

The Role of Material Selection and Design on the Sleep Quality and Performance of Bedding Products

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Abstract

This paper provides a comprehensive review of the role played by bedding materials and bedding infrastructure on the sleep quality and the general feeling of restfulness and relaxation experienced by the sleeper. It covers the influence of some common design aspects of mattresses, pillows and sheets and how they relate to the satisfaction and comfort level experienced by people who practice one of three common sleeping modes. It also describes the role played by the materials used in bedding articles and the maintenance practices employed during end use on their durability and sleep performance metrics.

Keywords: Sleep quality; Bedding products; Mattresses; Pillows; Sheets; Quality; Materials

How Extensive and Common is the Sleep Deprivation Problem [1]?

A recent poll taken by the US National Sleep Foundation illustrates the wide-spread prevalence and the severity of the sleep deprivation problem. Twenty percent of American adults reported being sleepy during the day to the extent that it interfered with their daily activities at least a few times a week. A frightening 17% reported falling asleep while driving within the last year. The risk of sleep-related accidents is compounded by the fact that people are unable to judge the likelihood that they will fall asleep, and by the related misconception that falling asleep is a slow process. In fact, it has been shown that sleep-deprived people commonly enter the so-called 'microsleep' states, where they fall asleep for brief episodes lasting several seconds, during which time they are perceptually 'blind', often unaware that they have fallen asleep.

Can Mattresses Influence Sleep Quality and Health? How Do You Realize that Your Mattress Could be Taking a Toll on Your Sleep [2]?

People often ask if the mattress a person sleeps on can affect his/her sleep quality and health. The answer to this question is a resounding YES. One's own bed, chosen based on his/her own perception of comfort and relaxation can improve health and general wellbeing by improving sleep quality. Following are some clues to identify and attribute sleep related problems to your mattress:

- Do you often wake up with a feeling of restlessness?
- Do you sleep better on a different bed, for example at a hotel or at a relative's home?
- Can you sense lumps, springs, or sagging in your mattress?
- Do you have to lie on a particular area in your mattress to fall in sleep?
- Is it almost as easy for you to fall asleep on the sofa as it is in your own bed?
- Does your mattress make any sound when you move in the bed?

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g. If you have said yes to any of the above questions, then your mattress could be affecting your sleep quality.

Quantity of sleep and quality of sleep are two different things

Sleep is crucial to quality of life. In today's fast-paced society, there is simply too much to do and not enough time. Yet our bodies still require sufficient sleep to regenerate each day to give us sufficient energy for the next day. If you suspect that your mattress is giving you less than stellar sleep health, then it's time for a new mattress. People often make the common mistake of confusing the quantity of sleep with quality. If your mattress fails to properly support your spine, then even a long night's sleep will not make you feel rested. You may even wake up in the morning experiencing back pain. In contrast, you'll be able to feel fully rested and refreshed when you use a mattress that is best suited for you, even if you get fewer hours of sleep. In that case, just imagine how fantastic a long sleep on the perfect mattress would feel!

What is the perfect mattress?

Everyone is unique, so there is no one-size-fits-all solution to the perfect mattress. There are several factors to consider when deciding which mattress is the most appropriate for you. The most important factor is one's own comfort, and the only way to determine that is to actually lie on a mattress to test it out. Although one can try out the mattress in the showroom, top mattress and

bedding stores will offer in-home trial. This is where one can actually test out the mattress for up to 100 days in one's own home. If you are not entirely satisfied, the bedding store should be able to change it for you. The idea here is to be certain that at the end of the day, you have the perfect mattress for you. However, before even getting to the point of an in-home trial, you may want to find out more online or at a bedding store about the different types of mattress materials. They all have different pros and cons, but if it has been a long time since you were last in the market for a mattress, you should be aware that new and improved materials may have become available after your last purchase. Some of these materials offer enhanced comfort, durability, mold and allergen resistance.

Under every perfect mattress is its own unique base

If you have the financial means, consider purchasing a new bed base along with a new mattress to reap the best benefit of sleep quality. A mattress will perform to its best when placed on a new bed base that is intended for use with the particular mattress model. On the other hand, even the best mattress cannot help but sag if the bed base is sagging. In warm and humid climates, the European style of adjustable sprung slatted bed base (shown in Figure 1 above) may be beneficial. This is because the slats allow excellent airflow to maintain the hygiene and cooler temperature, while simultaneously offering natural springiness for optimal mattress support and comfort.



Figure 1: Bed with a black colored slatted bed base that helps to relieve pressure with aligned spinal cord.

Regaining your sleep health

Ultimately, while the mattress upon which you sleep comprises one of the most important parts of your sleep health, it is not the only part. You could purchase a new mattress only to stay awake much of the night because you have had a lot of coffee that day. So make sure you exercise sensibly, set a regular bedtime most days when possible, and ensure your room is sufficiently dark during bedtime. When you regain your sleep health, you will feel better and healthier. You'll be able to fight off infections better, be more

effective at work, and drive more safely. Not only will this increased well-being benefit you, but your improved mood and outlook will also benefit your relationships with others.

Seven Facts of Sleep Revealed by Recent Research [3]

The 'Huffpost' published in the US calls sleep as "third pillar" of health, along with nutrition and exercise. Getting the quality sleep that you need has the power to protect your physical and mental

health, while skipping out on sleep can seriously hurt your health, cognition, and well-being over time. Research work reviewed by Huffpost reveals the following facts:

A sleeping brain is an active brain

While you're resting, your brain is actually in a highly active state. It processes complex information and even prepares for future actions when you're unconscious, according to a study published in the journal 'Current Biology'. Sleep also creates new memories and consolidates older memories for easier retrieval. A series of studies conducted by researchers at the University of Rochester found that the brain is busy doing some house-cleaning while we're asleep, clearing out damaging toxins that can contribute to neurodegeneration.

Sleep is an important key to health

Chronic sleep loss can lead to scary negative health impacts, including heart disease, heart attack, high blood pressure, diabetes, obesity, stroke, high mortality, depression and anxiety. Sleep loss has even been linked to an increased risk for colorectal and breast cancer.

There are perks to being an early bird

There is sufficient scientific evidence suggesting that being a morning person carries a number of benefits for health and cognition. Research has suggested that morning people have trimmer waistlines and motivated, "go-getter" personalities. It also revealed that they are more likely to exercise than evening people. One particular study, published in 2012 in the journal *Emotion*, even found that morning people experience more positive feelings and greater sense of overall well-being compared night owls.

Scientists have discovered how to "reset" the brain's biological clock

There's a biological clock in your brain that controls your 24-hour rhythms of sleeping and waking, and neuroscientists at Vanderbilt University have recently found a way to manipulate it. By stimulating the tiny brain region that contains the brain's biological clock, the researchers were able to change mice's rhythms of sleep and activity so that they fell asleep during the time they would usually be staying awake and vice versa. This discovery could pave the way for more effective treatments for seasonal affective disorder, jet lag and the negative health impacts of shift work.

Smartphones are hurting our sleep

If you want good sleep, keep your devices out of the bedroom—that's the conclusion of a wealth of new research on the effects of smartphones on stress levels and sleep quality. Roughly one-in-four 18- to 24-year-olds say that they don't sleep as well because of technology, according to a 2012 poll. A 2013 Mayo Clinic study found that the bright light emitted by smartphones and tablets can disrupt sleep by interfering with the production of melatonin, a hormone that plays an important role in sleep-wake cycles. Research from Michigan State University found that people who regularly use their smartphones for work purposes after 9 p.m. are more tired and less engaged at work the next day.

Sleep loss can impair judgment

Just like you shouldn't swim after eating, you shouldn't make big decisions after a sleepless night. A growing body of research has shown that sleep loss can affect cognition in a way that hinders our judgment and decision-making abilities. A 2007 study found that sleep deprivation harms a person's decision-making by making the person exhibit increased expectation of gains and reduced expectation of possible losses. Eight years later, another study found that sleep loss impairs important aspects of decision-making in "high-stakes, real-world situations".

Shift work can be detrimental to sleep

Many researchers have shown that a job that disrupts your natural sleep patterns can pose a major risk to your well-being. 'Shift Work Sleep Disorder' has been recognized as a medical condition that is common among the roughly 20 percent of the U.S. population engaged in shift work.

The Required Sleep Duration is Different for Different Age Groups [4]

An 18-member multidisciplinary expert panel constituted by 'The National Sleep Foundation' to recommend sleep durations for different age groups observed that sleep duration requirements vary across the lifespan and from person to person. It made the following sleep duration recommendations for healthy individuals after reviewing related research literature. The appropriate sleep duration for newborns is between 14 and 17 hours, infants between 12 and 15 hours, toddlers between 11 and 14 hours, preschoolers between 10 and 13 hours, and school-aged children between 9 and 11 hours. For teenagers, 8 to 10 hours was considered appropriate. For young adults, 7 to 9 hours was considered appropriate while for older adults 7 to 8 hours of sleep was considered adequate.

Does the Color of Hotel Bedding Affect Sleep Quality [5]?

The Huffington Post insists that white bedding used in most hotels encourages better sleep. What makes a hotel bed so comfortable? According to The Huffington Post, it's not the quality of the mattress, the pillows or even the comforter. Rather, it's the color of the bedding. If it's white, then it's more likely to feel right.

Effect of Cold Blast Stimulation through Bedding on the Quality of Sleep [6]

Human sleep is thought to consist of some stages. It depends on the sleep stage whether awaking is pleasant or not. The sleep state changes cyclically, and the change can be checked by measuring the depth of sleep. It is believed that the depth of sleep affects the mood upon awakening and the quality of sleep. This research focused on controlling the sleep cycle by giving a cold blast stimulation in order to improve the quality of sleep. The researchers experimented on their belief that rapid temperature changes in the bed affected the sleep cycle. They gave cold blast stimulations during deep sleep to control the sleep cycle. They concluded that moderately cold temperatures promote quality sleep.

Effects of Interface Pressure Distribution on Human Sleep Quality [7]

High sleep quality promotes efficient performance in the following day. Sleep quality is influenced by environmental factors, such as temperature, light, sound and smell. Here, the researchers investigated whether differences in the interface pressure distribution on healthy individuals during sleep influenced sleep quality. They defined four different pressure models by varying the area of pressure distribution and the resultant subjective feelings that occurred when participants slept on the mattresses. One of the pressure models was associated with “over-concentrated” distribution of pressure; other was characterized by “over-evenly” distributed interface pressure while the other two models exhibited intermediate distribution of pressure. A polysomnography analysis demonstrated an increase in the duration and proportion of non-rapid-eye-movement sleep (stages 3 and 4) as well as decreased number of micro-arousals, in subjects sleeping on models characterized by intermediate pressure distribution as opposed to models with over-concentrated or over-evenly distributed pressure. Similarly, higher scores of self-reported sleep quality were obtained in subjects sleeping on the two models with intermediate pressure distribution. Thus, pressure distribution has been shown to influence sleep quality and self-reported feelings of sleep-related events, though the underlying mechanisms remain unknown.

How to Wash Your Bedding the Right Way [8]

A person sleeping for 8 hours per day on average spends one third of his/her life in bed. That equals almost sixty hours per week of sweat, dead skin cells, and body oils in our sheets. We should be washing that crud away on a regular basis to help us stay healthy and keep our beds a haven for quality sleep, but how often is a “regular basis”? According to Whirlpool’s Institute of Home Science, there are some tried and true hacks for getting the most out of washing your bedding. Following their expert advice will not only give you cleaner sheets, it will also help them last longer. If you want to keep dust mites and other allergens at bay, you should be washing your sheets and pillowcases once a week.

Loading the washer

Don’t jam too much bedding into the machine—sheets need more room than clothing to get clean. To avoid tearing and wrinkling, don’t wrap sheets around the washer’s agitator. Wash sheets separately from other items to prevent everything from getting balled up and tangled together.

Choosing the right settings

Cotton bedding should be safe to wash at any temperature, but always check the care instructions on your sheets before tossing them into the machine. Choose the cycle that fits the level of clean that you need – normal for light soil, heavy for stains and extra soil. Don’t over wash. Picking the Ideal Water Temperature: Light-colored and white sheets can be washed at any temperature. Dark bedding should be washed on cool to avoid color fading. During

cold and flu season, all bedding should be washed on the hot/warm cycle to prevent the spread of illness and allergens.

Handling stains on bedding

For small stains, use a stain pre-treater or liquid detergent on the spots to remove soil. Larger stains or dingy sheets should be tackled with chlorine bleach for white bedding or color-safe bleach for darker sheets and pillowcases.

Drying Your Bedding

To avoid wrinkling, shrinking, and the weakening of bedding fibers, set your dryer to “less dry”. Check your sheets when the buzzer sounds to see if they need to be detangled and tossed back in. For extra wrinkle prevention, try adding a couple of tennis balls in an old pillowcase to the load. If you want to go green, consider drying your clothes outside for a fresh smell of the outdoors.

Can Hypoallergenic Bedding Help You to Sleep Better? [9]

Everyone needs a good night’s sleep on a regular basis, but what do you do if your allergies are keeping you from achieving the rest that is vital to your health and well-being? Your allergies don’t turn off when you go to bed, whether you suffer from seasonal or household allergies. If you don’t want to start another morning sneezing, or you can’t stand to spend another night itching, there are ways you get more sleep with hypoallergenic bedding. By converting your bedding to hypoallergenic materials, you can remove allergens from your room and reduce their negative impact on your sleep. Hypoallergenic bedding is made from materials that are resistant to the common allergens. Memory foam pillows are anti-microbial, resisting mold and dust mites. Synthetic polyester is anti-microbial as well and can be combined with memory foam to make mattress pads and pillows. Cotton is naturally hypoallergenic. Cotton also offers the opportunity to get rid of the allergy causing particles through frequent washing. Hypoallergenic bedding can greatly increase the quality of your sleep by reducing congestion, sneezing and itching. Pollen, dust mites, bed bugs and mold are some of the common allergens that can impair sleep quality. Allergy-inducing pollen can be ubiquitous in the spring, residing in our hair, on our clothing and floating through the air. While it can be difficult to eliminate pollen seasonally, there are steps one can take to minimize its effect on sleep quality.

We all shed skin cells throughout the day and also when we sleep. Living on these cells, dust mites and their detritus tend to collect in soft, porous bedding materials. Mold can have a negative impact on allergies. They can also be detrimental to long-term health, with prolonged exposure possibly causing fever and breathing problems. Whether one is allergic to mold or not, it is important to keep mold out of the living environment.

Unlike sheets, mattresses and pillows cannot be easily washed. Therefore, they can harbor allergens within them that stir every time you toss and turn. A mattress cover provides the barrier between the sleeper and the allergens already residing in the bed. A simple

mattress cover such as a slipcover made from hypoallergenic materials can help reduce exposure to allergens present in mattresses and pillows. If you are looking for more protection, mattress covers that encase the entire mattress with a covered zip closure are available. It is also possible to encase the box springs, creating a barrier between the sleeper and any possible allergens lurking in the most difficult to clean parts of the bedding.

Rest your head in hypoallergenic comfort

Consider replacing pillows filled with down or feathers, which can harbor allergy-inducing dander, or other synthetic materials with one of these two options-latex or memory foam pillows which are soft and supportive, or pillows filled with polyester fibers or memory foam chips. Latex pillows are also machine washable, which is a desirable feature if mites and their detritus are among your allergens.

Protect the exterior of your bed with a hypoallergenic comforter

As with pillows, avoid down or feather duvets and comforters. This may mean moving the heirloom comforter to another bed in the house, but it does not mean you have to sacrifice comfort. Look for a comforter made not only from hypoallergenic material like silk, wool, or organic cotton, but also with a high thread count for the best barrier against allergens. The tight weave prevents allergens from being able to reside inside your bed cover. While wool and silk are hypoallergenic and might be fine for a comforter, they are difficult to wash regularly and can therefore harbor dust mites, making them unsuitable for people with mite related allergies. They can also lead to an uncomfortable night's sleep because of how little airflow is allowed by the fabric. Organic cotton is a fiber that is naturally hypoallergenic and convenient to wash and dry, easily withstanding the high heat needed to remove dust mites. If your skin is irritated by man-made fibers, natural organic cotton can offer a comfortable, chemical- and irritant-free alternative to synthetic fibers.

- a. Other allergen reducing measures include:
- b. Keeping all pets from the room you sleep to reduce dander.
- c. Showering nightly before bed to wash off any allergens you might be carrying from the day.
- d. Washing sheets frequently, at least once a week, to remove allergens.
- e. Avoiding drinking alcohol before bed, as it might exacerbate the inflammation associated with allergies.
- f. Reducing indoor humidity with a dehumidifier.

How Does the Age of a Foam Mattress Relate to its Pressure Relief Performance? [10]

Many hospitals have begun replacing their standard mattresses with pressure-reducing foam mattresses to eliminate the costly overlays that have been used for comfort and to protect patients

at risk for development of pressure ulcers. Although researchers have tested the performance of new mattresses and have shown that many may be of use with patients at high risk, no information is available on the pressure-reducing capabilities of used mattresses. This study was designed to evaluate changes with use in the support characteristics of foam-core hospital replacement mattresses. In the first part of the study, interface pressure measurements were made at regular intervals over an extended period of use. Sixty mattresses were randomly selected from 750 mattresses currently in use at St. Luke's Episcopal Hospital, Texas Medical Center, Houston. The mattresses were labeled and marked at three selected points, and interface pressures under a standard load were measured at approximately 3-month intervals for 12 months. Data trends showed that the interface pressures increased at each site during the course of the study; however, an analysis of variance indicated that the changes were not statistically significant during the time frame of the study. It was concluded that no significant changes in interfacial pressure could be found in foam mattresses that were used for 12 months.

Are Your Sheets Getting in the Way of Your Sleep? Some Truths about Bedding [11]

When it comes to improving sleep, activity leading up to bedtime and the quality of the mattress are more frequently discussed factors, but as it turns out, bed sheets and pillowcases could be the reason you are not refreshed when you wake up each morning. Contrary to popular belief, a higher thread count, unto itself, might not be the solution.

Higher thread count doesn't always mean higher quality

Sheets and pillowcases with thread counts greater than 1,000 carry folded yarns which are thicker and often less soft compared to single yarns. For this reason many bedding experts do not recommend thread counts larger than 500 for sheets and pillow covers.

Some materials are cooler than others

100% synthetic fabrics have a tendency to trap heat leading to uncomfortable sleep experience. For this reason, quality cotton fabrics containing Egyptian or Pima cotton are preferred over synthetics. Sateen weaves and the associated soft touch finish are also preferred for their softness and moisture-wicking properties.

New sheets are to be washed before they are used

Make sure that you wash your sheets at least two times before putting them on your bed. Washing not only removes the residual chemicals, if any, but also makes the sheets softer and mores absorbing.

For sleepers with sensitive skin, detergent and bleach may be more problematic than the bedding material

Detergents and bleaches that can be easily washed off without leaving any significant traces on the fabric are preferable for sensitive skins. Organically grown cotton fiber that is subjected to harsh chemical treatments defeats the purpose.

Toss bedding in the laundry basket once every 10 days or so

There's nothing that feels quite like climbing into a clean set of sheets. Therefore, it is worth doing a little extra laundry if you want to get the best rest. It is also necessary to change the bedding more often if you are more active than most.

Seasonal bedding and sleep wear might make a difference

For example, wearing a jersey T-shirt in the wintertime and a much lighter shirt for the summertime makes more sense.

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