



United Home Brands Pillowcase Research 2020

Introduction

To confirm the effects of the YouthSecret spa pillowcase's ability to prevent wrinkles we rely on published research as well as reproducible test data. The substantiation requires looking at two factors independently. The first step is proving that sleep lines can become wrinkles and the second is demonstrating that the YouthSecret spa pillowcase helps prevent these sleep lines from forming. Below we separate the substantiation data and demonstrate these two facts independently.

Sleep lines can become wrinkles

The American Academy of Dermatology (AAD) and WebMD have recognized that sleeping for years on a standard pillowcase can ultimately lead to wrinkles as noted below.

"Resting your face on the (a standard) pillow in the same way every night for years on end leads to wrinkles." - The American Academy of Dermatology (AAD) ¹

"Sleeping in certain positions night after night leads to sleep lines -- wrinkles that don't disappear once you're up". – WebMD April 2011²

The sleep lines referred to are initially temporary creases in the skin that when you are young disappear after a few minutes to within hours of waking up. Sleep lines are a result of shear stresses and direct forces acting on the skin from long term contact from a pillow with a standard pillowcase. When young, your skin has the elasticity that can withstand these pressures. As we age our skin becomes less resilient and these lines become permanent wrinkles, continually increasing in number, length and depth.

This was first researched by Dr. Samuel J. Stegman who wrote an article in The Journal of Cosmetic Surgery³ on "sleep creases" in 1987. He focused mainly on the forehead sleep lines which may develop as three or four waves across the forehead on one or both sides from chronic contact with the pillowcase during the night. Other sleep creases or lines such as the lines along the side of the nose or side of the chin also develop in a similar manner.

Dr. Stegman found that after a few nights without the head pushed into the pillow, the sleep creases were less noticeable. He observed that this could only be accomplished by changing the sleepers position and suggested that the patient attempt to try to train themselves to sleep in such a manner as to minimize facial contact with the pillow.

A second article evaluating sleep lines was published by Dr. Fulton.⁴ Dr. Fulton's article that was published in 1999 confirms Dr. Stegman's findings but offers that filling these lines is not likely to offer long term relief when compression during sleep re-establishes the crease within hours of treatment. Sleep lines will reappear eventually since the underlying behaviour that created them in the first place continues unchanged.

The theory that sleeping on one's face leads to wrinkles was again proven by research published in the Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery⁵. The observations were the following: Plastic surgery must achieve the best cosmetic results, and it helps to consider certain skin lines. Aging and scars can cause the face to become lined, and we have noticed various facial lines among patients or their relations who have come to our outpatient clinic. These lines are sometimes single and there are sometimes 2-3 parallel lines generally in the same area of the face, such as the lateral orbital, temporal, frontal, and buccal regions. After detailed evaluation, we concluded that these oblique or horizontal wrinkles were caused by the position in which they slept. All of them slept prone, with their faces buried in the pillow, which over many years has caused wrinkling of the skin. We think therefore that sleeping position should be considered as an etiological factor in the formation of wrinkles.

Many other Dermatological and Plastic surgery articles that have studied this issue and have arrived at similar conclusions that sleep lines can become wrinkles.

In a study by Gerhardt LC,⁽⁶⁾ it was noted that these factors become increasingly important as we age with the conclusion: "Adhesion is usually assumed to be the dominant factor in skin friction, but our observations imply that deformation is also an important factor in the friction of aged skin. In the elderly, lower skin elasticity and skin turgor are associated with more pronounced skin tissue displacements and greater shear forces during frictional contact, emphasizing the importance of friction reduction in wound-prevention programs."

The YouthSecret Spa Pillowcase prevents sleep line formation

From the above information it has been shown that the forces that create sleep lines are the shear stress on the skin and the direct pressure. The peer reviewed study from Xing, Malcolm M Q for the first time confirms quantitatively that poorly chosen fabric with inappropriate

garment design renders adverse actions on human skin⁷. Since that time there have been numerous published medical articles which demonstrate the correlation between fabric and stresses and their relation to skin injury⁽⁸⁾. One such recent study from Smith G., with 165 patients concluded that low-friction garment products have a role to play in the prevention of skin breakdown, and appear to be both clinically effective and cost effective⁽⁹⁾.

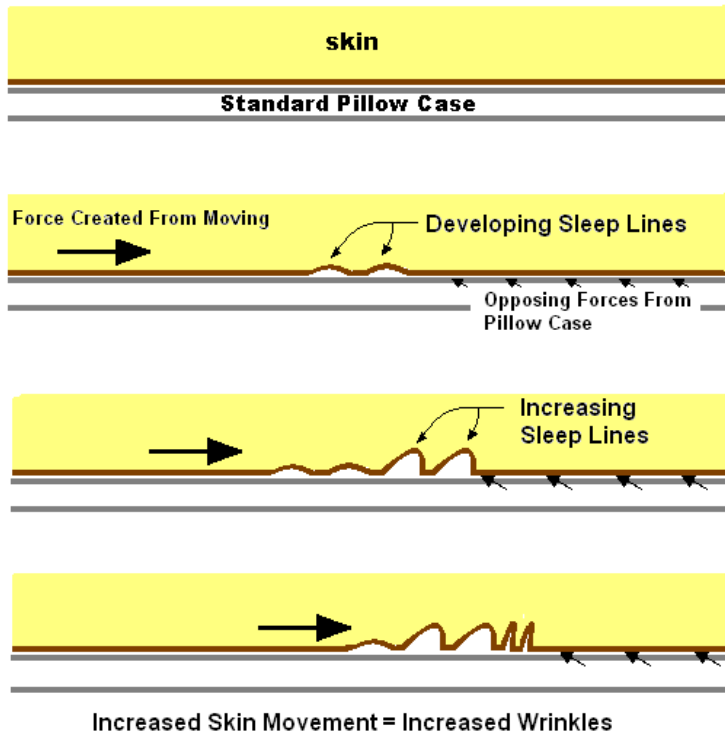
Currently there are many low frictions medical products on the market all used to prevent skin injury. These are commonly used around joints, high pressure regions and what are termed bony protuberances. These are sold by many companies such as Parafriacta (UK)⁽¹⁰⁾ and Tamarack Habilitation Technologies (US)⁽¹¹⁾.

At United Home Brands our solution to creating the anti-wrinkle pillowcase began by working towards eliminating sleep lines. Initially, we reviewed both dermatology research and materials engineering data to understand the forces exerted on the skin. We then identified three external factors (shear, pressure and material bunching) as the root cause of skin lines and using mechanical engineering technique the unique, patent pending YouthSecret solution was designed. The YouthSecret™ Spa pillowcase eliminates the undesired pressures on the skin while maintaining the experience of using a normal feeling pillowcase. Below is a brief description of the data and analysis involved in our design process for the YouthSecret™ Spa Pillowcase.

Analysis of sleep line creating forces on a standard pillowcase:

According to the AAD, wrinkles are a result of both internal forces created from physiologic changes in the skin and external forces such as pressure on the skin surface and environmental factors such as the sun. Our investigation is only directed at understanding and solving the problem of external forces acting on the skin.

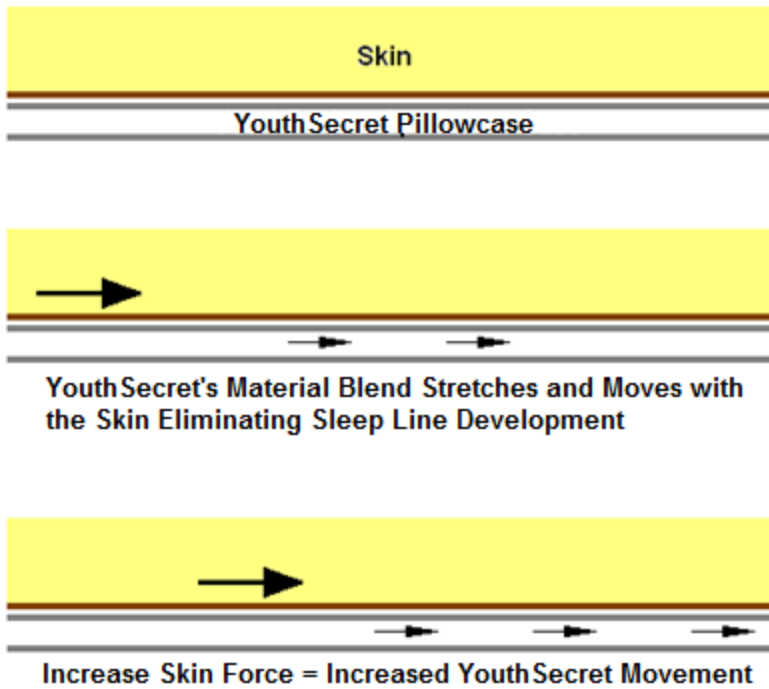
As shown in Fig 1 below, sleep lines caused by shear stress are a result of parallel differential motion of your skin relative to the standard pillowcase. As you move, your skin moves over the standard pillowcase fabric surface and as a result, friction and associated shear stress is created. The shear stress stops region of the skin from moving where it then bunches up and forms creases.



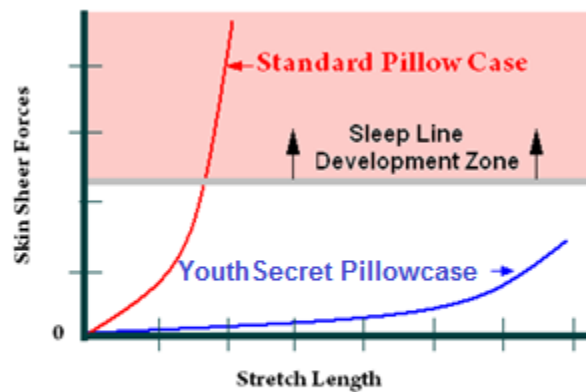
The sleep development has a second component which is the force created by the weight of the head acting in a perpendicular direction to the shear stress. This force then acts upon the sleep line by increasing the pressures further deforming the skin.

YouthSecret Solution

Counteracting the forces of sheer and direct pressure, while keeping the experience of sleeping on a normal pillow, were our design objectives. To eliminate sheer we employed a common mechanical engineering solution using both stretchable materials and low-friction interface that will not allow the build-up of “parallel” pressures. As the skin contacts the fabric blend the pressures that would normally be created and maintained are released due to the material stretching. Therefore, as skinfolds are developing the energy is dissipated and the skin lies flat as can be seen in the figure below.



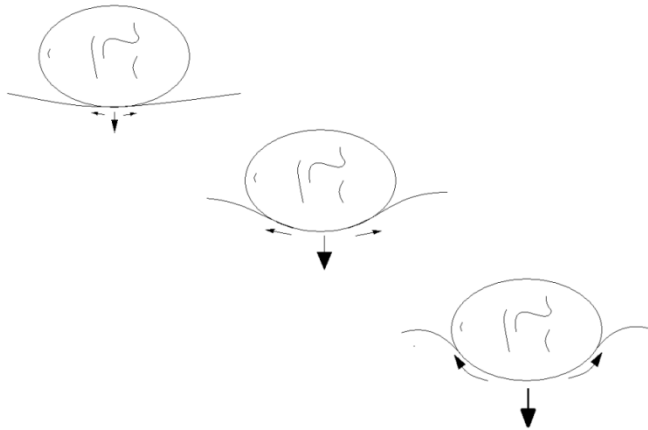
Essentially, as your skin moves our fabric blend stretches and moves with it eliminating sleep lines. In the graph below it can be seen that forces on your skin from a standard pillowcase increase rapidly, beyond the limit for the skin to crease – well above the “sleep line development zone”. The YouthSecret pillowcase stretches and keeps the stress low, below the level required to create skin creasing.



Stress-Strain Relationship without direct forces

Elastic layer, shear stress and direct pressure

A second feature of the stretchable material is that as the direct pressure of the head is applied to the pillow a constant positive shear force is created that works to keep the skin tight. The more direct (perpendicular) force there is, the greater the positive shear becomes to keep your skin tight as shown in Fig. 3 below.



As Pressure from Your Head is Exerted on the Pillow the YouthSecret Blend of Materials Stretches Keeping Your Skin Tight – Further Helping Too eliminate Sleep Lines.

Material Bunching effects

The final factor creating sleep lines is that of material bunching and pressure. When you look at standard pillowcases there are fabric wrinkles that naturally occur due to excess materials. As we sleep we move and this creates waves of material that can “bunch-up” under our skin. This bunched-up material with the exerted pressures of your head result in sleep lines. The YouthSecret pillowcase eliminates bunching to occur as the elastic cover fits tight over a standard pillowcase.

The above etiology and associated sleep line tests considering the construction of an alternate pillowcase design were also describe in the 2012 article from Poljsak et al. below:

Independent Research and United Home Brands Tests

The influence of sleeping on formation of facial wrinkles. ⁽¹²⁾
Poljsak B, Godic A, Lampe T, Dahmane R.
J Cosmet Laser Ther. 2012 Jun;14(3):133-8.

OBJECTIVE: The study addressed the influence of sleep as an important and overlooked contributory factor to the formation and progression of facial wrinkles and an alternative pillow was designed to reduce them.

MATERIALS AND METHODS: Fifteen healthy young participants of both sexes (aged 26-42 years old) volunteered for this study. We used a transparent PVC pillow filled with air to demonstrate mechanical forces and deformations of the face as a consequence of sleeping on a pillow. We used a Podometer (PDMTR) (integrated fluorescent luminaire lamp) as a diagnostic device to visualize and to document the imprint of facial deformities on a glass, as seen during sleeping.

RESULTS: We observed various facial deformities and wrinkles during sleep ('crow's feet' fine lines, lines around the mouth, flattening of the forehead, blunting of the nasofrontal angle, melolabial and nasolabial folds) and designed an alternative pillow to reduce them by redistributing the pressure from the wrinkled parts of the face.

United Home Brands Studies

Trial 1: We performed similar research however needed to provide an “inverse experiment” compared with that of Poljsak B (cited above) in that observations would be needed to visualize the wrinkle formation with the YouthSecret pillowcase. To do this we created an experiment (water bag test) using a sealed bladder of fluid to act as the skin which was placed over the YouthSecret Spa Pillowcase and a standard pillowcase as our control. The bag had a surface area of contact of 16 sq. inches and a total of 2.5 pounds was applied by hand. The pressure was measured by means of a scale beneath the pillow. Linear motion was then applied at a distance of 1inch lateral to either side of the fluid bladder at a rate of 1 cycle per second. Visual measurements were then taken of the number of wrinkle formed per cycle measure of a period of 60 seconds. This was performed using a standard cotton pillowcase and the YouthSecret pillowcase covering a standard pillow. The below data is a result of our studies:

	Standard Pillowcase	YouthSecret Pillowcase	Difference
*Average Wrinkle Count/cycle	4.3	2.2	49%

*15 trials performed at 1 minute intervals using 1cycle/second

To see the YouthSecret “water bag” test follow the link:

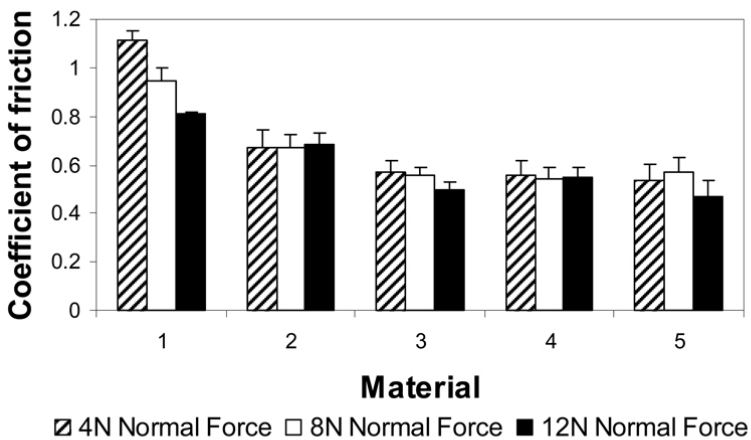
<https://www.youtube.com/watch?v=qQm-xcfsYEI> ⁽¹³⁾

Trial 2: Early data from YouthSecret sleep participant study using alternating night sleep on the YouthSecret Pillowcase and a standard pillowcase demonstrated results showing decrease

sleep line formation. The study followed a single participant through 40 sleep cycles of greater than 45 minutes in the evening after the subject finished work. Although ongoing, the data confirms decrease sleep line formation which was less than the water bag results but still statistically significant at nearly 30% difference between the pillowcases. This data also surprisingly showed that sleep lines were commonly formed on the participants neck which were also decreased to a nearly 20% difference with the YouthSecret pillowcase. Although the facial sleep lines appear to be mostly from friction we are uncertain however if these neck skin lines are due to friction or as a result of the bunching effect as described below.

Claim of “2X Silkier than Silk”

Of course “2x Silkier than Silk” is a marketing term (trademarked) used to illustrate the properties of the pillowcase however it does rely on actual scientific data. The term refers to the difference between the coefficient of friction between silk and skin and our proprietary blend of fabrics. It is an accurate comparison as our design allows the “slip” registered when calculating the coefficient of friction to be between materials as our outer layer stretches and is not intended to “slip” on the skin. The data for the silk-skin coefficient was calculated by the National Institute of Health (NIH) study¹⁴ as 0.68 as shown in the below chart:



Legend: ▨ 4N Normal Force □ 8N Normal Force ■ 12N Normal Force

Coefficients of friction at various normal forces and on different materials: 1=sandpaper, 2=silk, 3=polyester, 4=cotton, 5=rayon. The inter-trial (A) and inter-subject (B) variability is shown as the standard deviation bars. (A) A representative subject. The averages (10 trials) and the standard deviations. (B) The group means (n=12 subjects) and the standard deviations.

YouthSecret fabric blend coefficient of friction was calculated by using the method described by the government publication “Coefficient of friction of fabrics”¹⁵ with serial test results indicating a coefficient of friction between .24 and .31 which is less than half that of silk on skin, hence “2x Silkier than Silk” meaning it is two times slipperier than silk.

For additional verification United Home Brands employed TexTest, a third party fabric testing company to independently verify the friction results discussed above. Sample of the YouthSecret pillowcase were tested in their labs confirming our prior data and even demonstrated lower coefficients of friction in the range of 0.04 to 0.16 for our specific blend of materials. This independent research shows that our materials are actually greater than “5x Silkier than Silk”. This data is available on request.

Conclusion:

Through prior independent research it has been shown that sleep lines can become wrinkles and that sleeping on a standard pillowcase can lead to sleep lines. Numerous studies have shown that proper selection of materials can prevent injury to the skin and many of these materials are used in healthcare today. Many of these products utilize anti-friction/shear combinations of fabrics to eliminate undesirable forces on the skin. We have shown that our patent-pending blend of materials is successful in eliminating the development of sleep lines in our model and participant trials and as such will decrease wrinkle formation.

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