<sub>2</sub> occurred during off-respirator periods and during either PMLE or control periods, thereby confirming PETCO<sub>2</sub> changes. Although no significant changes in oxyhemoglobin saturation by pulse oximetry were apparent during the trials because of concurrent administration of supplemental oxygen, TcPO<sub>2</sub> increased during PMLE, from  $36 \pm 2$  to  $49 \pm 3$  mm Hg ( $p < 0.001$ ). Although tidal volume was not measured, PMLE was associated with substantial increases in respiratory rate, from  $10.2 \pm 1.9$  to  $21.2 \pm 2.7$  breaths/min ( $p < 0.0001$ ) (Figure 2), which lasted throughout the duration of PMLE.

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Figure 1. Representative physiological tracing of a 5-mo-old male infant with central hypoventilation syndrome (CCHS) who was disconnected from his mechanical ventilator and allowed to increase PETCO<sub>2</sub> to ~ 60 mm Hg. Upon initiation of passive motion of lower extremities (PMLE) (as indicated by the arrow), there was a rapid decline in both PETCO<sub>2</sub> and TcPCO<sub>2</sub>, increased TcPO<sub>2</sub> and respiratory frequency, and no changes in EEG or submental EMG activities. TcPCO<sub>2</sub> = transcutaneous carbon dioxide tension; TcPO<sub>2</sub> = transcutaneous oxygen tension; PETCO<sub>2</sub> = end-tidal carbon dioxide tension; Abd = abdominal respiratory excursion; SpO<sub>2</sub> = oxyhemoglobin saturation by pulse oximetry; ECG

= electrocardiogram; cEMG = chin electromyogram; C4A1 and C3A2 = electroencephalogram leads; REOG and LEOG = right and left electrooculogram.

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Figure 2. Individual average changes in PETCO<sub>2</sub> (upper panels) and respiratory frequency (f) (lower panels) from baseline (pre-PMLE or pre-C) and after application of PMLE (solid lines) or control (C) (dashed lines). As an indicator of intraindividual variability in the PMLE response, the standard deviation of Delta pre-PMLE-PMLE ranged from 1.7 to 4.6 mm Hg across subjects.

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In this study, we have shown that passive motion of the extremities in sleeping children with CCHS elicited significant increases in alveolar ventilation as evidenced by reductions in PETCO<sub>2</sub> and TcPCO<sub>2</sub> and increases in respiratory frequency. The improvement in gas exchange lasted for the duration of PMLE.

In a previous study by Paton and coworkers (13), incremental exercise tests were conducted on a treadmill in children with CCHS. At peak exercise, oxygen consumption and VE were lower in CCHS; however, CCHS primarily increased their ventilation by increasing breathing frequency rather than tidal volume. Further, breathing frequency and VE increased proportionately to running frequency in CCHS, suggesting that respiratory entrainment, mechanoreceptor activation, and/or lactate-induced activation of type III/IV fibers in exercising muscle may underlie the ventilatory enhancements associated with exercise (21).

Both animal and human evidence support the concept that passive motion of limbs will induce increased ventilation via spinal afferent pathways (24). To assess whether peripheral neural feedback mechanisms are critical for motion-induced ventilatory responses, Weissman and coworkers (30) used a spinal lesion model in cats, whereas later, Brice and colleagues (31, 32) studied awake humans with clinically complete spinal lesions. Passive movements of lower extremities did not elicit VE increases in the presence of complete spinal lesions (30). Thus, based on the premise that no evidence of spinal lesion or dysfunction is demonstrable in children with CCHS, we performed PMLE during wakefulness, and elicited significant increases in ventilation (12). However, the overall contribution of cortical activity (i.e., the wakefulness drive to breathe) to PMLE-associated ventilatory enhancements could not be determined. The present study performed in Stages 3-4 of NREM sleep would suggest that such cortical contribution is at most minimal, as evidenced by Ishida and colleagues (33), who demonstrated that increases in ventilation elicited by passive limb motion were actually greater in four of five healthy adult subjects tested during Stage 3-4 of NREM sleep.

Earlier observations on the coordination of breathing and movement seemed to support the assumption that synchronization of these two activities would be advantageous to decrease the work of respiratory muscles

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induced by exercise (21, 34) Thus, entrainment of respiration could be a learned behavior to facilitate ventilatory adjustments during transient changes in respiratory requirements. Indeed, unconscious entrainment of respiratory frequency to rhythmical events such as finger tapping (35), music (36), and walking or running (37), is frequently observed in awake humans. On the other hand, body movement could induce vestibular influences on breathing pattern, which would be operative during both awake and sleep states. In 18 premature infants, manual rocking at varying rates between 30 and 60 cycles/min showed coherence spectra  $> 0.85$ , indicative of strong entrainment to rocking in 15 babies (38). Infants born at postconceptional ages  $> 35$  wk exhibited greater coherence to rocking than did more prematurely born infants, indicating that this vestibular-mediated reflex undergoes maturational changes (38). Thus, natural stimulation of rocking in newborns seemed to provide phasic inputs to the respiratory pattern generator that were capable of resetting the oscillatory pattern and entraining the respiratory rhythm (38). Furthermore, the rocking bed method was successfully implemented in adult patients with respiratory failure, and it elicited both increases in oxygen saturation and falls in PCO<sub>2</sub> (39). Notwithstanding the vestibular or visceral contributions to respiratory control by body rocking, it is unlikely that they played any role in our current experiments since the periodic motion applied to the patients with CCHS was restricted to their lower limbs, with no changes in head or body position throughout the trials.

In an interesting study, Ingersoll and Thoman (40) examined the effect of a "breathing" teddy bear on sleep states and regularity of respiration during sleep states in premature infants born at 33 wk gestational age. The bear, which provided a source for optional rhythmic stimulation, was associated with slower and more regular respiration during QS and more QS at 45 wk postconceptional age compared with infants who had a "nonbreathing" bear (40). These findings suggested that the rhythmic stimulation facilitated neurobehavioral development, as well as entrainment from an optional stimulation reflecting one of the infant's own biologic rhythms. It is therefore possible that children with CCHS, who lack central chemosensitivity and display deficient integration of afferent cardiorespiratory inputs, may have "learned" and further developed the locomotor-respiratory interdependencies that promote increased ventilatory outputs during physical activity. Thus, any maneuver that leads to increased mechanoreceptor activity or that will enhance entrainment of a priori separate rhythmicities (i.e., lower limb motion and respiration) could be associated with favorable increases in ventilatory outputs and improved gas homeostasis.

The central coupling between locomotion and respiration was further examined in the decerebrate and paralyzed rabbit preparation (41). In this experimental model, stimulation of the mesencephalic locomotor region evokes locomotor activities as recorded from hindlimb muscle nerves that are rarely coordinated with phrenic inspiratory activity. However, stimulation of the spinal locomotion generator situated caudal to C6-C7 resulted in enhanced coupling of respiratory and locomotor activity during ongoing mesencephalic stimulation (41). When transection was performed at C6-C7 but not at L1 (i.e., when the spinal locomotor centers became isolated from supraspinal regions), the 1/1 evoked locomotor-respiratory coupling was abolished (41). These experiments suggest that either a common supraspinal drive cannot entrain locomotion and respiration or that respiration is entrained at the locomotor rate by the spinal locomotion generators. Thus, extrapolation of such findings to our experiments would support the concept that passive motion of the lower limbs will activate spinal afferent pathways during both wakefulness (12, 13) and sleep (33), which, in turn, will lead to enhanced activation of those regions underlying the central pattern generator of respiration. In this context, the effect of sleep on these spinal reflexes is difficult to assess since these children were not the same children that we previously tested during wakefulness (12). Nevertheless, it is noteworthy pointing out that, in general, sleep exerts substantial attenuation of spinal reflexes and that such reduction is particularly prominent during NREM sleep (42). To what extent this effect of sleep applies to the respiratory system remains to be determined.

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Within the limitations of current knowledge on the basic defect in CCHS, we present novel evidence, which indicates that the dysfunctional brain structures that mediate the abnormal ventilatory response to slowly evolving hypercapnia or hypoxia in CCHS do not disrupt the on-response of reflex ventilatory changes elicited by passive motion during NREM sleep. However, although the ventilatory response to passive motion was present for as long as passive movement was continued, we still do not know whether this mechanism will undergo some form of habituation and therefore will progressively decrease the effect of PMLE on ventilation during sleep. In two trials, PMLE was continued for 15 min and no attenuation of the ventilatory effect was noted (data not shown), suggesting that the effect of PMLE is sustained. However, this issue needs to be critically examined before any definitive conclusion can be drawn. In addition, the impact of CCHS phenotype variability on the magnitude and duration of the PMLE-induced ventilatory response remains undefined. Notwithstanding such shortcomings, PMLE may provide a useful interventional strategy for nocturnal, noninvasive ventilatory support in some children with CCHS.

### Footnotes

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## **Passive Aerobic Exercisers**

Using a Passive Aerobic Exerciser helps improve circulation and cell oxygenation just as aerobic exercise does, but without raising blood pressure or heart rate. Daily use improves the body's metabolism, helps align the spine, stimulates the immune system, releases muscle tension, and gently manipulates the internal organs. Many users report increased energy and rapid relief of stress and tension; also many individuals comment on relief of chronic back or neck pain within a matter of days.

Increased oxygenation of the blood takes place due to lateral flexing of the spine, which stimulates the autonomic nervous system to open the bronchioles. Once there is increased oxygenation, the circulation automatically increases to pick up the additional oxygen.



## Benefits of Passive Aerobic Exercisers

- Better stamina
- Stress Reduction
- Relief from back pain
- Improved lymphatic drainage
- Reduce overall body weight
- More energy, a greater sense of well-being
- Stronger and more limber spine and joints
- Firming and toning of thighs, hips, buttocks
- Sounder and more restful sleep
- Greater ease in getting going in the morning
- Stronger immune system - fewer or no colds
- Alleviation of many stress-related conditions
- Improved circulation of the blood
- Improved function of the internal organs

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Children's Hospital Boston

(article)

<http://www.childrenshospital.org/research/Site2029/mainpageS2029P6sublevel7Flevel11.html>

### Fighting Polio One Step at a Time

Doctors, nurses and physical therapists attacked polio on every possible front. The first step was strict isolation until the patient's fever went down. At Children's, physical therapists went into the isolation units in masks to systematically assess patients' muscles, determining which muscle groups were affected by polio and which were intact and able to compensate. If breathing muscles threatened to be affected, patients would get a trial on the respirator.

Specialized beds such as this Emerson rocking bed help patients breathe. (Photo: Children's Hospital Boston Archives)

Patients with less severe breathing problems used rocking beds, whose up-and-down motion put pressure on the diaphragm, helping them inhale and exhale. Hot packs -- hot steamed blankets -- were used to ease muscle pain; they were pleasant for some, but torture for others. Recovering patients received rehabilitation in Hubbard tubs and hydrotherapy pools, where the lack of gravity allowed them to move their limbs and develop muscle strength. Several orthopedic operations, still used today, were pioneered or perfected at Children's and prevented growing children from developing permanent limb deformities or from having to wear braces. In occupational therapy sessions, patients in braces and crutches practiced getting on and off a bus and crossing the street while a traffic light was still green.

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**(From the web site for a Chi Machine, a device that rocks the lower body)**

Benefits:

1. CELLULAR ACTIVATION. Massage stimulation to the sympathetic nervous system opens up the bronchial to provide maximum oxygen access to the lungs. Simultaneously the blood flow to and from the lungs is increased, enhancing oxygen exchange from the lungs to the blood and therefore to the body cells.
2. SPINAL BALANCING With the body relaxed in the lying position, the massage unit will influence a correction to certain misalignments. Such corrective action can in turn cure or alleviate complications arising in vertebral joints from certain spinal misalignments.
3. IMPROVING THE IMMUNE SYSTEM. These Chi Type Machines stimulate globulin production which increases the immune system's defense capacity, thereby providing greater freedom from disease.
4. BLOOD PRODUCTION. Blood is produced in the spleen and spinal bone marrow. The massager's action on the spine stimulates the sympathetic nervous system which increases spinal 'marrow' blood production. Any form of anemia can be benefited by this massage action.
5. RESTORATION OF BALANCE TO THE AUTONOMIC NERVOUS SYSTEM  
If the parasympathetic and sympathetic nervous systems fail to function properly, insomnia, excessive dreaming, digestive problems, stomach pain, palpitation, anxiety, constipation and many types of aches as well as mental stress may surface. The massager can restore vital balance to the nervous system and alleviate such conditions.
6. EXERCISING INTERNAL ORGANS.  
Western medical science is beginning to consider ancient eastern traditions that focus healing and good health on a life force energy which flows in channels though all living forms. Acupuncture and associated therapies are being increasingly used by western practitioners to 'invigorate' the life force to restore health. The Chinese refer to this energy as 'Chi'. The Chi Type Machine will aid in unblocking the 'Chi' pathways and ensure maximum flow of this healing source through all body organs, thus improving or restoring normal functioning.

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**The UNSPSC Code #42251611 is described as:  
Vestibular motion devices for rehabilitation or therapy.**

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**NOTE: some of the info on the following several pages I found on this rocking chair website. Not sure how to use it – find original sources, rewrite it, or thank them for posting it. However, he actually found some of it on my site, and did not thank me, so there's that.**

**<http://www.rockingchairtherapy.org/research.html>**

Research from the Columbia Hospital in Milwaukee, Wisconsin resulted in an article in the "American Journal of Sports Medicine", March-April 1989 titled "Seniors ROCKING TO GOOD HEALTH" detailing the benefits of rocking to older Americans. It is good for the mind, body and spirit and even can help those with an otherwise sedentary lifestyle to achieve muscle tone through the manageable, non-weight bearing exercise of rocking in a rocking chair.

Later, studies at the University of Rochester, Rochester, New York using Rocking Chair Therapy with Alzheimer and Dementia patients. Their research showed that seniors could literally rock away their anxiety and depression. The patients required less medication and their balance improved as well. Further benefits included a happier nursing home staff. Families of rocking seniors were happier because their loved ones were happier. Isn't it interesting that this research showed that one intervention (rocking) produced six benefits, and effected many people in a positive way?

**Our exploration into Rocking Chair Therapy was prompted by a phone call from teacher Ken Rubin. He informed us that our #7 rocker is helping students with ADD and ADHD to better adapt and focus in the learning environment.** We've heard more about this since we started this journey. It seems the motion of the rocking chair can accommodate the need to keep moving while these students are studying, listening, etc. We have asked the department of exceptional children in Iredell-Statesville Schools and the Georgetown School District (both in North Carolina) to place the #7 rocker in their classrooms and we are receiving positive feedback from their experiences thus far.

*ANS* - In the 1970's rebound exercise **such as rocking and bouncing** was studied by NASA scientists in regard to astronauts returning to earth from low-earth orbit. After six months their autonomic nervous systems lost their capacity to stand in a gravitational field. The astronauts had to be dragged out of the space capsule horizontally because they would faint upon standing. They were experiencing a disautonomic condition which is similar to what CFS (Chronic Fatigue Syndrome) patients experience. So what did NASA determine as the most effective procedure to bring back the livelihood of the astronauts autonomic nervous systems? Well, it was to bounce and rock them.

*CFS* - Recognizing NASA's rocking results, **it was later determined that rocking was also the best solution for CFS patients.** Rocking provides easy, non-weight bearing, rhythmic motion and does a very important job in autonomic tone for a population that has difficulty accomplishing exercise.

***Cesarean Section Recovery* - In an article in the "Physical Therapy Review" 40:818, 1960; a study of women who had cesarean sections showed a faster recovery if they spent an hour a day rocking.**

A follow-up study in Galveston, Texas in December of 1990 followed women who had cesarean sections and showed that rocking mothers had less gas pains, walked faster, and left the hospital one day sooner than non-rocking mothers. This article was published in the "Journal of Prenatal Nursing" on December 24, December 1990. Hmm. Could that be why rockers are a standard in maternity wards today?

***Knee Surgery Recovery*** - Orthopedic surgeons have long recommended rocking to those who are re-cooperating from knee replacement surgery.

### **Pregnancy & Delivery**

We are all familiar with the theories and results of using cradles and rockers to calm babies and ease them off to sleep. We have run across research proposing that the rocking of babies by their mothers is not only soothing, but crucial in the bonding process between mother and child.

*Prenatal Benefits* - At the Department of Obstetrics and Gynecology at the Hua Chiew Hospital in Bangkok, Thailand, authors Panthuraamphorn C. Dookchitra D., and Sanmaneechai M. composed a study and compiled their findings in a book "Effects of Prenatal Tactile and Vestibular Enrichment on Human Development". Their purpose was to investigate the influence of prenatal tactile and vestibular intervention on an infant's social, emotional and motor development and to evaluate maternal-child attachment after participation in the prenatal activity. One hundred and twenty women in the study were trained to stroke their abdomen, pat rhythmically on the fetus' bottom and rock themselves in a rocking chair 10-15 minutes each

## Rocking Studies, General

day throughout their pregnancy. Anne Ayres, an American nerve psychologist, recommends that at the start of the 10th week of pregnancy, women should rock 5 to 10 minutes twice a day. Her belief is that rocking promotes the development of the fetal nervous system.

*Infancy and Child Development* - The infant's developmental outcomes were evaluated by the Denver Developmental Test in terms of social, emotional and motor development. The mother-child attachment and the calming effect on infant were assessed and evaluated as well. The infant's responses to stimuli were also analyzed. The participating infants stopped crying and showed calming effects when rhythmic patting and rocking were applied. They also had a capacity of conditioned learning by kicking back in response. The enriched infants smile, hold their heads up and sit and stand earlier than the control group. They also showed good emotion and better performance in mother-child attachment. The findings in this study suggest that infants have an ability to learn in utero and that the prenatal tactile sensation (rocking) vestibular enrichment may be an effective way to promote an infant's social, emotional and motor development. Numerous articles in "Mothering" magazine extol the benefits of rocking for mother and child. Rocking soothes fussy babies and relaxes mothers. It stimulates the balance mechanism of the inner ear. It assists an infant's biological development and ability to be alert and attentive.

At the University of Waikato in New Zealand rocking stimulation has been shown to be beneficial for premature babies in reducing apnea

*Labor, Delivery and Recovery* - Lamaze International advocates that moving freely in labor improves a woman's sense of control and decreases her need for pain medication. In choosing a care provider one of the things they suggest in the birthing room is a rocking chair.

*Cesarean Section Recovery* - In an article in the "Physical Therapy Review" 40:818, 1960; a study of women who had cesarean sections showed a faster recovery if they spent an hour a day rocking. A follow-up study in Galveston, Texas in December of 1990 followed women who had cesarean sections and showed that rocking mothers had less gas pains, walked faster, and left the hospital one day sooner than non-rocking mothers. This article was published in the "Journal of Prenatal Nursing" on December 24, December 1990. Hmm. Could that be why rockers are a standard in maternity wards today?

*Post Partum Weight Loss* - Also, good news for post partum weight loss: rocking burns about 150 calories an hour and will help mothers recover more rapidly from the experience of childbirth (also from "Mothering" magazine).

### **Sensorial, autism, etc:**

*Sensory Integration (SI)* - SI is the ability to take in information through your physical senses (touch, movement, smell, taste, vision, and hearing) and put it together with prior information (stored) and make a meaningful response.

*Sensory Integrative Dysfunction (SID)* - SID is a disorder in which sensory input is not integrated or organized appropriately in the brain. Main symptoms of SID look like symptoms of other disabilities that include Fragile X, ADHD, ADD, Autism, Pervasive Development Disorder (PDD), and Tourette Syndrome.

*Sensory Integration Therapy (SIT)* - SIT is a theory used by occupational therapists. It is one approach used by therapists as part of a comprehensive and individualized intervention program. Its principles have been recommended for and applied to autism learning disabilities, attention problems, and developmental problems like Fragile X. Rocking in a rocking chair is one of the calming activities that are recommended. Sensory integration intervention is based on a neurophysiological view of autism. The late A. Jean Ayres, Ph.D. of the US developed the theory and practice of sensory integration. She believed every autistic child should have a rocker in his room.

*Fragile X* - Fragile X is a family of genetic conditions which impacts individuals and families in different ways. Fragile X Syndrome is the most common form of inherited mental impairment and is sometimes referred to as Mental Retardation. Sensory impairment or sensory processing difficulties are often a part of the puzzle. Rocking in a rocking chair is a recommended part of therapy, cited for its calming effects.

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In September of 2006, The American Library Association offered a workshop at their annual conference entitled "Welcoming Special Needs Children at Your Library". Lindsey Biel OCR/L, presenter and co-author of Raising a Sensory Smart Child suggests incorporating rocking chairs into the environment for it's soothing and repetitive motion for children with a range of disorders.

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### Varicose Veins

There is research on the use of rocking to stimulate circulation, improve muscle tone, and to help prevent and cure varicose veins. Many pregnancy support articles and web sites recommend rocking in a rocking chair to prevent the development of varicose veins.

### Vestibular Function and SIDS (Sudden Infant Death Syndrome)

*Vestibular Function* - The vestibular system helps the body maintain its "postural equilibrium". It relates to or effects the perception of body position and movement and is essential in coordinating the position of the head and the movement of the eyes. The vestibular system resides in the inner ear.

*Dreams and VF* - An article by Kenneth Leslie and Robert Ogilive titled "Vestibular Dreams: The Effect of Rocking on Dream Mentation" describes a rocking time interaction; rocking increased lucid mentation during early morning REM periods. These results suggest that vestibular activation during REM sleep can influence dream mentation; specifically dream self-reflectiveness and vestibular imagery. This article appeared in *Dreaming: Journal of the Association for the Study of Dreams*. Vol. 6 (1) 1-16 Mar. 1996.

*SIDS and VF* - At the University of Waikato in New Zealand there have been studies relating vestibular function to SIDS (Sudden Infant Death Syndrome). Rocking stimulation has been shown to be beneficial for premature babies in reducing apnea.

### SIDS - Sudden Infant Death Syndrome

At the University of Waikato in New Zealand there have been studies relating vestibular function to SIDS (Sudden Infant Death Syndrome). Rocking stimulation has been shown to be beneficial for premature babies in reducing apnea.

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## **The Development Benefits of Rocking a Baby**

Rocking your baby can be one of the most enjoyable activities of being a new parent. You and your baby can enjoy the person-to-person contact that rocking provides. The motion of rocking your baby has developmental benefits as well, which help foster healthy growth, according to Megan Faure and Ann Richardson, authors of "Baby Sense: Understanding Your Baby's Secret World."

## **Fosters Motor Development**

According to Faure and Richardson, the movement your baby feels when you rock her is laying the foundation for future motor development. As your baby feels the gentle rocking motion of your movements, she is beginning to become more aware of her body as well as how your body works to soothe her. Over time, this awareness will allow your baby to begin moving her own body in new and more advanced ways. Your baby is also likely to learn coordination by being rocked on a regular basis, which will enable her to control the movements she makes using her whole body as well as the individual parts of her body.

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## **Relaxes Baby's Heartbeat**

Rocking soothes and comforts your baby when he is upset, tired or uncomfortable, writes Linda Folden Palmer, author of "The Baby Bond: The New Science Behind What's Really Important When Caring for Your Baby." When you rock your baby, his breathing regulates and his heartbeat slows, so he is able to relax, calm down or fall asleep. Palmer goes on to write that daily rocking can also regulate your baby's sleep patterns so he is able to fall asleep quickly and stay asleep longer. Sufficient sleep is essential for healthy development because much of your baby's brain growth occurs when he is sleeping.

## **Increases Neurological Development**

Babies who are rocked on a regular basis may have improved neurological function and higher scores on mental development tests, reports Palmer. When areas of your baby's brain are not stimulated, brain cells can become weakened and die. If you rock your baby, you will stimulate various areas of her brain, which fosters mental development and increases alertness when your baby is awake. Daily rocking can also promote defensive reflexes that your baby will need as she grows older. Rocking can also improve your baby's response to sounds and sights, so she can process the world around her as she grows and develops.

Read more: <http://www.livestrong.com/article/224277-the-development-benefits-of-rocking-a-baby/#ixzz14ZSyHxfM>

Read more: <http://www.livestrong.com/article/224277-the-development-benefits-of-rocking-a-baby/#ixzz14ZSnp2ct>

Without a doubt, we live in a high-tech world. It seems a new gadget for promoting better health comes along every day, but according to Life Span, a simple rocking chair can improve your health and increase overall well-being.

## **Increased Well-Being of Dementia Patients**

Rocking Chair Therapy reports that a study conducted at the University of Rochester reveals an increase in the psychological well-being of nursing home residents with severe forms of dementia. The study suggests rocking causes a release of endorphins that elevates the mood of dementia patients, in addition to relieving pain.

## **Decreased Need For Medications**

Nancy Watson, director of Center for Clinical Research on Aging, explains that rocking causes a reduction in anxiety and depression among seniors. Watson reported a decreased need for anxiety and depression medication in those who she observed.

## **Increased Balance**

The motion of rocking stimulates the body to maintain balance, resulting in greater balance capabilities. Greater balance is especially useful in older individuals, who face an increased risk of injury by falling.

## Improved Muscle Tone

Rocking provides a way to tone the leg muscles of those who cannot tolerate weight-bearing exercise. Rocking brings a safe activity to people who live an otherwise sedentary lifestyle.

## Sooths Colic Symptoms

Rocking mimics the movement the baby felt inside the mother's womb. Rocking a baby who suffers from colic reduces crying episodes and promotes sleep. Rocking also might promote restful sleep in babies not diagnosed with colic disorder.

Read more: <http://www.livestrong.com/article/146843-what-are-the-health-benefits-of-a-rocking-chair/#ixzz14ZTOiZwf>

Read more: <http://www.livestrong.com/article/146843-what-are-the-health-benefits-of-a-rocking-chair/#ixzz14ZTDdN1B>

<http://becausebabiesgrowup.blogspot.com/2009/05/physical-friday-benefits-of-rocking.html>

What I find more fascinating is that mothers **unknowingly** rock their babies as fast (or as slowly) as they walk. And yet, that is precisely the most calming speed for their babies. Which also explains why mothers seem to have "a knack" for calming their babies faster than anyone else. I can't tell you how many times I've refrained from offering to take a crying baby. I'm pretty good with my own kids, usually, but that doesn't mean I'm a super-comforter!

**The second tangent about rocking showed how rocking is important and necessary for baby's development. The rocking motion helps a baby organize the [vestibular system](#) which controls equilibrium, or balance.**

As a baby is rocked, the fluids in the inner ear move around which triggers the vestibular system to action. While the baby is calmed and rocked to sleep, this system is hard at work practicing communicating to the brain all the information gathered about the baby's balance.

<http://www.currenthealtharticles.net/the-benefits-of-rocking-chair-therapy/>

Lately, the medical community has produced reports on various studies about the health benefits of rocking chairs. These studies are showing that hours of rocking can help all kinds of medical issues; even to the extent of assisting people who suffer from different kinds of diseases. This scientific look at rocking therapy is finding interesting results that may confirm old-wise tales of health benefits from a rocker. Case studies performed by the Medical College of Virginia have resulted in information that says 'kinetic therapy' (the constant, gentle motion of rocking) can drastically speed healing in severely ill patients. Illnesses such as heart attacks, strokes, and the common flu have been cured or dramatically reduced by the constant rocking motion. The old-fashioned rocker has been known to help reduce recovery time with surgery patients, heal arthritis, and calm children who suffer from ADHD and ADD.

For many years, orthopedic surgeons have suggested rocking to everyone who is recovering from knee replacement surgery. It is said that regular rocking activity can create natural rhythm within the human body that produces powers of regeneration and recuperation in post-surgery patients.



## Rocking Studies, General

Arthritis patients that use rocking as a deterrent to the pain in all of their joints have often been able to free themselves of the constant arthritic pain. It has been reported that people who have been condemned to the bed have freed themselves by rocking for several hours per day.

Kinesthetic methods are becoming popular when dealing with kids that are diagnosed with ADHD/ADD because of what the rocking motion does to soothe anxiety. Just as an infant is calmed by the rocking movement, children with anxiety and hyper issues are calmed by the [childs rocking chair](#).

Therapy utilizing various [childrens rocking chairs](#), has helped calm and heal children with various anxiety diseases. These rockers also assist people with post-surgery rehabilitation and those who suffer from arthritis. Why not get into a rocker today and let the healing begin?

[http://www.ehow.com/list\\_7236554\\_advantages-rocking-chair.html](http://www.ehow.com/list_7236554_advantages-rocking-chair.html)

□ The Rocking Chair Therapy, Fine Woodworker, Childs Rocking Chair and Rocking Chair Zone [websites](#), the Journal of Perinatal and Neonatal Nursing, and the International Cesarean Awareness Network all assert rocking chairs have [health](#) benefits. Rocking chairs provide light to moderate [exercise](#) even for those who have limited mobility. Specifically, rocking works the muscles and tendons of the thighs, lower legs and ankles. This may help keep you more fit or to maintain or lose a small amount of weight. Additionally, even five to 10 minutes of rocking per day may reduce blood pressure and improve circulation. Rocking in a rocking chair also has been shown to reduce the impact of diseases like arthritis, probably because the increased blood flow provides more oxygen to joints and the relaxation that results positively impacts the immune system. Rocking also may promote prenatal nervous system development and promote healing after surgery. Pregnant women may find rocking chairs especially beneficial because the chairs provide back [support](#) and often have matching stools that let the mom-to-be put her feet up and reduce swelling.

### **Concentration**

□ The American Journal of Alzheimer's Disease, Lindsey Biel (author of "Raising a Sensory Smart Child") and the Rocking Chair Therapy and Rocking Chair Zone websites indicate that rocking has been linked to improved sensory disorders such as autism. Researchers believe that the motion of rocking satisfies the autistic individual's need to keep moving while allowing them to concentrate and [study](#). Rocking chairs also may improve cognitive conditions like Alzheimer's disease.

### **Sleep**

□ In the womb, babies are lulled to sleep by the natural movement of the mother's body. Rocking chairs re-create some of this natural movement and help newborns to relax. This helps in getting the babies to sleep and reduces the odds of apnea and Sudden Infant Death Syndrome (SIDS), according to T. Farrimond of the University of Waikato and the Rocking Chair Therapy website. Rocking chairs may release tension in adults that makes sleep difficult, as well.

### **Reduced Anxiety**

□ Rocking chairs are effective in relieving tension and anxiety, as shown by the Rocking Chair Therapy and Rocking Chair Zone websites. Although rocking chairs of course cannot eliminate stress completely from your daily life, they may improve quality of living by rejuvenating your mind.

Read more: [The Advantages of a Rocking Chair | eHow.com](#)

[http://www.ehow.com/list\\_7236554\\_advantages-rocking-chair.html#ixzz14ZVNBZjD](http://www.ehow.com/list_7236554_advantages-rocking-chair.html#ixzz14ZVNBZjD)

<http://www.finewoodworker.com/rockingchairbenefits.html>

### **Benefits of Rocking**



## Rocking Studies, General

Science has proven that a rocking motion has a therapeutic effect on humans. When rocking in a rocking chair the blood pressure falls and respiration slows. The physical act of rocking taps into a pleasure center located in the brain somewhere between the one for chocolate and the one for music.

The record for the longest period without sleep is 18 days, 21 hours, 40 minutes during a rocking chair marathon. The record holder reported hallucinations, paranoia, blurred vision, slurred speech and memory and concentration lapses.

The 1989 Exxon Valdez oil spill off Alaska, the Challenger space shuttle disaster and the Chernobyl nuclear accident have all been attributed to human errors in which sleep-deprivation played a role.

- The NHTSA estimates fatigue is involved in one in 6 fatal road accidents.

Feeling tired can feel normal after a short time. Those deliberately deprived of sleep for research initially noticed greatly the effects on their alertness, mood and physical performance, but the awareness dropped off after the first few days.

Feeling tired can feel normal after a short time. Those deliberately deprived of sleep for research initially noticed greatly the effects on their alertness, mood and physical performance, but the awareness dropped off after the first few days.

As a group, 18 to 24 year-olds deprived of sleep suffer more from impaired performance than older adults.

The extra-hour of sleep received when clocks are put back at the start of daylight in Canada has been found to coincide with a fall in the number of road accidents.

Anuntasree et al 2007 thai study.

### **Premature babies who experience the rocking motion similar to that which is natural while in the womb develop faster in many ways, including muscle tone, strength of grasping and weight gain.**

“Studies on the effects of rocking on human infants indicate their considerable benefits. Neal studied the effects of rocking on two- to three-month prematures. These were rocked for the number of days they were premature, and it was found that the rocked prematures were significantly superior to the nonrocked prematures in the development of tracking behavior to visual and auditory stimulation, head lifting, crawling, muscle tone, strength of grasping, and weight gain. In addition no edema ever developed in the rocked prematures, whereas it did in some of the nonrocked ones. Ms. Neal suggests that rocking stimulation provided by the mother during pregnancy constitutes an important sensory input for normal development, and that prematures are unduly handicapped, following deprivation stimulation, by their premature birth.”

**“Woodcock observed the effects of rocking newborn female babies in a mechanical bassinet for one hour a day for six days. On the sixth day they were tested for heart-rate and acceleration responses in the rocked infants suggest an increased maturational development.”**

**“A fascinating account of the serendipitous discovery of the benefits of rocking for seriously disturbed mental patients is reported by Dr. Joseph C. Solomon. Dr. Solomon observed that patients taken from their rooms in hospital for transfer to another town by train, though they had earlier needed to be restrained in straitjackets and muffs, became very quiet and calm as soon as the train was in motion.**

Solomon reasoned that, since in the womb the child is subjected to considerable passive motion, part of the human contact these patients may have missed as children was the active rocking in the mother’s arms which would, among other things, stimulate the vestibular apparatus. Purposive active motions, Solomon suggests,

develop with facility and pleasure when the passive motion imparted by the mother has been satisfactorily internalized as an integrated inner function."

"Conversely, when there is little chance for the internalization of the passive movements derived from the mother, the active rocking becomes a habitual device for self-containment. It is a method of defending the formative ego against the feeling of being abandoned. This follows the principle of Newton's Second Law. If you actively push against something, it is as though something is pushing against you. In this way the infant accomplishes the goal of not feeling completely alone. It is as though somebody is always there. As such it is another self-containment device similar to thumbsucking, the security-blanket, nail-biting...[etc]." (160-161)

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## From [American Journal of Critical Care](#) **Rotational Bed Therapy to Prevent and Treat Respiratory Complications: A Review and Meta-Analysis**

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[Authors and Disclosures](#)

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<http://www.medscape.com/viewarticle/550481>

### **Abstract and Introduction**

#### **Abstract**

**Background:** Immobility is associated with complications involving many body systems.

**Objective:** To review the effect of rotational therapy (use of therapeutic surfaces that turn on their longitudinal axes) on prevention and/or treatment of respiratory complications in critically ill patients.

**Methods:** Published articles evaluating prophylaxis and/or treatment were reviewed. Prospective randomized controlled trials were assessed for quality and included in meta-analyses.

**Results:** A literature search yielded 15 nonrandomized, uncontrolled, or retrospective studies. Twenty prospective randomized controlled trials on rotational therapy were published between 1987 and 2004. Various types of beds were studied, but few details on the rotational parameters were reported. The usual control was manual turning of patients by nurses every 2 hours. One animal investigation and 12 clinical trials addressed the effectiveness of rotational therapy in preventing respiratory complications. Significant benefits were reported in the animal study and 4 of the trials. Significant benefits to patients were reported in 2 of another 4 studies focused on treatment of established complications. Researchers have examined the effects of rotational therapy on mucus transport, intrapulmonary shunt, hemodynamic effects, urine output, and intracranial pressure. Little convincing evidence is available, however, on the most effective rotation parameters (eg, degree, pause time, and amount of time per day). Meta-analysis suggests that rotational therapy decreases the incidence of pneumonia but has no effect on duration of mechanical ventilation, number of days in intensive care, or hospital mortality.

**Conclusions:** Rotational therapy may be useful for preventing and treating respiratory complications in selected critically ill patients receiving mechanical ventilation.

#### **Introduction**

The use of positioning therapy has been advocated for the management of respiratory conditions in critically ill patients.<sup>[1-4]</sup> This review is focused on a method of positioning patients that uses a programmable bed that turns on its longitudinal axes, intermittently or continuously, with the aim of preventing and/or treating respiratory complications in critically ill patients. The generic term commonly used for this therapy is

*continuous lateral rotation*. If the degree of turn is 40° or greater to one side (80° total arc), the treatment may be referred to as *Kinetic Therapy*. Kinetic Therapy is a trademarked term and has been supported by the Centers for Disease Control and Prevention as a measurable method of turning patients. The terms continuous lateral rotation and Kinetic Therapy are often loosely used in a similar context. The rotation of the patient on a bed is hypothesized to improve drainage of secretions within the lung and lower airways, to increase functional residual capacity by providing an increased critical opening pressure to the independent lung, and to reduce the risk of venous thrombosis and associated pulmonary embolism.<sup>[5]</sup>

**It has long been recognized that immobility is associated with complications involving many body systems<sup>[6-13]</sup> ( [Table 1](#) ). Rotational therapy may be effective in treating and preventing many of these complications;**

however, this review is limited to a discussion of the role of rotational therapy with respect to respiratory complications.

Respiratory complications experienced by patients in an intensive care unit (ICU) include ventilator-associated pneumonia (VAP), atelectasis, and acute respiratory distress syndrome (ARDS). Patients with VAP may spend longer in the ICU and have a higher mortality rate than patients without VAP.<sup>[14]</sup> Guidelines for the prevention of pneumonia advocate a range of interventions that may be organizational, pharmacological, or physical.<sup>[15-17]</sup> ARDS is associated with high morbidity and mortality.<sup>[18]</sup> Current best practice is focused on ventilatory strategies to protect the lung.<sup>[19]</sup> Rotation of patients on therapeutic beds is one of the interventions that may be useful in preventing and treating these respiratory complications.

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## **CPM Creating an ideal environment for repair** (10 pages)

### Summary

**Studies of passive motion have shown to be beneficial to different aspects of repair, particularly, in acute musculoskeletal conditions.**

Over the last two decades the importance of passive motion has come to light by the extensive research into the effects of passive motion on repair processes in the musculoskeletal system. There are several physiological mechanisms by which passive motion may be clinically useful:

1. Improving the quality of repair
2. Improving the rate of repair
3. Improving drainage of oedema following tissue damage
4. Reducing overall pain

The significant therapeutic effects of passive motion on tissue repair have been shown in connective tissue, joints and muscle.

[Connective tissue: the importance of movement](#)

## Rocking Studies, General

There is a strong body of evidence to support the view that periodic, moderate stress is essential for connective tissue nutrition, homeostasis and repair.<sup>1-6</sup> In many of the studies remobilization was introduced with passive movement.<sup>7-16</sup> Moderate active movement has also been shown to be beneficial in assisting tissue recovery following an injury and immobilization.<sup>2,17-22</sup>

These studies provide us with important general directions as to the use of passive motion or/and exercise in treating connective tissue damage.

**Connective tissue matrix** - Movement encourages the normal turnover of collagen and its alignment along the lines of mechanical stress. This provides the tissue with better tensile properties. Movement improves the balance of GAGs and water content within the tissue which helps maintain the inter-fibril distance and lubrication. This reduces the potential for abnormal cross-links formation and adhesion. In avascular structures, such as cartilage, ligaments and tendons, periodic stress provides a pumping effect for the flow of interstitial fluid. This may support the increased metabolic needs of the tissue during inflammation and repair.<sup>1,23</sup> Another important effect of early movement could be in preventing the secondary damage of the connective tissue matrix by distention from oedema. Movement within the pain-free range and low loading force may help drain the fluid build up and reduce distention.

**Ligaments** - Passive motion has been shown to stimulate various aspects of repair in ligaments. If a knee is mobilized soon after injury, the ligaments show higher strength and stiffness compared with immobilized ligaments (providing that the joint movements are not excessive and scar formation is not disturbed).<sup>24,25</sup> Similarly, the strength of repair ligaments has been shown to be greater in animals that were allowed to exercise.<sup>26</sup>

**Tendons** – After surgery, tendons that undergo mobilization have a higher tensile strength and rupture less often than immobilized tendons.<sup>27-31</sup> Early mobilization of an injured tendon reduces the proliferation of fibrous tissue and reduces the formation of adhesions between the tendon and its sheath.<sup>32,33</sup> Animal experiments have shown that tendons undergoing early mobilization are stronger than immobilized tendons. For example in one such study it was demonstrated that when the tendon was mobilized at 12 weeks post-operation, the angular rotation of the joint was 19% of the full range of movement. Mobilization delayed until after 3 weeks post-operation produced an angular rotation of 67%, while the early mobilization within a five days of surgery resulted in angular rotation of 95%.<sup>27</sup> The total DNA and cellularity content of mobilized tendons at the repair site were significantly higher than was found in immobilized tendons.<sup>34</sup> Increased DNA and cellularity signifies an accelerated tendon repair and maturation. Motion also stimulated the reorientation and revascularization of the blood vessels at the site of repair in a more normal pattern, which are well adapted to withstand the mechanical forces imposed on the tissue.

**Skin** - Wound repair in skin has also been shown to be affected by passive motion.<sup>35,36</sup> Mechanically stressed scars being much stronger and stiffer than unstressed scars. The mechanical properties of a scar closely resemble those of normal skin, the collagen fibres developing in a biaxial orientation. The cosmetic appearance of a scar healed under mechanical loading is greatly superior to that of unstressed scar.<sup>36-39</sup>  
Importance of movement to joints

Articular cartilage homeostasis and repair, synovial fluid formation and flow and the connective tissue supporting the joints are all structures and processes responsive to mechanical stimulation.<sup>40</sup> These

structures and processes respond to particular forms of mechanical events indicating that Harmonic Technique could be potent therapeutic tool in treating various joint pathologies.<sup>40,41</sup>

### Trans-synovial pump

**Some of the positive responses in joint repair seen in rhythmic passive approaches could be attributed to the activation of a physiological mechanism called the *trans-synovial pump*.**

This pump facilitates the formation and drainage of synovial fluid in the joint and is activated by movement (passive or active). The pump has three elements to it all stimulated by movement; a fluctuating intra-articular pressure,<sup>42</sup> an increased synovial blood flow and facilitated drainage into the lymphatics.<sup>40</sup> An increase in the intra-articular pressure produces an outflow, while a decrease in intra-articular pressure and increasing the influx into the joint cavity.<sup>43,44</sup> Another important part of the trans-synovial pump is the effect of movement on the periarticular vascular and lymphatic flow.<sup>43</sup> On one end of the pump movement causes increased blood flow around the synovium (which important for the formation of synovial fluid) and on the other end of the system it stimulate drainage into the interstitial spaces (lymphatic system).<sup>45,46</sup>

The pattern of pressure may vary on whether the joint is moved actively or passively. In the human knee, during passive motion the pressure in the knee tends to remain under negative pressure. It only rises at extreme flexion and extension. During active movement the overall pressure in the joint increases but the patterns remains similar to the one observed during passive movement.<sup>47</sup> It suggests that application of passive movement may be less stressful to the swollen synovium and capsule of inflamed and effused joints and therefore more appropriate in the treatment of acute joint injuries, in particular, in conditions where the patient is unable to initiate movement due to force losses of pain.

### Cartilage nutrition

Articular cartilage has no direct supply route from the underlying bone and the nutrition and viability of the chondrocytes are totally dependent on synovial fluid.<sup>48</sup> The supply of nutrients to the cartilage is partly by diffusion and partly by hydrokinetic transport. Furthermore, movement produces smearing and agitation of the synovial fluid on the cartilage surface which aids this transport.<sup>49-52</sup>

Nutritional transport to the articular cartilage occurs over a relatively long distance. Different joint pathologies that alter the structure and function of the synovial membrane and the capsule will impede this transport.<sup>53</sup> For example joint effusion may result in synovial membrane ischaemia.<sup>54</sup> This could lead to damage and death of the chondrocytes and the subsequent degeneration of the articular cartilage.

### Joint injuries and immobilization

Joint injuries can vary from mild sprains causing minor damage to the synovial lining, capsular and ligamentous structures to more severe articular surface damage. The damage to any of these joint structures will initiate a repair process which is similar to the one described above in connective tissue.

The inflamed synovial lining follows a similar history of repair described above in connective tissue. Some important consideration for passive motion therapy is that the inflamed joint is usually hypoxic and acidotic. This is due to several factors; a high synovial metabolic rate, reduced synovial capillary density, capillary "burial" under thickened synovial lining, and in the end stages, a chronically reduced blood flow. The inflamed synovial linings will also demonstrate villus projection encroaching on the joint space.<sup>46,55</sup>

These areas of the inflamed synovium may be crushed by excessive movement further aggravating the inflammation. In particular if this movement is active (active movement imposes greater stresses on joints).

Further complications to simple injuries can be the lack of mechanical stimulation brought about by inactivity or immobilization of the joint. In essence, joints being designed to be mobile and under repetitive mechanical stress are therefore very sensitive to immobility. The effects of immobility are usually quite extensive resulting in atrophy of the capsule, ligaments, synovial membrane and articular cartilage. Adhesions and abnormal cross-links can develop fairly rapidly after the onset of immobility resulting in reduced overall movement of the joint.

The synovial tissue of immobilized joints seems to be the most sensitive to the effects of immobilization. The synovial membrane in the immobilized joints undergoes fibrofatty changes. The resultant fibrofatty tissue proliferates into all the articular soft tissues, for example in the knee, into the cruciate ligament and the undersurface of the quadriceps tendon. With the passage of time, fibrofatty changes will proliferate to cover the non-articulating area of cartilage, with the subsequent formation of adhesions between the two surfaces as the fibrofatty tissue matures. The proliferation of fibrofatty tissue and adhesion formation has been shown to occur as early as 15 days after immobilization, becoming well established after 30 days.<sup>56,57</sup> These changes have been shown to occur in experimental animals as well as in human spine and knee joints.<sup>36-59</sup> In the knee, similar but less extensive changes have been observed in subjects with damage to the anterior cruciate ligament. Adhesion formation and fibrosis have been found between the patellar fat pad and the synovium adjacent to the damaged ligament.<sup>59</sup>

The chondrocytes are highly sensitive to compressive loading for normal homeostasis of the articular cartilage.<sup>15,18-22,60-62</sup> Immobilization has a deleterious affects resulting in reduction of GAGs thinning and softening of the articular cartilage. This degrades the mechanical strength of cartilage. Furthermore the chondrocytes are totally dependent on synovial fluid for their nutrition. As the synovial membrane progressively atrophies, there may be a decrease in nutrition and gradual destruction of the articular cartilage. Indeed, in animal studies the contents of synovial fluid itself were shown to be negatively effected by immobilization (these changes were normalized by remobilization).<sup>63</sup>

Other complications of joint injury may be brought about by joint effusion. Above a critical effusion pressure, there may be an impairment of synovial blood flow.<sup>54,64-66</sup> This could impede the normal functioning of the trans-synovial pump reducing the movement of nutrients and metabolic waste products through the joint cavity. For example, it has been shown in osteoarthritic knees that increased intra-articular pressure reduces synovial blood flow, which may contribute to joint anoxia and cartilage damage in chronic arthritis.<sup>67,68</sup>

#### Joints: the importance of movement

The introduction of movement at an early stage after injury can help protect the joint against many of the changes described above as well as reversing some of these changes. The effects of passive motion can be observed in several areas:

- Range of movement/joint stiffness
- Quality of repair
- Pain levels and pain medication
- Return to normal activity

#### Range of movement/joint stiffness

Initially, the most common cause for joint stiffness and a reduced range is intraarticular swelling (edema and blood), periarticular swelling and later adhesion of the different joint structures.<sup>69</sup> Early mobilization with CPM could help reduce joint swelling by activating the trans-synovial pump and draining the edematous periarticular structures. Early passive movement was shown to increase the rate of improvement in range after joint injury or surgery.<sup>70-74</sup>

Passive motion has been shown to facilitate the transport of synovial fluid contents by activating the trans-synovial pump. When a tracer substance was used to study the nutrition of the anterior cruciate ligament under conditions of passive motion and immobilization, it was found that in the mobilized knees, the clearance rate of the tracer was so rapid that it did not have sufficient time to diffuse into the intracapsular structures.<sup>75</sup> Other studies have shown the benefits of passive motion in reducing haemarthrosis.<sup>76</sup> After 1 week of treatment with passive motion, there was a significant decrease in the amount of blood in the mobilized, compared with the immobilized. Passive motion was shown also to affect the outcome of septic arthritis, leading to less damage of the articular cartilage.<sup>77</sup> This was attributed to the effective removal of the damaging lysosomal enzymes by accelerated clearance rate.

Activating the trans-synovial pump could be also important in inflamed joints where there is an increased in synovial fluid volume and pressure (a common cause for the sensations of tension, pain and limitation of movement). Passive or low stress active motion of joints may help to reduce effusion and facilitate the rate of repair.<sup>78,79</sup> It was shown in swollen knees that the clearance rate in the knee joint was increase with dynamic (active movement in this study) cyclical activities such as cycling and walking.<sup>79</sup> Passive cycles of flexion and extension of the spine have been shown to produce pressure fluctuations within the facet joints.<sup>80</sup> When saline was injected into the facet joint artificially to increase intra-articular pressure (as if the joint is effused), cycles of active and passive motion caused a drop in this pressure. This effect was greater when the movement was specific to the effused joint.

Apart from activating the trans-synovial pump, passive motion assist the joint range by pumping blood and edema fluid away from periarticular tissues. This may account for some improvement in range seen with the use of passive motion after surgery.<sup>73</sup>

Adhesions that form later after injury are also a common cause for a reduced range of movement.<sup>59</sup> Intra-articular adhesions that were formed during immobilization were shown to be reduced by passive motion and the return to active movement.<sup>57</sup> This is of particular interest to our clinical work, demonstrating that the adhesion is a “living” adaptable tissue like other connective tissue, and that it has the capacity to remodel itself in response to its mechanical environment. This remodelling was taking place without any forceful stretching of the joint. Connective tissue adhesion affecting the periarticular structures the (capsule and ligaments) may also be reduced by passive or active movement.

### Quality of repair

Passive motion has a beneficial effect on the quality of repair of different joint structures and is extensively used postoperatively to facilitate joint repair.<sup>71,81,82</sup> The ligaments, tendons, synovial tissue have all been shown to have better repair with early introduction of passive movement. The effects of passive movement on ligaments, capsules and tendons have been discussed above.<sup>7,8,9-14,15,16</sup> In cartilage passive motion has been shown to promote the repair of minor damage in experimental animals (Fig.5.15).<sup>83</sup> Cyclical stress brought about by movement stimulates the metabolic activity of chondrocytes, resulting in proteoglycans and collagen synthesis.<sup>84</sup> The viability and repair of the articular cartilage depends on these cyclical mechanical

stresses.<sup>18,19,21,22,85,86,87</sup> Even slight degrees of motion or intermittent pressure are sufficient to stimulate the production of small amounts of cartilage.<sup>8</sup>

### Pain levels and pain medication

Passive motion has been shown to be useful in reducing pain and pain medication in different joint conditions including back pain sufferers. Passive motion into full extension has been shown significantly to improve the range of movement and to reduce pain in spinal disc injuries.<sup>88</sup> A treatment of 20–30 minutes produces immediate positive changes (the frequency used being 10 cycles/min). In another study a 12-minute daily passive motion using BackLife CPM of the lower back into flexion-extension cycles produced significant relief of back pain.<sup>89</sup>

Passive movement is also used postoperatively to facilitate joint repair.<sup>81,82,71</sup> This form of treatment tends to reduce the recovery time and pain level and improve the quality of repair. Passive motion provided on a daily basis was shown to reduce pain in patients with osteoarthritis of the hip.<sup>72</sup> Some of the pain relief may be associated with the direct effects of movement in activating the trans-synovial pump. This may increase the clearance rate of the inflammatory by-products from the site of damage and reduce the swelling in the joint. Another mechanism for pain relief could be related to movement facilitating the repair process. Neurological gating of pain may be another possible mechanisms producing pain relief by movement.

### Return to normal activity

Generally, patient who receive early passive motion for joint surgery tend to have reduced hospital stay and early return to normal daily activities.<sup>35,74</sup>

The addition of passive motion was shown to reduce pain in frozen shoulder<sup>118</sup> and to be beneficial and safe and useful after rotator cuff repair.<sup>119,120</sup>

### Muscle Tissue

Muscle is the main tissue to undergo shortening and is often the cause of restriction of the range of movement after joint injury. Such changes in length are due to adaptive sarcomere and connective tissue changes.<sup>90,91</sup> It has been demonstrated that in muscle immobilized in its shortened length, there is a reduction in the number of sarcomeres (up to 40% within a few days). This is accompanied by shortening and proliferation of the muscle's connective tissue elements (epimysium, perimysium and endomysium).<sup>92-95</sup> Such changes account for some of the stiffness and reduced extensibility of muscle during passive stretching.<sup>90</sup> Without movement or muscle contraction, there may be excessive oedema and stasis in the tissue spaces.<sup>93</sup> This may eventually lead to excessive connective tissue deposition rather than regeneration of the contractile elements. Some of the changes in innervated and denervated immobilized muscle are very similar, suggesting that the structural changes are largely a result of the absence of mechanical stress on muscle tissue.<sup>35</sup>

### Effects of movement on muscle

As with other tissues in the body, muscle regeneration is dependent on *dynamic* longitudinal mechanical tension (stretching or muscle contraction) for homeostasis, regeneration and adaptation.

Longitudinal tension promotes the normal parallel alignment of the myotubes to the lines of stress,<sup>93,96</sup> and is also required for the restoration of the connective tissue component of the regeneration



muscle.<sup>93</sup> The normal development of connective tissue in muscle is important for the development of internal tendons, fasciculi and adequate well-defined skeletal attachments. If normal development of connective tissue fails muscle function will not be restored even when full muscle fibre regeneration has taken place.<sup>96</sup>

Tissue culture experiments highlight the importance of both stress and motion to repair and adaptation in muscle. Passive stretching of muscle activates intracellular mechanisms that result in hypertrophy (increase in cell size) of the muscle cells.<sup>97</sup> Smooth muscle cells that are cyclically stretched demonstrate increased synthesis of proline, a major constituent of collagen.<sup>98</sup> Studies using skeletal tissue culture have shown that muscle cells incubated under constant tension synthesize protein at 22% of the rate observed *in vivo*, whereas passive intermittent stretching resulted in a level of 38% of that found *in vivo*.<sup>99</sup>

During remobilization of muscle, the number and size of the sarcomeres generally return to preimmobilization levels.<sup>90</sup> Animal studies show that passive muscle stretching leads to increased muscle length, hypertrophy<sup>100</sup> and increased capillary density.<sup>101</sup> In humans rhythmic muscle tension brought about by passive joint movement has also been shown to promote muscle hypertrophy.<sup>102</sup> Such hypertrophy has been observed in diverse conditions such as muscle wasting in patients who are terminally ill.<sup>103</sup> In subjects with osteoarthritis of the hip, passive manual muscle stretching has been shown significantly to increase the range of movement as well as the cross-sectional area of muscle fibres and their glycogen content (decreased muscle mobility leading to muscle atrophy and reduced glycogen content).<sup>101</sup> Patients who had surgery for rotator cuff tears were shown to undergo hypertrophy when passive movement was added.<sup>104</sup>

### Summary

Studies of passive motion have shown to be beneficial to different aspects of repair, particularly, in acute musculoskeletal conditions.

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The UNSPSC Code #42251611 is described as:  
Vestibular motion devices for rehabilitation or therapy.

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Without a doubt, we live in a high-tech world. It seems a new gadget for promoting better health comes along every day, but according to Life Span, a simple rocking chair can improve your health and increase overall well-being.

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## 8. Miscellaneous (Re Sleep, but not sleep while rocking)

### Sleep Habits and Susceptibility to the Common Cold

Sheldon Cohen, PhD; William J. Doyle, PhD; Cuneyt M. Alper, MD; et alDenise Janicki-Deverts, PhD; Ronald B. Turner, MD

Author Affiliations [Article Information](#)

*Arch Intern Med.* 2009;169(1):62-67. doi:10.1001/archinternmed.2008.505

#### Abstract

**Background** Sleep quality is thought to be an important predictor of immunity and, in turn, susceptibility to the common cold. This article examines whether sleep duration and efficiency in the weeks preceding viral exposure are associated with cold susceptibility.

<https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/414701>

**Results** There was a graded association with average sleep duration: participants with less than 7 hours of sleep were 2.94 times (95% confidence interval [CI], 1.18-7.30) more likely to develop a cold than those with 8 hours or more of sleep. The association with sleep efficiency was also graded: participants with less than 92% efficiency were 5.50 times (95% CI, 2.08-14.48) more likely to develop a cold than those with 98% or more efficiency. These relationships could not be explained by differences in prechallenge virus-specific antibody titers, demographics, season of the year, body mass, socioeconomic status, psychological variables, or health practices. The percentage of days feeling rested was not associated with colds.

**Conclusion** Poorer sleep efficiency and shorter sleep duration in the weeks preceding exposure to a rhinovirus were associated with lower resistance to illness.

It is commonly thought that poor sleep increases our susceptibility to the common cold. However, there is little direct evidence for this assertion. Experimental studies have demonstrated that sleep deprivation results in poorer immune function, such as reduced natural killer cell activity, suppressed interleukin-2 production, and increased levels of circulating proinflammatory cytokines.<sup>1-3</sup> Sleep deprivation has also been found to attenuate antibody response to both hepatitis A<sup>4</sup> and influenza immunizations.<sup>5</sup> The only direct evidence that

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sleep habits are associated with cold susceptibility derives from a secondary analysis of data from a rhinovirus (RV)-challenge study in which a single retrospective questionnaire assessing sleep habits during the previous month was used to assess sleep efficiency (the percentage of time a person actually sleeps between lying down to sleep and waking up the next morning).<sup>6</sup> Efficiencies below 80% predicted a greater risk for the development of verifiable illness.

In this study, we examined whether sleep habits are associated with resistance to a common cold. Instead of retrospective reports, we obtained estimates of sleep habits by averaging respondent reports of sleep duration, efficiency, and “feeling rested” across 14 consecutive days. After sleep assessments were completed, the participants were exposed to an RV and were monitored to see whether they developed clinical illness. Infection and signs and symptoms of illness were assessed the day before and for 5 days after the viral challenge. This design extends previous work by providing reliable (averaged over 14 days) online (collected daily) measures of baseline sleep; by allowing the comparison of the relative importance of sleep duration, efficiency, and feeling rested for cold susceptibility; and by providing the opportunity to test for graded relationships between sleep measures and disease susceptibility.

Studies have demonstrated that poor sleep and susceptibility to [colds](#) go hand in hand, and scientists think it could be a reflection of the role sleep plays in maintaining the body’s defenses.

[In a recent study](#) for The Archives of Internal Medicine, scientists followed 153 men and women for two weeks, keeping track of their quality and duration of sleep. Then, during a five-day period, they quarantined the subjects and exposed them to cold viruses. Those who slept an average of fewer than seven hours a night, it turned out, were three times as likely to get sick as those who averaged at least eight hours.

Sleep and [immunity](#), it seems, [are tightly linked](#). Studies have found that mammals that require the most sleep also [produce greater levels of disease-fighting white blood cells](#) — but not red blood cells, even though both are produced in bone marrow and stem from the same precursor. And researchers at the Max Planck Institute for Evolutionary Anthropology [have shown](#) that species that sleep more have greater resistance against pathogens.

“Species that have evolved longer sleep durations,” the Planck scientists wrote, “appear to be able to increase investment in their immune systems and be better protected.”

THE BOTTOM LINE Research suggests that poor sleep can increase susceptibility to colds.

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## 9 benefits of better sleep

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You'll Look Prettier

## Rocking Studies, General

Sleeping beauty had this one right: regular shuteye alone actually makes you look prettier, according to a 2010 [study published in the \*British Medical Journal\*](#).

The researchers took photos of 23 people after a normal night's sleep of eight hours and after a period of sleep deprivation. Then, a group of 65 people rated each set of photos for perceived health, attractiveness and tiredness. The sleep deprived group scored lower in all three categories.

"We propose that sleep is a cheap and effective beauty treatment, both acutely and in the long-term," John Axelsson, [lead researcher on the study, told NBC News](#). "Sleep should be seen as the body's natural beauty treatment and a clear alternative or complement to other beauty treatments."

Sleep can also actually help to keep your skin in top condition. Over the long term, sleep deprivation can cause increased stress-related aging, a decreased ability to stay hydrated and a decreased ability to fight off environmental pollutants, [writes Elizabeth Tanzi, M.D. on DoctorOz.com](#).

"The most important thing you can do for your skin may be getting a great night's sleep," dermatologist Dr. Howard Murad [told the \*Los Angeles Times\*](#).

### You'll Eat Less

Both [experts](#) and [scientific data](#) have long connected lack of sleep with increased hunger and weight gain -- and now a recent study has quantified the phenomenon. The findings, presented last month at an American Heart Association meeting, suggest that otherwise healthy people may eat more than 500 additional calories a day when they're sleep deprived, [the Huffington Post reported](#) when the study first came out.

### You'll Make Better Decisions

Stumped? You may want to sleep on it.

A study published last year in the *Journal of Sleep Research* found that [people make smarter calls](#) after a good night's sleep. The researchers asked 54 young adults to play a card game aimed to imitate casino gambling. Those who were well-rested made decisions that resulted in greater winnings four times more often than those who were sleep deprived -- and they had a firmer grasp on the rules.

"This provides support for what Mom and Dad have always advised," lead author and psychologist Rebecca Spencer, of the University of Massachusetts Amherst, [said in a statement](#). "There is something to be gained from taking a night to sleep on it when you're facing an important decision. We found that the fact that you slept makes your decisions



better."

## You Can Ease Bad Memories

If you're sorting through a painful memory, try giving it a rest.

One small study last year found that sleep might help to [take the edge off difficult emotional experiences](#) that happen during your waking hours.

"The dream stage of sleep, based on its unique neurochemical composition, provides us with a form of overnight therapy, a soothing balm that removes the sharp edges from the prior day's emotional experiences," senior author Matthew Walker, associate professor of psychology and neuroscience at UC Berkeley [said in a statement](#).

## You Could Learn Better

You may be conditioned to think that the best way to learn is to stay up all night cramming, but the truth is that you'd be better off to get some sleep.

[Several studies](#) have linked rest with increased performance on [learning-related tasks](#), and now a new study has found that the timing of sleep may matter, too.

[The researchers](#) asked more than 200 people to memorize related words (such as "fire and smoke") and unrelated words (think: "insect and truth"). When later tested for recall, those who slept just after learning performed better than those who went a whole day before sleeping.

## You Can Be More Organized

Ever notice how you can read the same paragraph over and over again when you're tired, without ever really retaining anything? That same phenomenon can result in your home or work-space becoming cluttered, explains Robert Oexman, D.C., director of the [Sleep to Live Institute](#) in Joplin, Mo. When humans are sleepy, they can lack the focus and drive to stay on task long enough to keep things orderly.

"Sleep-deprived people can't focus very well," he told The Huffington Post. "A lot of things are cluttered in their lives and they find themselves less organized."

It's the oldest excuse in the book: "Honey, I'm too tired." And while there's certainly some truth to being too exhausted to have sex, Oexman believes there's something deeper at work here. Chronic sleep deprivation can take a mental toll that affects how people perceive their own attractiveness and, in turn, sexual desire.

"They don't just not feel like it," Oexman says. "They *really* don't feel like it. They don't feel good about themselves."

### You'll Have A Better Sex Life

It's the oldest excuse in the book: "Honey, I'm too tired." And while there's certainly some truth to being too exhausted to have sex, Oexman believes there's something deeper at work here. Chronic sleep deprivation can take a mental toll that affects how people perceive their own attractiveness and, in turn, sexual desire.

"They don't just not feel like it," Oexman says. "They *really* don't feel like it. They don't feel good about themselves."

### You'll Be Easier To Get Along With

We all know a bad night's sleep can make us grumpy. And over time, that can take a real toll on your personality.

"People who don't sleep well tend to over-escalate a problem," Oexman says. In fact, one study even found that [sleep deprived people could be more likely to blame other people](#) and plan revenge against them.

"Sleepier people seem to engage in counterfactual thinking that is more dissatisfied and perhaps more selfish," study author David Mastin, Ph.D., associate professor of psychology at the University of Arkansas at Little Rock, [said in a statement](#). "It may be that the sleepier you are, the more likely your musings are to be angry thoughts about how others could have done better."

So if you can't stop thinking how everyone else is to blame, you might want to pause to consider how many hours you've been clocking in bed each night.

### Your Immunity Will Be Boosted

It's pretty much common sense that if you're rundown or exhausted, you'll be more susceptible to picking up a bad cold. But a recent study helped to explain that link further. As The Huffington Post reported [when the findings were released](#):

Researchers found that the body's circadian clock controls an essential immune system gene in mice -- a gene that helps the body ward off bacteria and viruses.

"People intuitively know that when their sleep patterns are disturbed, they are more likely to get sick," study author Erol Fikrig, professor of epidemiology at the Yale

School of Medicine, said in a press release. "It does appear that disruptions of the circadian clock influence our susceptibility to pathogens."

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## Better sleep survey:

Too little sleep takes big toll on productivity at work

-- Furniture Today, 5/2/2007 6:25:00 AM

New BSC survey indicates accuracy, judgment, memory suffer for many workers

ALEXANDRIA, Va. — Employees are paying a high price for too little sleep when it comes to work productivity, according to new statistics from the Better Sleep Council.

Respondents to the BSC's 2007 Better Sleep Month survey, conducted for Better Sleep Month this May, reported a decline in quality of work, poor judgment and trouble retaining information as the top work-related consequences from lack of sleep. Some 44% said they were likely to be in an unpleasant or unfriendly mood.

"Some believe you can accomplish more if you spend less time sleeping, but limited sleep can affect every aspect of your life, including job performance," said Dr. Bert Jacobson, Better Sleep Month spokesperson and sleep researcher. "In fact, sleep deprivation impacts your level of alertness, your productivity and your ability to socially interact with colleagues."

According to the BSC, studies estimate that sleep deprivation costs U.S. businesses nearly \$150 billion annually in absenteeism and lost productivity.

Better Sleep Month survey respondents reported sleep deprivation impaired their quality and accuracy of work (31%), clear thinking or judgment (31%) and memory of important details (30%).

"Our survey indicates that companies would be more productive and offices would be happier places if employees got more of the sleep they need," said Nancy Shark, executive director of the Better Sleep Council. "Anyone looking to improve their daily work performance could benefit by improving the quality of their sleep."

Survey results also showed that tired employees are turning instead to quick-fix performance enhancers to remedy their sleep deficiency problem, including:

+ Drinking coffee or other caffeinated drinks (33%).

+ Taking a nap (17%).

+ Going outside for fresh air (18%).

Only 13% of Americans are willing to make the commitment to get more sleep in order to feel more awake and productive at work, according to the survey.

These findings are taken from a survey of 1,000 people conducted by the polling company TM inc. from March 30 to April 2. The margin of error is three percentage points.

The Better Sleep Council said many Americans are losing sleep on mattresses that may no longer provide optimum comfort. The bedding industry group said mattresses should be evaluated every five to seven years for comfort and support and replaced if necessary.

But survey respondents indicate that most consumers (50%) sleep on mattresses that are five years old or older, and 24% sleep on mattresses eight years old or older.

According to a recently released article in the Journal of Chiropractic Medicine, Oklahoma State University researchers suggest the quality of sleep is affected by the age of the sleep system. The study showed new bedding provided immediate and sustained benefits in sleep comfort and quality, plus reduced back pain.

“Sleep problems can be caused by a host of factors ranging from physical discomfort to stress and lifestyle dynamics,” said Jacobson, the author of the study. “In our research, we found that for the average person, better sleep quality can be as simple as a new bed.”

The BSC has several recommendations for better sleep:

+ Pay your sleep debt. Getting even 30 minutes less sleep than your body needs can lead to accumulated sleep debt, which has both short- and long-term consequences for health, mood and performance, both on and off the job. It’s important to schedule eight hours of sleep each night and maintain a regular sleep and wake schedule, even on weekends.

+ Though a mattress may not show physical signs of wear, it loses comfort and support over the years. It’s important to evaluate a mattress every five to seven years to ensure it still provides optimal comfort and support. Research shows that the age of a mattress affects quality of sleep.

+ Use your bedroom for sleep and sex only. The bedroom should be an uncluttered environment that is relaxing, comfortable and conducive to sleep and relaxation. Keep work, computers and TVs out of the bedroom.

+ Kick the caffeine habit. Research shows that caffeine interferes with getting a restful night’s sleep and waking refreshed in the morning. Avoid tea, coffee and soft drinks close to bedtime.

+ Invest in the best quality and most comfortable mattress you can afford to ensure a great night’s rest.

More information on Better Sleep Month, and a Better Sleep Guide with tips for improving the quality of your sleep, are online at <http://www.bettersleep.org>.

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The currently understood model for the production of vertigo or motion sickness includes a system in which information is gathered from vestibular, visual, proprioceptive, and cortical activity (figure). This information is then compared with an internal model of expected input congruity. Detection of a stimulus mismatch promotes the symptoms associated with vertigo and motion sickness. This comparator also serves to promote habituation to new environmental stimuli or compensation for erroneous input caused by disease.

It is interesting that some medications that are excellent antiemetics do not prevent vertigo or motion sickness. One such medication, ondansetron, is often used for the prevention of chemotherapy-induced nausea. It acts on 5-[HT.sub.3] receptors in the area postrema. Activity in this location would not necessarily prevent stimulation of the vestibular nuclei from ultimately causing nausea and vomiting. However, patients who are particularly susceptible to motion sickness also demonstrate increased responses to other vomiting center stimuli. This may provide a rationale for the use of general antiemetics in vertigo associated with nausea. (23,24)

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<http://www.furnituretoday.com/article/CA610093.html?industryid=23169&industry=Headline+News&nid=2373>

**Duxiana’s ‘sleep rooms’ win business**

David Perry -- Furniture Today, 6/22/2005 7:48:00 AM  
Customers delighted

NEW YORK -- Consumers who visit the Duxiana store in Union Square here can try out the Swedish-made mattresses in the privacy of their own “sleep room.”

The retailer has two rooms in the back of its showroom here where customers can literally sleep on any of the company’s three Dux beds to see how they feel.

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## Sleep Therapy Is Expected to Gain a Wider Role in Depression Treatment

By BENEDICT CAREY

Published: November 23, 2013

<http://www.nytimes.com/2013/11/24/health/sleep-therapy-is-expected-to-gain-a-wider-role-in-depression-treatment.html?hpw&rref=health&r=0>

Shelby Harris, the director of the behavioral sleep medicine program at Montefiore Medical Center. “There aren’t many of us doing this therapy,” Dr. Harris said, but that may change soon.

An insomnia therapy that scientists just reported [could double the effectiveness of depression treatment](#) is not widely available nor particularly well understood by psychiatrists or the public. The [American Board of Sleep Medicine](#) has certified just 400 practitioners in the United States to administer it, and they are sparse, even in big cities.

That may change soon, however. Four rigorous studies of the treatment are nearing completion and due to be reported in coming months. In the past year, the [American Psychological Association](#) recognized sleep psychology as a specialty, and the Department of Veterans Affairs began a program to train about 600 sleep specialists. So-called insomnia disorder is defined as at least three months of poor sleep that causes problems at work, at home or in relationships.

The need is great: Depression is the most common mood disorder, affecting some 18 million Americans in any given year, and most have insomnia.

“I think it’s increasingly likely that this kind of sleep therapy will be used as a possible complement to standard care,” said [Dr. John M. Oldham](#), chief of staff at the [Menninger Clinic](#) in Houston. “We are the court of last resort for the most difficult-to-treat patients, and I think sleep problems have been extremely underrecognized as a critical factor.”

The treatment, known as [cognitive behavioral therapy for insomnia](#), or CBT-I, is not widely available. Most insurers cover it, and the rates for private practitioners are roughly the same as for any psychotherapy, ranging from \$100 to \$250 an hour, depending on the therapist.

“There aren’t many of us doing this therapy,” said [Shelby Harris](#), the director of the behavioral sleep medicine program at Montefiore Medical Center in the Bronx, who also has a private practice in Tarrytown, N.Y. “I feel like we all know each other.”

According to preliminary results, one of the four studies has found that when CBT-I cures insomnia — it does so 40 percent to 50 percent of the time, previous work suggests — it powerfully complements the effect of antidepressant drugs.

“There’s been a huge recognition that insomnia cuts across a wide variety of medical disorders, and there’s a need to address it,” said [Michael T. Smith](#), a professor at the Johns Hopkins School of Medicine and president of the [Society of Behavioral Sleep Medicine](#).

The therapy is easy to teach, said [Colleen Carney](#), director of the sleep and depression lab at Ryerson University in Toronto, whose presentation at a conference of the Association for Behavioral and Cognitive

## Rocking Studies, General

Therapies in Nashville on Saturday raised hopes for depression treatment. “In the study we did, I trained students to administer the therapy,” she said in an interview, “and the patients in the study got just four sessions.”

CBT-I is not a single technique but a collection of complementary ideas. Some date to the 1970s, others are more recent. One is called stimulus control, which involves breaking the association between being in bed and activities like watching television or eating. Another is sleep restriction: setting a regular “sleep window” and working to stick to it. The therapist typically has patients track their efforts on a standardized form called a sleep diary. Patients record bedtimes and when they wake up each day, as well as their perceptions about quality of sleep and number of awakenings. To this the therapist might add common-sense advice like reducing caffeine and alcohol intake, and making sure the bedroom is dark and quiet.

Those three elements — stimulus control, restriction and common sense — can do the trick for many patients. For those who need more, the therapist applies cognitive therapy — a means of challenging self-defeating assumptions. Patients fill out a standard questionnaire that asks how strongly they agree with statements like: “Without an adequate night’s sleep, I can hardly function the next day”; “I believe insomnia is the result of a chemical imbalance”; and “Medication is probably the only solution to sleeplessness.” In sessions, people learn to challenge those beliefs, using evidence from their own experiences.

“If someone has the belief that if they don’t sleep, they’ll somehow fail the next day, I’ll ask, ‘What does failure mean? You’ll be slower at work, not get everything done, not make dinner?’ ” Dr. Harris said. “Then we’ll look at the 300 nights they didn’t sleep well over the past few years and find out they managed; it might not have been as pleasant as they liked, but they did not fail. That’s how we challenge those kinds of thoughts.”

Dr. Aaron T. Beck, an emeritus professor of psychiatry at the University of Pennsylvania who is recognized as the father of cognitive therapy for mental disorders, said the techniques were just as applicable to sleep problems. “In fact, I have used it myself when I occasionally have insomnia,” he said by email.

In short-term studies of a month or two, CBT-I has been about as effective as prescription sleeping pills. But it appears to have more staying power. “There’s no data to show that if you take a sleeping pill — and then stop taking it — that you’ll still be good six months later,” said [Jack Edinger](#), a professor at National Jewish Health in Denver and an author, with Dr. Carney, of [“Overcoming Insomnia: A Cognitive-Behavioral Therapy Approach.”](#)

“It might happen, but those certainly aren’t the people who come through my door,” he said.

Dr. Edinger and others say that those who respond well to CBT-I usually do so quickly — in an average of four sessions, and rarely more than eight. “You’re not going to break the bank doing this stuff; it’s not a marriage,” he said. “You do it for a fixed amount of time, and then you’re done. Once you’ve got the skills, they don’t go away.”



A version of this article appears in print on November 24, 2013, on page A30 of the New York edition with the headline: Sleep Therapy Is Expected to Gain a Wider Role in Depression Treatment.

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## Sleep & ADHD

[http://www.nytimes.com/2013/04/28/opinion/sunday/diagnosing-the-wrong-deficit.html?\\_r=0](http://www.nytimes.com/2013/04/28/opinion/sunday/diagnosing-the-wrong-deficit.html?_r=0)

By VATSAL G. THAKKAR

Published: April 27, 2013

*Vatsal G. Thakkar is a clinical assistant professor of psychiatry at the N.Y.U. School of Medicine.*

IN the spring of 2010, a new patient came to see me to find out if he had attention-deficit hyperactivity disorder. He had all the classic symptoms: procrastination, forgetfulness, a propensity to lose things and, of course, the inability to pay attention consistently. But one thing was unusual. His symptoms had started only two years earlier, when he was 31.

Though I treat a lot of adults for attention-deficit hyperactivity disorder, the presentation of this case was a violation of an important diagnostic criterion: symptoms must date back to childhood. It turned out he first started having these problems the month he began his most recent job, one that required him to rise at 5 a.m., despite the fact that he was a night owl.

The patient didn't have A.D.H.D., I realized, but a chronic sleep deficit. I suggested some techniques to help him fall asleep at night, like relaxing for 90 minutes before getting in bed at 10 p.m. If necessary, he could take a small amount of melatonin. When he returned to see me two weeks later, his symptoms were almost gone. I suggested he call if they recurred. I never heard from him again.

Many theories are thrown around to explain the rise in the diagnosis and treatment of A.D.H.D. in children and adults. According to the Centers for Disease Control and Prevention, 11 percent of school-age children have now received a diagnosis of the condition. I don't doubt that many people do, in fact, have A.D.H.D.; I regularly diagnose and treat it in adults. **But what if a substantial proportion of cases are really sleep disorders in disguise?**

For some people — especially children — sleep deprivation does not necessarily cause lethargy; instead they become hyperactive and unfocused. Researchers and reporters are increasingly seeing connections between dysfunctional sleep and what looks like A.D.H.D., but those links are taking a long time to be understood by parents and doctors.

We all get less sleep than we used to. The number of adults who reported sleeping fewer than seven hours each night went from some 2 percent in 1960 to more than 35 percent in 2011. Sleep is even more crucial for children, who need delta sleep — the deep, rejuvenating, slow-wave kind — for proper growth and development. Yet today's youngsters sleep more than an hour less than they did a hundred years ago. And for all ages, contemporary daytime activities — marked by nonstop 14-hour schedules and inescapable melatonin-inhibiting iDevices — often impair sleep. It might just be a coincidence, but this sleep-restricting lifestyle began getting more extreme in the 1990s, the decade with the explosion in A.D.H.D. diagnoses.

A number of studies have shown that a huge proportion of children with an A.D.H.D. diagnosis also have sleep-disordered breathing like apnea or snoring, restless leg syndrome or non-restorative sleep, in which



delta sleep is frequently interrupted.

One study, published in 2004 in the journal *Sleep*, looked at 34 children with A.D.H.D. Every one of them showed a deficit of delta sleep, compared with only a handful of the 32 control subjects.

A 2006 study in the journal *Pediatrics* showed something similar, from the perspective of a surgery clinic. This study included 105 children between ages 5 and 12. Seventy-eight of them were scheduled to have their tonsils removed because they had problems breathing in their sleep, while 27 children scheduled for other operations served as a control group. Researchers measured the participants' sleep patterns and tested for hyperactivity and inattentiveness, consistent with standard protocols for validating an A.D.H.D. diagnosis.

Of the 78 children getting the tonsillectomies, 28 percent were found to have A.D.H.D., compared with only 7 percent of the control group. Even more stunning was what the study's authors found a year after the surgeries, when they followed up with the children. A full half of the original A.D.H.D. group who received tonsillectomies — 11 of 22 children — no longer met the criteria for the condition. In other words, what had appeared to be A.D.H.D. had been resolved by treating a sleeping problem.

But it's also possible that A.D.H.D.-like symptoms can persist even after a sleeping problem is resolved. Consider a long-term study of more than 11,000 children in Britain published last year, also in *Pediatrics*. Mothers were asked about symptoms of sleep-disordered breathing in their infants when they were 6 months old. Then, when the children were 4 and 7 years old, the mothers completed a behavioral questionnaire to gauge their children's levels of inattention, hyperactivity, anxiety, depression and problems with peers, conduct and social skills.

**The study found that children who suffered from sleep-disordered breathing in infancy were more likely to have behavioral difficulties later in life — they were 20 to 60 percent more likely to have behavioral problems at age 4, and 40 to 100 percent more likely to have such problems at age 7. Interestingly, these problems occurred even if the disordered breathing had abated, implying that an infant breathing problem might cause some kind of potentially irreversible neurological injury.**

CLEARLY there is more going on in the nocturnal lives of our children than any of us have realized. Typically, we see and diagnose only their downstream, daytime symptoms.

There has been less research into sleep and A.D.H.D. outside of childhood. But a team from Massachusetts General Hospital found, in one of the only studies of its kind, that sleep dysfunction in adults with A.D.H.D. closely mimics the sleep dysfunction in children with A.D.H.D.

**There is also some promising research being done on sleep in adults, relating to focus, memory and cognitive performance. A study published in February in the journal *Nature Neuroscience* found that the amount of delta sleep in seniors correlates with performance on memory tests. And a study published three years ago in *Sleep* found that while subjects who were deprived of sleep didn't necessarily report feeling sleepier, their cognitive performance declined in proportion to their sleep deprivation and continued to worsen over five nights of sleep restriction.**

As it happens, “moves about excessively during sleep” was once listed as a symptom of attention-deficit disorder in the *Diagnostic and Statistical Manual of Mental Disorders*. That version of the manual, published

## Rocking Studies, General

in 1980, was the first to name the disorder. When the term A.D.H.D., reflecting the addition of hyperactivity, appeared in 1987, the diagnostic criteria no longer included trouble sleeping. The authors said there was not enough evidence to support keeping it in.

But what if doctors, before diagnosing A.D.H.D. in their patients, did have to find evidence of a sleep disorder? Psychiatric researchers typically don't have access to the equipment or expertise needed to evaluate sleep issues. It's tricky to ask patients to keep sleep logs or to send them for expensive overnight sleep studies, which can involve complicated equipment like surface electrodes to measure brain and muscle activity; abdominal belts to record breathing; "pulse oximeters" to measure blood oxygen levels; even snore microphones. (And getting a sleep study approved by an insurance company is by no means guaranteed.) As it stands, A.D.H.D. can be diagnosed with only an office interview.

Sometimes my patients have resisted my referrals for sleep testing, since everything they have read (often through direct-to-consumer marketing by drug companies) identifies A.D.H.D. as the culprit. People don't like to hear that they may have a different, stranger-sounding problem that can't be fixed with a pill — though this often changes once patients see the results of their sleep studies.

Beyond my day job, I have a personal interest in A.D.H.D. and sleep disorders. Beginning in college and for nearly a decade, I struggled with profound cognitive lethargy and difficulty focusing, a daily nap habit and weekend sleep addiction. I got through my medical school exams only by the grace of good memorization skills and the fact that ephedra was still a legal supplement.

I was misdiagnosed with various maladies, including A.D.H.D. Then I underwent two sleep studies and, finally, was found to have an atypical form of narcolepsy. This was a shock to me, because I had never fallen asleep while eating or talking. But, it turned out, over 40 percent of my night was spent in REM sleep — or "dreaming sleep," which normally occurs only intermittently throughout the night — while just 5 percent was spent in delta sleep, the rejuvenating kind. I was sleeping 8 to 10 hours a night, but I still had a profound delta sleep deficit.

It took some trial and error, but with the proper treatment, my cognitive problems came to an end. Today I eat well and respect my unique sleep needs instead of trying to suppress them. I also take two medications: a stimulant for narcolepsy and, at bedtime, an S.N.R.I. (or serotonin-norepinephrine reuptake inhibitor) antidepressant — an off-label treatment that curtails REM sleep and helps increase delta sleep. Now I wake up without an alarm, and my daytime focus is remarkably improved. My recovery has been amazing (though my wife would argue that weekend mornings are still tough — she picks up the slack with our two kids).

Attention-deficit problems are far from the only reasons to take our lack of quality sleep seriously. Laboratory animals die when they are deprived of delta sleep. Chronic delta sleep deficits in humans are implicated in many diseases, including depression, heart disease, hypertension, obesity, chronic pain, diabetes and cancer, not to mention thousands of fatigue-related car accidents each year.

Sleep disorders are so prevalent that every internist, pediatrician and psychiatrist should routinely screen for them. And we need far more research into this issue. Every year billions of dollars are poured into researching cancer, depression and heart disease, but how much money goes into sleep?

The National Institutes of Health will spend only \$240 million on sleep research this year. One of the problems is that the research establishment exists as mini-fiefdoms — money given to one sector, like

cardiology or psychiatry, rarely makes it into another, like sleep medicine, even if they are intimately connected.

But we can't wait any longer to pay attention to the connection between delta sleep and A.D.H.D. If you're not already convinced, consider the drug clonidine. It started life as a hypertension treatment, but has been approved by the Food and Drug Administration to treat A.D.H.D. Studies show that when it is taken only at bedtime, symptoms improve during the day. For psychiatrists, it is one of these "oh-we-don't-know-how-it-works" drugs. But here is a little-known fact about clonidine: it can be a potent delta sleep enhancer.

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## Sleep&Memory

[http://www.nytimes.com/2013/01/28/health/brain-aging-linked-to-sleep-related-memory-decline.html?partner=rss&emc=rss&\\_r=2&](http://www.nytimes.com/2013/01/28/health/brain-aging-linked-to-sleep-related-memory-decline.html?partner=rss&emc=rss&_r=2&)

### Aging in Brain Found to Hurt Sleep Needed for Memory

By BENEDICT CAREY

Published: January 27, 2013

Scientists have known for decades that the ability to remember newly learned information declines with age, but it was not clear why. A new study may provide part of the answer.

The report, posted online on Sunday by the journal [Nature Neuroscience](#), suggests that structural brain changes occurring naturally over time interfere with sleep quality, which in turn blunts the ability to store memories for the long term.

Previous research had found that the prefrontal cortex, the brain region behind the forehead, tends to lose volume with age, and that part of this region helps sustain quality sleep, which is critical to consolidating new memories. But the new experiment, led by researchers at the University of California, Berkeley, is the first to directly link structural changes with sleep-related memory problems.

The findings suggest that one way to slow memory decline in aging adults is to improve sleep, specifically the so-called slow-wave phase, which constitutes about a quarter of a normal night's slumber.

Doctors cannot reverse structural changes that occur with age any more than they can turn back time. But at least two groups are experimenting with electrical stimulation as a way to improve deep sleep in older people. By placing electrodes on the scalp, scientists can run a low current across the prefrontal area, essentially mimicking the shape of clean, high-quality slow waves.

The result: improved memory, at least in some studies. "There are also a number of other ways you can improve sleep, including exercise," said Ken Paller, a professor of psychology and the director of the cognitive neuroscience program at Northwestern University, who was not involved in the research.

Dr. Paller said that a whole array of changes occurred across the brain during aging and that sleep was only one factor affecting memory function.

But he said the study told “a convincing story, I think: that atrophy is related to slow-wave sleep, which we know is related to memory performance. So it’s a contributing factor.”

In the study, the research team took brain images from 19 people of retirement age and from 18 people in their early 20s. It found that a brain area called the medial prefrontal cortex, roughly behind the middle of the forehead, was about one-third smaller on average in the older group than in the younger one — a difference due to natural atrophy over time, previous research suggests.

Before bedtime, the team had the two groups study a long list of words paired with nonsense syllables, like “action-siblis” and “arm-reconver.” The team used the nonwords because one type of memory that declines with age is for new, previously unseen information.

After training on the pairs for half an hour or so, the participants took a test on some of them. The young group outscored the older group by about 25 percent.

Then everyone went to bed — and bigger differences emerged. For one, the older group got only about a quarter of the amount of high-quality slow-wave sleep that the younger group did, as measured by the shape and consistency of electrical waves on an electroencephalogram machine, or EEG. It is thought that the brain moves memories from temporary to longer-term storage during this deep sleep.

On a second test, given in the morning, the younger group outscored the older group by about 55 percent. The estimated amount of atrophy in each person roughly predicted the difference between his or her evening and morning scores, the study found. Even seniors who were very sharp at night showed declines after sleeping.

“The analysis showed that the differences were due not to changes in capacity for memories, but to differences in sleep quality,” said Bryce A. Mander, a postdoctoral fellow at Berkeley and the lead author of the study. His co-authors included researchers from the California Pacific Medical Center in San Francisco; the University of California, San Diego; and the Lawrence Berkeley National Laboratory.

The findings do not imply that medial prefrontal atrophy is the only age-related change causing memory problems, said Matthew P. Walker, a professor of psychology and neuroscience at Berkeley and a co-author of the study.

“Essentially, with age, you lose tissue in this prefrontal area,” Dr. Walker said. “You get less quality deep sleep, and have less opportunity to consolidate new memories.”

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## **Cheating Ourselves of Sleep**

**BY JANE E. BRODY**

By JANE E. BRODY

[http://well.blogs.nytimes.com/2013/06/24/steps-for-more-and-better-sleep/?\\_r=0](http://well.blogs.nytimes.com/2013/06/24/steps-for-more-and-better-sleep/?_r=0)

I regret that for most of my adult life, I treated sleep as more a luxury than a necessity. There was always something more to do before I crawled under the covers and turned out the light. I realize belatedly that I might have been more productive — and a lot nicer to live with — if I had given sleep its proper due.

By failing to acknowledge chronic sleep deprivation, I dozed during countless cultural events, and on two occasions I fell asleep while driving, barely escaping disaster. I have since reordered my priorities and learned to avoid distractions and activities that can keep me from getting the sleep my body and mind really need.

About 70 million Americans sleep poorly or not nearly long enough to achieve [the full physical, emotional and cognitive benefits sleep can bestow](#). There are myriad reasons, ranging from self-inflicted disruptions to those that are seemingly unavoidable. But there are also potential solutions to most of the factors that can interfere with sleep. For the sake of your health and longevity, I urge you to give them a try.

It was long ago shown that a midafternoon nap of about 20 minutes can improve alertness and productivity and reduce mistakes among sleep-deprived workers, yet few employers offer a midday lie-down or provide a place for one.

Age also affects the quality of sleep and the amount of time spent in the various stages of sleep. These include REM, or rapid-eye-movement sleep (often called dream sleep), and three types of non-REM sleep: the light sleep of Stage 1, followed by the more relaxed sleep of Stage 2 and the most restorative deep sleep of Stage 3.

Research shows that most people require seven or eight hours of sleep to function optimally. Failing to get enough sleep night after night can compromise your health and may even shorten your life. From infancy to old age, the effects of inadequate sleep can profoundly affect memory, learning, creativity, productivity and emotional stability, as well as your physical health.

According to sleep specialists at the University of Pittsburgh School of Medicine and Western Psychiatric Institute and Clinic, among others, a number of bodily systems are negatively affected by inadequate sleep: the heart, lungs and kidneys; appetite, metabolism and weight control; immune function and disease resistance; sensitivity to pain; reaction time; mood; and brain function.

Poor sleep is also a risk factor for depression and substance abuse, especially among people with post-traumatic stress disorder, according to Anne Germain, associate professor of psychiatry at the University of Pittsburgh. People with PTSD tend to relive their trauma when they try to sleep, which keeps their brains in a heightened state of alertness.

Dr. Germain is studying what happens in the brains of sleeping veterans with PTSD in hopes of developing more effective treatments for them and for people with lesser degrees of stress that interfere with a good night's sleep.

The elderly are especially vulnerable. Timothy H. Monk, who directs the Human Chronobiology Research Program at Western Psychiatric, heads a five-year federally funded study of circadian rhythms, sleep strength, stress reactivity, brain function and genetics among the elderly. "The circadian signal isn't as strong as people get older," he said.

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He is finding that many are helped by standard behavioral treatments for insomnia, like maintaining a regular sleep schedule, avoiding late-in-day naps and caffeine, and reducing distractions from light, noise and pets.

It should come as no surprise that myriad bodily systems can be harmed by chronically shortened nights. “Sleep affects almost every tissue in our bodies,” said Dr. Michael J. Twery, a sleep specialist at the National Institutes of Health.

Several studies have linked insufficient sleep to weight gain. Not only do night owls with shortchanged sleep have more time to eat, drink and snack, but levels of the hormone leptin, which tells the brain enough food has been consumed, are lower in the sleep-deprived while levels of ghrelin, which stimulates appetite, are higher.

In addition, metabolism slows when one’s circadian rhythm and sleep are disrupted; if not counteracted by increased exercise or reduced caloric intake, this slowdown could add up to 10 extra pounds in a year.

The body’s [ability to process glucose is also adversely affected](#), which may ultimately result in Type 2 diabetes. In one study, healthy young men prevented from sleeping more than four hours a night for six nights in a row ended up with insulin and blood sugar levels like those of people deemed prediabetic. The risks of cardiovascular diseases and stroke are higher in people who sleep less than six hours a night. Even a single night of inadequate sleep can cause daylong elevations in blood pressure in people with hypertension. [Inadequate sleep is also associated with calcification of coronary arteries](#) and raised levels of inflammatory factors linked to heart disease. (In terms of cardiovascular disease, sleeping too much may also be risky. Higher rates of heart disease have been found among women who sleep more than nine hours nightly.)

The risk of cancer may also be elevated in people who fail to get enough sleep. A Japanese study of nearly 24,000 women ages 40 to 79 found that those who slept less than six hours a night were more likely to develop breast cancer than women who slept longer. The increased risk may result from diminished secretion of the sleep hormone melatonin. Among participants in the Nurses Health Study, Eva S. Schernhammer of Harvard Medical School found [a link between low melatonin levels and an increased risk of breast cancer](#).

A study of 1,240 people by researchers at Case Western Reserve University in Cleveland found an [increased risk of potentially cancerous colorectal polyps in those who slept fewer than six hours nightly](#).

Children can also experience hormonal disruptions from inadequate sleep. Growth hormone is released during deep sleep; it not only stimulates growth in children, but also boosts muscle mass and repairs damaged cells and tissues in both children and adults.

Dr. Vatsal G. Thakkar, a psychiatrist affiliated with New York University, recently described evidence associating inadequate sleep with an [erroneous diagnosis of attention deficit hyperactivity disorder in children](#). In one study, 28 percent of children with sleep problems had symptoms of the disorder, but not the disorder.

During sleep, the body produces cytokines, cellular hormones that help fight infections. Thus, short sleepers may be more susceptible to everyday infections like colds and flu. In a study of 153 healthy men and women, Sheldon Cohen and colleagues at Carnegie Mellon University found that [those who slept less than seven hours a night were three times as likely to develop cold symptoms](#) when exposed to a cold-causing virus than were people who slept eight or more hours.

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Some of the most insidious effects of too little sleep involve mental processes like learning, memory, judgment and problem-solving. During sleep, new learning and memory pathways become encoded in the brain, and adequate sleep is necessary for those pathways to work optimally. People who are well rested are better able to learn a task and more likely to remember what they learned. The cognitive decline that so often accompanies aging may in part result from chronically poor sleep.

With insufficient sleep, thinking slows, it is harder to focus and pay attention, and people are more likely to make poor decisions and take undue risks. As you might guess, these effects can be disastrous when operating a motor vehicle or dangerous machine.

In driving tests, sleep-deprived people perform as if drunk, and no amount of caffeine or cold air can negate the ill effects.

At your next health checkup, tell your doctor how long and how well you sleep. Be honest: Sleep duration and quality can be as important to your health as your blood pressure and cholesterol level.

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Sleep Foundation

**Synopsis: kids need sleep to succeed.**

### **Roundtable On Children and Sleep**

#### **What do we know about the connection between sleep problems and children's behavior?**

Dr. Mindell: We know a great deal about the impact of sleep deprivation on children's behavior. It affects their mood and can make them cranky and irritable. It also affects their ability to regulate their emotions—they may get more easily frustrated or act silly if they don't get enough sleep. It also has cognitive effects: it has an impact on decisionmaking, creativity, memory, and performance in school.

Sleep-deprived children are also more likely to be overactive and noncompliant. And sleep problems can have an incredible effect on the entire family—the parents get cranky and irritable, too. A child's sleep problem is a family problem.

Dr. Chervin: The interesting thing is that when sleep is poor, children won't necessarily look sleepy during the day. Sometimes they have ADHD (attention deficit hyperactivity disorder) symptoms: inattention, hyperactivity and impulsiveness. They need to create a stimulating environment to keep themselves awake, because they need to stay awake to learn. They will do anything to change their environment, including displaying aggressive behavior.

It isn't surprising that children spend a third of their day sleeping. If their brain isn't able to use sleep for the restorative processes it needs to, then it will function during the waking hours to stay awake in able to learn.

Dr. Fallone: As kids progress through adolescence, they tend to get less and less sleep on school nights. This trend has been observed in many different countries. What are the developmental and physiological

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implications of that? What are the issues relating to circadian rhythm and "morningness" (which describes a person who is more alert early in the day) and "eveningness" (someone who is most alert later in the day)?

Dr. Rosen: The difficulty with this is that the relationship between academic behavior and sleep problems can go both ways. It can be causal; sleep problems can cause behavior and academic problems. What is less well recognized by parents and healthcare providers is that it is common—and may be even more common—that there is a coincidental relationship between sleep problems and behavioral problems. It is very rare that you fix the sleep problem and the behavioral problem goes away.

What are some of the most common sleep problems in children?

Dr. Owens: One of the sleep problems that has received the most attention is obstructive sleep apnea (OSA) and the relationship to ADHD-type symptoms. Not only is there an overlap between symptoms of OSA and those of ADHD (inattention, hyperactivity, distractibility) but the data suggest that when you treat a child with OSA, usually through removal of the adenoids or tonsils, the child sleeps better and the daytime symptoms are reduced.

Another emerging area of research is inadequate or insufficient sleep not only in adolescents but in middle school and younger students as well. Although these types of studies are difficult to conduct, there is evidence that links sleep deprivation in children and parental perception of behavioral problems, performance on psychological tests measuring reaction time, vigilance and working memory. One study shows verbal creativity is negatively impacted by sleep deprivation.

Dr. Pelayo: Sleeping should be refreshing. If a child wakes up tired, there may be a problem. Children also shouldn't be sleeping in on the weekends. This may signal that the child is trying to make up for lost sleep during the week. Snoring can also be a sign of a problem. Not all snoring is sleep apnea, but routine, habitual snoring is not normal for children.

What should parents and teachers do if they suspect sleep problems in children?

Dr. Meltzer: If your infant or toddler is overtired during the day, he or she should have a set sleep schedule, including an early bedtime and a daily nap. Sometimes when the younger child stays up late or misses a daily nap, it can be harder for them to fall asleep at night. Teachers should look for children who are frequently yawning or falling asleep in class. If they observe this behavior, they should notify the child's parents.

Dr. Owens: It is particularly important that both teachers and parents recognize that there may be that connection between sleep problems and behavior problems. When a potential problem is recognized, parents should seek professional help from their pediatrician. In many cases, daytime behavioral problems may improve once the sleep problem is addressed.

What should pediatricians and other children's health care providers do?

Dr. Broch: A recent study at a pediatric clinic showed that health providers tended to overlook sleep problems in children, as is the case in the adult population. I suggest that physicians ask their patients about their sleep and become educated about sleep disorders. They should know that sleep is an important part of health and medicine.

Dr. Owens: Every child with behavior/mood problems may have a sleep problem. Pediatricians should screen for sleep problems, but often they do not. When their patients get past the toddler stage, they tend not to. They should have a systematic way to ask about bedtime, wake time, and fragmented sleep, as well as excessive daytime sleepiness, awakenings at night, regularity and duration of sleep, and snoring.



Dr. Rosen: In dealing with other physicians, I just try to get sleep on their screen. Kids are "normally" nearly perfect sleepers, so anything that's different from that is not normal. If the kid is snoring or waking frequently during the night, that's not normal.

This article was published in the Spring 2004, Volume 6, Issue 2 of sleepmatters.

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### Sleep research

<https://www.nytimes.com/2017/09/04/well/family/relationship-problems-try-getting-more-sleep.html>

## Relationship Problems? Try Getting More Sleep

By TARA PARKER-POPE SEPT. 4, 2017

It started as a simple conversation about a child's birthday party. But it quickly escalated into a full-blown marital rift. She accused him of neglecting the family. He said she was yelling.

*"Whatever," she said. "Go. Go."*

*"Go where?" he replied.*

*"I don't know," she told him. "I don't want to talk to you anymore."*

The bickering parents were among 43 couples taking part in an Ohio State University study exploring how marital interactions influence a person's health. Every couple in the study — just like couples in the real world — had experienced some form of routine marital conflict. Hot-button topics included managing money, spending time together as a family or an in-law intruding on the relationship.

But while marital spats were universal among the couples, how they handled them was not. Some couples argued constructively and even with kindness, while others — like the couple fighting about the birthday party — were hostile and negative.

What made the difference? The hostile couples were most likely to be those who weren't getting much sleep. "When people have slept less, it's a little like looking at the world through dark glasses," said [Janice Kiecolt-Glaser](#), a longtime relationship scientist and director of the Ohio State Institute for Behavioral Medicine Research. "Their moods are poorer. We're grumpier. Lack of sleep hurts the relationship."

The men and women in the study had been married from three to 27 years. They reported varying amounts of sleep — anywhere from three and a half to nine hours a night. Each couple made two visits to the lab, where the partners were prodded to talk about the issues that caused the most conflict in their relationship. Then the researchers analyzed videos of their exchanges using well-established scoring techniques to assess positive and negative interactions and hostile and constructive responses. After all the data were parsed, a clear pattern emerged.

Couples were more likely to be hostile — like the couple fighting about the child's birthday party — when both partners were functioning on less than seven hours of sleep.

Notably, the couples with more than seven hours of sleep still argued with each other, but the tone of their conflict was different. Consider this couple discussing concerns about spending and budget challenges.

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*“Do you want to try taking over the budget?”*

*“I can’t. I don’t want to.”*

*“I understand.”*

*“You’re just being too accepting. You can tell me I’m crazy.”*

*“You’re not crazy.”*

Although the couple had indicated they regularly argued about money issues, getting adequate sleep seemed to give them the patience to approach conflict in a constructive way.

“It’s not the fact that the couples were disagreeing,” Dr. Kiecolt-Glaser said. “It’s the lack of sleep and the way in which they disagreed.”

She continued: “The better functioning couples could do it with humor and kindness but clearly still disagree. The poorer functioning couples could get pretty nasty.”

The notion that better sleep makes a better marriage isn’t entirely new. A large body of research suggests that sleep-deprived people are more unpleasant and even hostile in their social interactions than those who get adequate sleep. People tend to [use more negative words](#) when they are sleep deprived than on days when they have had a full night’s sleep. [A 2010 study](#) found that men were more likely to fight with their wives after a night of disturbed sleep. [In a 2014 study](#), couples who reported poor sleep during a two-week period reported more daily marital conflict than those who got better sleep.

But the Ohio State study went a step further to measure how marital discord combined with sleep deprivation can become toxic to a person’s health. Each partner in the study also gave blood samples, before and after the fight with their spouse. The samples were to measure markers of inflammation, which has been linked with heart disease, cancer and other health problems.

The study found that when married partners got less sleep, not only were they more likely to have hostile conflicts, but they also had higher levels of inflammatory proteins in their blood after those conflicts. In short, marital discord is more toxic to your body when you haven’t gotten enough sleep.

“Lack of sleep not only hurts the relationship,” said Dr. Kiecolt-Glaser, the senior author on the study, which was published in May in the journal [Psychoneuroendocrinology](#). “It makes relationship conflict harder on the body.”

There was some good news from the study. When one partner got more rest, it was possible to mitigate the impact of sleep deprivation on the other partner. Couples with one rested partner were less likely to engage in hostile exchanges than when both partners were sleep deprived.

“Sleep and conflict worked together to increase inflammation, but both partners’ sleep mattered,” said Stephanie Wilson, the study’s lead author and a postdoctoral fellow at Ohio State. “When one person was rested, it protected the couple from being more nasty to each other.”

Sleep problems in a relationship aren’t uncommon. The [National Sleep Foundation](#) found that nearly 25 percent of couples sleep in separate beds. [Other research](#) shows that having a bed partner affects how much and how well a person sleeps. And when one relationship partner doesn’t sleep well, his or her partner is more likely to report [poor health and well-being](#).

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While the recent study examined only heterosexual married couples, the findings likely are relevant to all couples, including cohabiting couples and gay and lesbian partners. “These are universal relationship processes,” said Dr. Wilson. “Just knowing these effects can happen can help people keep in mind the importance of getting a good night’s sleep and treading carefully with conflict.”

The lesson, say the study authors, is that before concluding a relationship is in trouble, couples who regularly experience conflict should take stock not only of the relationship and how they are managing conflict, but also of their sleep habits.

“Losing sleep here and there and coming across interpersonal tensions in daily life is really common for people,” Dr. Wilson said. “These are small vulnerabilities that may add up. It teaches you the importance of getting rested every night and handling disagreements in a mindful way.”

A version of this article appears in print on September 5, 2017, on Page D4 of the New York edition with the headline: To Bicker Less, Shut Your Eyes .... [Order Reprints](#) | [Today's Paper](#) | [Subscribe](#)

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## **New Research Links Good Sleep to Good Health Lack of sleep may contribute to obesity, heart disease and frequent colds**

By: Sid Kirchheimer | Source: AARP Bulletin Today | March 20, 2009

The country’s financial woes have found their way into the bedroom.

Poll results released by the National Sleep Foundation (NSF) in early March find that one-third of Americans are losing sleep over worries about the economy, personal finances and health care costs. The restless nights might be harming their health as well.

It’s no secret that sleep is essential to health—it rests the body, renews the brain and produces higher levels of certain beneficial hormones. Unfortunately, getting those often-recommended seven to eight hours of sound, restful sleep—night after night—may be something you can only dream about.

By around age 60, it may take even longer to fall asleep—and stay asleep. The NSF says that nearly half of older people report they have insomnia several nights a week or more.

Sometimes, bad sleep is the result of health conditions—from those midnight bathroom breaks triggered by an enlarged prostate to the pain of arthritis, fibromyalgia and other ailments. But even perfectly healthy people in their later years may find themselves dosing off in the daytime and tossing and turning at night.

“As you age, different physiologic processes take place in the body that affect sleep,” explains Aparajitha Verma, M.D., medical director of the Sleep Disorders Center at the Methodist Hospital in Houston. “The

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circadian rhythm of older people—your internal body clock—changes, so you may be sleepier in the daytime and have lower sleep efficiency at night.”

But that may be OK, say some experts. In one study published last August in *Current Biology*, researchers from Harvard’s Brigham and Women’s Hospital and from the United Kingdom reported that otherwise healthy people sleep less as they get older because they need less shut-eye—about 1.5 hours less per night for those in their 60s compared with twentysomethings. Why less sleep? Because of a shifting circadian rhythm, more daytime napping and, often, a lower daytime expenditure of energy.

“Some people need more sleep, some people need less: A specific person’s individual sleep requirement is just that—very individual,” notes Verma. “But for most people, it’s clear that not getting seven or eight hours a night consistently is related to several health issues such as problems with memory, concentration and learning; poorer physical performance; and a greater risk of traffic accidents.”

But in recent months, several studies provide more evidence that failing to consistently meet the goal of seven to eight hours may further impact some already dangerous age-related conditions:

**Blood vessels.** Artery-stiffening calcium deposits are twice as likely to occur in people who sleep five to seven hours per night, finds a study published last December in the *Journal of the American Medical Association* that tracked 495 middle-age men and women for five years. But increasing sleep just one hour per night may cut this risk by about a third—the equivalent of a 16-point drop in blood pressure.

The links between sleep and artery health are still being explored but senior researcher Diane Lauderdale of the University of Chicago has some theories. “Blood pressure tends to dip during sleep, so it’s possible that sleeping longer means that people have relatively lower blood pressure during a 24-hour period,” she says. “Also, when people are sleep deprived, that may release high levels of stress hormones such as cortisol, which we know is a risk factor for heart disease.”

**Cholesterol.** It’s not clear why, but older people who sleep less than seven hours per night—or more than eight hours—may have higher cholesterol, and lower levels of heart-healthy HDLs, observed Dutch researchers in the November/December 2008 issue of *Psychosomatic Medicine*. Their study included 768 men and women age 57 and older, none of whom were taking statin drugs.

**Heart disease.** After tracking more than 58,000 Chinese men and women age 45 and older in Singapore, researchers found that during their 13-year study, those getting less than five hours of sleep—or more than nine hours—were up to twice as likely to die from heart disease compared with those getting about seven hours a night. Researchers who published their study last year in the *American Journal of Epidemiology* found this link independent of known risk factors such as smoking and obesity.

**Colds and respiratory illness.** The less sleep you get, the more vulnerable you are to the common cold. In addition, a recent team from three universities—Carnegie Mellon, the University of Pittsburgh and the University of Virginia—wrote in *Archives of Internal Medicine* that people who get less than seven hours per night are three times more likely to develop respiratory illness after a cold than those sleeping eight hours or more. Researchers suspect that lack of sleep interferes with infection-fighting mechanisms.

**Obesity.** Emerging evidence suggests that getting too little sleep may play a key role in an expanding waistline, which factors into heart disease, diabetes and other health problems. “We know there’s more daytime snacking in people who are sleep-deprived,” notes Verma, “because sleep helps regulate two

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hormones affecting appetite—ghrelin, which tells the brain you need to eat more, especially cravings for poor carbohydrate choices; and leptin, which tells the brain that you're full. People who don't sleep enough have higher levels of ghrelin.”

In one study presented at a meeting of sleep specialists last year, University of Chicago researchers noted that participants limited to 5.5 hours of sleep per night consumed about 200 extra calories per day on snacks alone compared with those who had “normal” sleep patterns. Other research has found that people who sleep more than nine hours a night are also more likely to be obese.

Diabetes. People who sleep less than six hours a night appear to have a higher risk of developing abnormal blood sugar levels that can lead to type 2 diabetes, according to a study presented March 11 at an American Heart Association conference in Palm Harbor, Fla. Researchers followed 1,455 people over six years and found that those who slept less than six hours a night were nearly five times more likely to develop impaired fasting glucose than those who slept six to eight hours a night.

So how can you better ensure a sound night's sleep? Some suggestions from Verma:

\* Get a checkup. Both insomnia and daytime sleepiness are often caused by an underlying medical problem, says Verma. Common culprits include anxiety and depression, as well as sleep apnea—which is “very common, but often undiagnosed, in post-menopausal women.”

\* Avoid sleep aids. Prescription medications offer temporary relief, but can quickly lose their efficacy. “Then they produce a rebound effect so you need them to sleep well,” say Verma. They also can cause dangerous interactions with other medications and some can cause drug dependence.

\* Practice stress management. Studies show that adults who regularly practice tai chi, yoga or other types of mood-boosting exercise sleep better. “Strong family networks and other social interactions also help improve sleep,” notes Verma.

\* Nix the nightcap. Avoid alcohol within four to six hours of bedtime; it can cause “fragmented” sleep when metabolized. Caffeine can also keep you up and worsen restless legs syndrome, which triggers a powerful urge to move your legs (waking you and your bedmate) and can cause a tingling or burning sensation.

- Time your naps. If you regularly take daytime naps, limit them to 15 to 30 minutes. Any longer and they'll likely affect nighttime sleep or could indicate an underlying health problem.

End Article.

### **Sleep article:**

[http://www.huffingtonpost.com/2012/12/10/health-decisions-decision-health\\_n\\_2019378.html](http://www.huffingtonpost.com/2012/12/10/health-decisions-decision-health_n_2019378.html)

### **Sleep vs. Exercise**

**The dilemma:** If one more person reminds us of the connection between inadequate sleep and weight gain,

we're going to slug them with a pillow. Equally frustrating is the fact that fitness pros, including Bob Greene, advise getting our recommended 30 minutes of exercise out of the way first thing in the morning, at the same time that we think we should be making up for our sleep deficits. So if we have only one free hour in our day, where should we spend it -- in bed, or in spin class?

**The advice:** Sam Sugar, MD, says this comes up all the time at the Pritikin Longevity Center & Spa, where he's the director of sleep services, and where twice-daily exercise is part of the program. Sugar points out that the scientific literature is extremely clear about the dangers of sleep loss.

**"Even one night of short-changed sleep can be bad for your health," he says, and excessive sleeplessness can result in increases in blood pressure, cholesterol and blood sugar -- as well as weight gain. Missing one or even two workouts doesn't have the same magnitude of negative effects.**

At the minimum, Sugar recommends getting six and a half to eight hours of sleep every night, while squeezing in exercise at least three times a week.

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## **Chronic Stress Changes Immune Cell Genes, Leading To Inflammation: Study**

Posted: 11/07/2013 5:15 pm EST

[http://www.huffingtonpost.com/2013/11/07/chronic-stress-health-inflammation-genes\\_n\\_4226420.html](http://www.huffingtonpost.com/2013/11/07/chronic-stress-health-inflammation-genes_n_4226420.html)

A new study provides a better understanding of why chronic stress leads to high levels of inflammation in the body.

Researchers found that chronic stress changes gene activity of immune cells before they enter the bloodstream so that they're ready to fight infection or trauma -- even when there is no infection or trauma to fight. This then leads to increased inflammation.

This phenomenon was seen in mice, as well as in blood samples from people with poor socioeconomic statuses (a predictor of chronic stress), reported the researchers from Ohio State University, the University of California, Los Angeles, Northwestern University and the University of British Columbia.

"There is a stress-induced alteration in the bone marrow in both our mouse model and in chronically stressed humans that selects for a cell that's [going to be pro-inflammatory](#)," study researcher John Sheridan, a professor at Ohio State University and associate director of the university's Institute for Behavioral Medicine Research, said in a statement. "So what this suggests is that if you're working for a really bad boss over a long period of time, that experience may play out at the level of gene expression in your immune system."

Inflammation isn't always bad, particularly [acute inflammation](#) in response to an injury or infection. But [chronic inflammation](#), on the other hand, has been linked with a range of conditions such as heart disease, [depression](#) and even cancer.

For the mouse part of this study, published in the [journal Proceedings of the National Academy of Sciences](#), researchers induced chronic stress in mice by having a bunch of male mice live together for a certain period

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of time. This time was enough for the mice to establish a hierarchy. Then, they introduced an aggressive male mouse to this group for periods of two hours to induce chronic stress in the mice.

After that, researchers looked at the immune cells circulating in the stressed mice's blood stream, and found that they had four times the frequency of immune cells in their blood and spleen, versus non-stressed mice.

Researchers completed genome-wide analysis of the immune cells taken from the stressed mice's blood. They found that compared with the non-stressed mice, 3,000 genes in the stressed mice's immune cells were either expressed at higher or lower levels -- and 1,142 of the up-regulated genes played a role in making the immune cells become more inflammatory.

Similar results were found in humans. The University of California, Los Angeles researchers looked at blood samples from both the stressed mice, as well as humans who came from differing socioeconomic statuses. Just like in the mouse part of the experiment, 387 genes were identified that had differences in activity between the people who came from low socioeconomic backgrounds and those who came from high socioeconomic backgrounds. And just like in the mice, the up-regulated genes in those who came from low socioeconomic backgrounds were pro-inflammatory.

In addition, a third of the genes that seemed to be affected by chronic stress were the same in both the humans and mice.

"This study provides a nice mechanism for how psychology impacts biology," study researcher Nicole Powell, a research scientist in oral biology at Ohio State University, said in a statement. "Other studies have indicated that these cells are more inflammatory; our work shows that these cells are primed at the level of the gene, and it's directly due to the sympathetic nervous system."

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## The Case for Sleep Medicine

By GAYLE GREENE

Published: March 24, 2012

<https://bmjopen.bmj.com/content/2/1/e000850>

**ACCORDING to a new study in the journal BMJ that has received wide media coverage, people who regularly took sleeping pills were nearly five times more likely to die over a two and a half year period than those who didn't take them.**

**Results** As predicted, patients prescribed any hypnotic had substantially elevated hazards of dying compared to those prescribed no hypnotics.

Related:

- [The Consumer: New Worries About Sleeping Pills](#) (March 12, 2012)



As the pioneering sleep scientist William Dement has argued, sleep is “the most important predictor of how long you will live — perhaps more important than [smoking](#), exercise or [high blood pressure](#).”

Sleep deprivation ratchets up the stress system, leaving you more susceptible to even relatively mild sources of strain. When University of Chicago researchers led by Eve Van Cauter deprived young, healthy people of a few hours of sleep for six nights, they produced in them the hormonal profiles of much older people: higher levels of stress hormones and lower levels of [growth hormone](#) (essential to cell repair). The study’s participants developed hormonal imbalances conducive to weight gain and levels of insulin resistance like those of people with [diabetes](#).

Loss of sleep also compromises immune resistance and leaves you more vulnerable to everything from the [common cold](#) to [cancer](#). In a University of Chicago study led by Karine Spiegel, participants whose sleep was restricted to four hours a night for six nights had, when vaccinated for [influenza](#), less than half the [immune response](#) of those who had slept well. Michael Irwin and colleagues at the University of California, Los Angeles found that even modest sleep loss — only one night, between 3 and 6 a.m. — significantly reduced white blood cell activity, a crucial line of defense against infection and cancer.

Then there are the ravages of sleep deprivation on the mind and mood. After a night with four hours sleep or less, some people can’t think, can’t work, can barely string words together to make a sentence. Sleep deprivation undermines focus, creativity, motivation and judgment, and leads to a wide range of emotional disturbances including volatility, impulsivity and depression. Studies show that insomniacs have a hard time getting jobs, performing at jobs and holding on to jobs, let alone building careers.

The drawbacks to sleep medication are real. These medications alter sleep cycles, so that the sleep they provide may not have the deep restorative benefits of natural sleep. They adversely affect memory and coordination, which can be bad news for the elderly, the group that takes them most. And you can develop a tolerance to them, causing you to take larger and larger doses to get the same effect. But the sleep they provide may make the difference between having a life or not.

The study in BMJ alludes to “the meager benefits” of sleep medications and the greater success of behavioral methods of dealing with [insomnia](#), which include things like going to bed and getting up at set times and using the bed only for sleep.

It’s not fun to rely on medications that carry risks. Nor is it fun to rely on doctors who are often not very sympathetic or knowledgeable about sleep, whose medical training is a hazing in sleep deprivation, and who often pride themselves on how little sleep they need. Insomniacs need doctors who will work with us to troubleshoot our condition; we do not need doctors who have been scared into a one-size-fits-all solution, when one size so obviously does not fit all.

We need to be allowed to work out our own terms with sleep and balance one set of risks against the other, so we can get on with our lives.

Full article:

<http://www.nytimes.com/2012/03/25/opinion/sunday/the-case-for-sleep-medicine.html?partner=rssnyt&emc=rss>



## Rocking Studies, General

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