Mr. Michael B. Madonia

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A Solution to Slipping on Yoga Mats

Advanced Materials

Commercialization Plan

Elevator pitch:

Those who do yoga are constantly slipping on their mats due to sweat. As a result, yoga practitioners are unable to perform to their full potential. This problem can be solved with the development of a wax product to be applied to the yoga mat known as Yoga Wax.

Part 2. Executive Summary:

Throughout the yoga community, a common problem persists: the problem of weak traction between that of the mat and the person practicing yoga. When practitioners sweat onto their mats, they lose traction and grip. This problem limits their performance. By utilizing the concepts of surfboard wax, a product which increases the traction between a surfer's feet and his surfboard, a similar wax product can be developed to solve this problem. A solid piece of wax, "Yoga Wax," can be rubbed onto the surface of the mat prior to practicing yoga. Similar to surfboard wax, Yoga Wax will increase the traction between the body's contact points with the mat. With this increased traction, yoga practitioners will feel more steady throughout their classes and have increased confidence. This product will improve practitioner's performances and be sold at a reasonable price, improving overall customer satisfaction.

Part 3. Problem Summary and Proposed Solution:

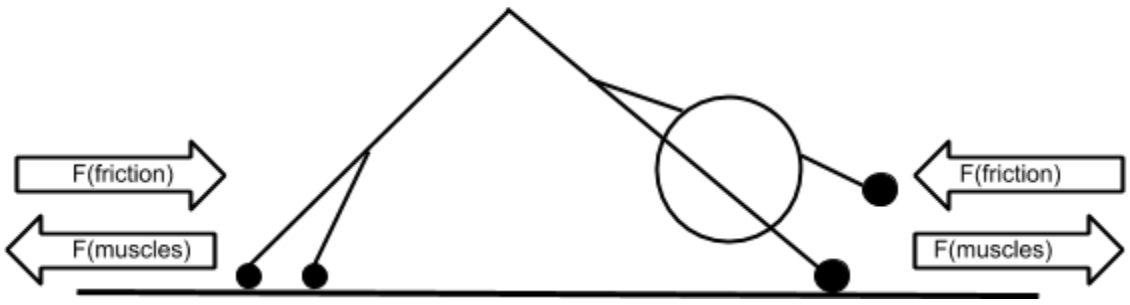
Throughout the yoga community, a common problem persists: the problem of weak traction between that of the mat and the person practicing yoga. As practitioners practice yoga, the poses and positions in which they hold their bodies gradually become more difficult. These strenuous positions require practitioners to have complete confidence in the traction of their mat, or the amount of force they can exert on the mat without slipping. Without this traction, they are unable to hold certain positions. Toward the beginning of a yoga class, traction is usually not an issue because the yoga mat is dry. However, as practitioners move through a class, they begin to sweat. When this sweat accumulates on their mats, practitioners lose traction and are unable to hold certain positions or advance to more difficult positions. An ingenious solution to the problem of slipping on yoga mats already exists within the surfboard community. When surfboarders went out into the ocean for the first time, developing their sport, they most likely experienced traction issues. Slippery water, high speeds, and boards without traction did not provide for a very enjoyable experience. They solved this problem by utilizing surfboard wax to increase the traction between their feet and the board. By utilizing this concept, a product can be developed to similarly meet the needs of the yoga community. This product will be referred to as Yoga Wax. Yoga Wax uses the principles of sliding friction to solve the problem of slipping on

yoga mats. By increasing the traction, practitioner's performances will improve and therefore, overall customer satisfaction will improve as well.

Part 4. Summarize the STEM Concepts and Principles Underlying the Overall Plan:

The solution to the problem of slipping on yoga mats was determined by utilizing the STEM scientific process of inquiry. In order to determine a meaningful project idea, a problem in today's society had to first be identified. The problem identified was slipping on yoga mats. The reason for slipping on yoga mats was then considered and determined to be the reduction of friction due to sweating on yoga mats. The logical solution to this issue would be to increase friction. When a yoga practitioner engages in a certain pose such as downward dog (Figure 1), their muscles provide force outward. In turn, the mat applies a frictional force back toward the force from the muscles. If the force of the practitioner's muscles overcome the frictional force of the mat, the practitioner will slip. By applying Yoga Wax to the mat, the frictional force pushing back towards the force of the muscles is increased so that the practitioner will not slip. With the addition of Yoga Wax, the practitioner will be able to exert more force on the mat without slipping, hold positions longer and advance to more difficult positions.

Figure 1.



Part 5. Commercialization Assessment of the Overall Plan:

Problem, pain point or market opportunity:

The problem of slipping on yoga mats affects any practitioner for whom sweat causes them to become unstable while practicing yoga. According to a study conducted by Sports Marketing Surveys USA, 15.8 million Americans practiced yoga in 2008 compared to 20.4 million in 2012,

indicating a 29% increase in the number of Americans who practice yoga over four years. With an increasing consumer market, Yoga Wax has the potential to reach a very broad audience. With the improved customer satisfaction from Yoga Wax, yoga studios also have the possibility to retain even more students and accelerate the rise in the yoga community population.

Proposed solution:

An ingenious solution to the problem of slipping already exists within the surfboard community. By utilizing the concept of sliding friction as surfboarders did with their surfboard wax, Yoga Wax can be used to prevent slipping on yoga mats. This product will increase the traction present on yoga mats.

Target customers and intended users:

The target customers of this product will be local yoga studios, large sports stores which sell yoga equipment, and internet yoga stores. The targeted customer would retail this product directly to the intended user, yoga students who slip on their mats.

Competitors:

Competitors of Yoga Wax include all companies who currently make products which aim to increase traction with yoga mats. For example, a company called ToeSox, markets an open-toed sock with a grippy sole to provide increased traction to the mat. Other products such as “skidless towels” increase traction through the use of silicone nubs which adhere to the mat. There is also “The Mat” which is marketed to solve all grip problems. This mat employs a moisture-absorbing method along with a polyurethane material to provide traction. The claim is that the absorption of the moisture draws the sweat away from the surface of the mat, keeping the mat drier and increasing traction.

Customer value proposition & competitive advantage:

Although the products retailed by the previously mentioned companies do help to a certain extent, they do not completely solve the problem because yoga practitioners are still slipping. Yoga Wax would work naturally to create more microscopic contact points on the mat and provided a more natural feeling than that of the industry’s current products. Along with a more natural feeling, Yoga Wax would cost significantly less than other current products. Yoga Wax is

estimated to retail to intended users at $15.00, whereas products such as “The Mat” retail for $68.00 (Lululemon, n.d.).

Principle revenue streams expected:

To quantify the possible revenue through the sale of Yoga Wax, several calculations can be made. If Yoga Wax were to be sold at a wholesale value of $10.00 per product and 10 products were sold to 10 local yoga studios (total of 100 products sold), a total revenue of $1,000.00 would be collected. Manufacturing of each product, including packaging materials, labeling, and actual product components would cost approximately $2.64 per product or $264.00 for 100 products. Therefore, the sale of 100 products would result in a net profit of $736.00 ($1,000.00 - $264.00). Additionally, if businesses sold the product to the intended users for $15.00 per product, a $100.00 profit would be collected for every twenty products sold. A spreadsheet of these figures is attached below.

Total Cost Per Product*	Sale Expense (100 Products)	Wholesale Price per Product	Wholesale Revenue (100 products)	Net Profit (100 products)	Retail Price per Product	Retail Store Profit (20 products)
$2.64	$264.00	$10.00	$1,000.00	$736.00	$15.00	$100.00

*Per product price calculated from prices of metal tin container ($0.69), labels ($0.06), and wax compound ($1.89).

Principal startup and operating costs expected to be incurred:

To quantify the possible startup and operating costs of producing Yoga Wax, consumer interest must first be gauged in order to determine the quantity of the initial batch. In order to determine customer interest, a survey has been prepared to be sent to approximately 30 yoga studios in the surrounding area. Each yoga studio will receive a free sample of Yoga Wax along with a survey (attached). The cost of distributing these free samples will be $79.20. After the yoga studios have tried the product, the survey will be sent back to the distributor in a self-addressed and stamped envelope expressing if the studio does or does not have interest in purchasing the product in

order to retail at their store. For example, if 50% of the studios express interest in purchasing Yoga Wax, each company will receive 20 products to stock their inventory. At $2.64 and a total quantity of 300 products, the distributor will need a principal startup amount of $792.00 to produce the products for all of the yoga studios. The distributor will need to purchase an industrial-level wax melter to melt down the components of the product which will cost him approximately $1,000.00. Selling these products at $10.00 each to the yoga studios will provide the distributor a $3,000.00 revenue and a net profit of $1,208. This profit can then be used to send out more samples to yoga studios in a broader radius along with producing more Yoga Wax for local yoga studios once they have sold out their inventory. A spreadsheet of these figures is attached below.

Total Cost Per Product*	Production Cost (300 Products)	Industrial-level Beeswax Melter	Wholesale Revenue (300 products)	Net Profit (300 products)
$2.64	$792.00	$1,000.00	$3,000.00	$1,208.00

*Per product price calculated from prices of metal tin container ($0.69), labels ($0.06), and wax compound ($1.89).

Part 6. Science and Technology Proof of Concept:

The science behind this idea lies entirely in friction. When two objects slide across each other, microscopic contact points between the two objects create friction. More contact points create more friction and similarly, less contact points result in less friction. The issue of slipping on yoga mats is due to a reduction in the amount of these contact points or friction between the body and the yoga mat due to sweat. When sweat is released onto yoga mats, the mats are designed to draw moisture from the surface of the mat by absorbing this moisture into the mat. This is an effective solution to reducing slippage due to excess sweat. However, when this moisture is absorbed by the mat, the mat expands in size. This expansion in size creates a greater expansion between the contact points of the the yoga practitioner's body and the mat. This spreading out of

contact points creates a reduction in the amount of sliding friction. Sliding friction is, in this case, the amount of pushing force applied by the yoga practitioner's body in comparison to the amount of friction created between the contact points. If the amount of force is less than friction, static sliding friction will be present and the yoga practitioner will not slide. However, if the level of force is greater than the amount of friction created, kinetic sliding friction will be created and the yoga practitioner will begin sliding.

In order to solve this problem, the solution is aimed toward increasing the overall μ (the coefficient of friction). By incorporating Yoga Wax, the yoga practitioner will have more contact points with the wax than the mat. Because the μ between the wax and skin is greater than the μ between the mat and the skin, the practitioner will have greater traction. This theory was supported with a friction table experiment. In this experiment, the angle at which an object began sliding on various mat conditions was recorded. The tangent of each of these values was then calculated to determine the coefficient of static friction for each mat situation. The results of the experiment provided the expected outcomes. The dry yoga mat had a higher μ value than the wet yoga mat, indicating that the dry mat had better traction. These results compare to real world scenarios because people lose traction when they sweat onto their yoga mats, making them wet, and eventually slip. In both the wet and dry situations, the Yoga Wax improved the μ value, indicating an increase in traction. These results also transfer to real world situations. When a yoga practitioner spreads Yoga Wax onto their mat, whether or not they sweat, they will have increased traction and grip and be able to perform to their full potential. An image of this experiment is shown below and attached is a copy of the experimental procedure and data.

A case study was also conducted at a local yoga studio to determine the real world effectiveness of Yoga Wax. At a local yoga studio, two certified yoga teachers were asked to try

the wax during their classes. Each teacher spread the wax in horizontal crossing patterns in areas where their hands and feet commonly made contact with the mat. In each instance, the wax was reapplied halfway through a 90-minute class. Each teacher supported the product and stated that it significantly improved their traction on their yoga mat. Images of a packaged prototype of Yoga Wax are shown below.

Part 7. Acknowledgements:

I owe gratitude to my parents Paul and MaryBeth Madonia. They both spent a good deal of time editing and helping me format my paper correctly. Along with editing, my mom is a yoga teacher who helped with the inspiration of my product. As well as personally testing the product, she helped me recruit other teachers to try the product. I also owe gratitude to my uncle, Michael Madonia, for helping to provide me with the components of my wax product. Thanks are due to my mentor Mr. Cypcar, who helped me with the science-oriented portion of this project. I owe thanks to the yoga instructor Michelle Egleston, who personally tested the product and assisted me in finding the appropriate packaging for my product. Finally, I owe thanks to my Chemistry teacher Mrs. Sfiligoj, without whom I never would have developed this product.

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Determining the Coefficient of Static Friction

Objective:
- Determine the μ value of a yoga mat under various conditions
- Determine if Yoga Wax improves the traction of a yoga mat

Materials:
- (2) Identical Yoga Mats
- Plywood Sheet
- Yoga Wax
- Track Hurdle
- Water
- Protractor
- Metal Tin

Procedure:
1) Lean plywood on hurdle so that one side is touching the ground and the other is suspended on the hurdle. (Shown in Figure 1 on page 11)
2) Place yoga mat on plywood and the metal tin on top of the yoga mat.
3) Position plywood at continuously steeper angles on the hurdle until the metal tin begins to slide down the yoga mat.
4) Use the protractor to record the angle of the plywood and the ground in your data table.
5) Wet the surface of the yoga mat and repeat procedure 3-4.
6) Replace yoga mat with the second identical yoga mat. Spread Yoga Wax on the surface of the mat and repeat procedure 3-4.
7) Wet the surface of the yoga mat with the wax and repeat procedure 3-4.

Trial:	Measured Angle (degrees)	Coefficient of Friction - μ
Dry Yoga Mat	43	0.93
Wet Yoga Mat	39	0.81
Dry Yoga Mat w/ Yoga Wax	47	1.07
Wet Yoga Mat w/ Yoga Wax	45	1.00

Calculations:
Take the tangent of each measured angle to determine the μ value of each trial. Record this value in your data table.

Analysis:

The results of the experiment provided the expected outcomes. The dry yoga mat had a higher μ value than the wet yoga mat, indicating that the dry mat had better traction. These results compare to real world scenarios because people lose traction when they sweat onto their yoga mats, making them wet, and eventually slip. In both the wet and dry situations, the Yoga Wax improved the μ value, indicating an increase in traction. These results also transfer to real world situations. When a yoga practitioner spreads Yoga Wax onto their mat, whether or not they sweat, they will have increased traction and grip and be able to perform to their full potential.

Figure 1.

Figure 2.

Figure 3.

Yoga Wax Product Survey

1. What did you like about this product?

_____

_____

_____

2. What did you not like about this product?

_____

_____

_____

3. How did this product perform?

1 2 3 4 5 6 7 8 9 10

4. Have you used other products to prevent slipping on your mat? If so, how did this product's performance compare to these other products?

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5. Would you consider purchasing this product to use on a regular basis?

Yes No

6. What do you think about the container of this product? Would another type of packaging other than a metal tin be more appropriate?

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_____

7. If you are a studio owner, would you be interested in purchasing and selling this product?

Yes No