

Good Vibrations

2 PH.D.S' SMART DEVICE FOR SORE KNEES INTERRUPTS PAIN SIGNALS TO PROMOTE MORE MOBILITY **BY EDITH G. TOLCHIN**

KNEEMO® is an invention close to this writer's heart (and bum knee)! I was recently surfing for solutions and came upon this invention, whose co-inventors are Jenny Hledik, Ph.D. of Lake Oswego, Oregon, and Tom Andriacchi, Ph.D., of Lake Tahoe, Nevada.

Edith G. Tolchin (EGT): What are your backgrounds?

Jenny Hledik (JH): I am the chief operating officer of SomaTX Design Inc. (SDI) and a biomechanical engineer with over 20 years of experience in musculoskeletal biomechanics research, medical device design and clinical trial testing.

I spent years as a researcher at Stanford University and the Veterans Affairs Hospital, where I focused on developing a multidisciplinary understanding of orthopedic conditions and the development and testing of non-invasive ways to help people stay active and manage joint pain.

Tom Andriacchi, Ph.D., is an emeritus professor at Stanford University and president of SDI. For over 50 years, Tom has conducted research in orthopedic biomechanics, studying how injuries and conditions like osteoarthritis affect the way we move.

Tom has developed numerous products to treat musculoskeletal conditions, including joint

replacement implants and a load-modifying shoe for knee osteoarthritis. His work has earned international recognition from both engineering and medical societies.

EGT: Please tell us about your company.

JH: SDI was founded in 2019 to bring KneeMo to market. The company is dedicated to enhancing mobility and improving the quality of life for individuals with musculoskeletal pain through innovative, non-invasive solutions.

EGT: What is KneeMo? Explain how it works.

JH: KneeMo is a smart, wearable device designed to reduce knee pain and help people move more comfortably. It consists of two motion-sensing bands worn above and below the knee.

KneeMo analyzes the wearer's movement in real time and delivers vibration that's precisely timed to each person's unique movement patterns. The vibration works by interrupting pain signals on their way to the brain, a concept known as the "Gate Control Theory" (of pain). In simple terms, it "distracts" the nervous system with motion-activated vibration, which has been shown to reduce knee pain and improve quadriceps muscle function during movement.

We designed it to be simple, comfortable and easy to wear so people can stay active and keep doing the things they love, with less pain getting in the way.

"We saw a real need for an effective, non-invasive, drug-free solution that could reduce knee pain, encourage activity and help restore function during movement." —JENNY HLEDIK





Motion-sensing vibration technology is a hallmark of KneeMo, co-invented by Tom Andriacchi, Ph.D.

EGT: What inspired KneeMo?

JH: Tom was my adviser and head of the Stanford BioMotion Lab when I was pursuing my Ph.D. in biomechanical engineering there, and we've worked together for many years since! Our research focused on how pain, injuries and conditions like osteoarthritis affect the way people move, and how subtle changes in movement can impact the knee joint over time.

The idea for KneeMo came from a shared desire to take what we learned in the lab and turn it into something real that could help people manage their knee pain not just in a clinic, but in their everyday lives.

Knee pain is one of the most common musculoskeletal issues worldwide. We saw a real need for an effective, non-invasive, drug-free solution that could reduce knee pain, encourage activity and help restore function during movement.

EGT: What types of knee conditions can KneeMo help with?

JH: KneeMo is designed for people dealing with chronic knee pain from a variety of causes—including osteoarthritis, past injuries like ACL or meniscus tears, or other conditions that lead to ongoing discomfort. These issues often come with impaired quadriceps' muscle function, [and quadriceps] play a key role in stabilizing and supporting the knee.

KneeMo has been shown to improve quadriceps' function during activity, making it a helpful tool not just for pain relief but for supporting better movement. We also have users wearing KneeMo following surgeries like total knee replacement, or as part of rehab for injuries, to help make daily

movement and rehab exercises more comfortable.

EGT: What makes KneeMo different from other knee pain treatments on the market?

JH: Traditional treatments like medications and surgery can help, but they often come with risks of side effects, high costs and long recovery times. And they don't directly reduce knee pain during movement to encourage staying active, which is important for both joint health and overall well-being.

Other options, like traditional knee braces, can offer support but often restrict motion and don't address restoring muscle function, which is key to long-term functional improvement.

We developed KneeMo to change the way people can manage their knee pain—by reducing pain and improving muscle function during movement with motion-sensing vibration technology. It's a non-invasive, drug-free way to help people stay active and enjoy everyday movement with more comfort and confidence.

EGT: How long did it take to go from a research concept to bringing KneeMo to market?

JH: The foundational research behind KneeMo goes back decades, but developing a consumer-ready product based on our research concept took about nine years! We began with initial research and prototyping, followed by clinical testing, and then design for manufacturing.

EGT: What kind of testing and validation did you do before launching KneeMo?

JH: Before launching, we conducted rigorous clinical testing to validate its effectiveness in reducing knee pain and enhancing mobility. We did clinical studies at Stanford with individuals experiencing knee pain from osteoarthritis, ACL injuries and meniscus tears.

In our initial, single-day study, we saw a significant improvement in quadriceps' muscle function during walking. That was followed by a longitudinal, randomized, controlled study. After four weeks of using KneeMo, study participants reported less knee pain during walking and navigating stairs—benefits that weren't seen after using the control treatment.

We also observed measurable improvements in mobility and quadriceps muscle function during movement. These findings, which were published in peer-reviewed journals, motivated us to bring KneeMo to market so that it could help others with knee pain.

EGT: Is KneeMo patented?

JH: Yes, we have two issued patents (U.S. Patent Nos. 11,285,034 and 11,576,807) covering KneeMo's technology.

EGT: Can users customize using KneeMo? Any apps involved?

JH: KneeMo is ready to use right out of the box, but we also have an app that allows users to customize their experience. The KneeMo app connects to the device and lets users select activity types like jogging or cycling, which adjusts the algorithm behind how the device responds to movement.

Users can also adjust the vibration intensity to their comfort level and use the app to track their usage and activity.

EGT: Have you run into any challenges with manufacturing or logistics?

JH: Manufacturing a technically complex product at scale can be difficult, especially as a small startup.

One of the biggest hurdles we faced initially was the global chip shortage, which affected our

ability to source key components. Like many others, we had to get creative and stay persistent to keep moving forward.

EGT: Where are you selling? Do you use a distribution center, or are you fulfilling orders yourself?

JH: Right now, we're selling KneeMo directly through our website: thekneemo.com.

We're also working on partnerships with health care providers to offer KneeMo to their patients. We fulfill orders through a distribution partner located in Indiana, allowing us to ship efficiently and reliably.

EGT: What's been the most rewarding part of creating KneeMo?

JH: The most rewarding part has been hearing about the impact that KneeMo has had on our users' daily lives—from helping during rehab after an injury to enabling people to return to activities they love, like jogging or pickleball, with less pain.

EGT: Any plans to expand your product line?

JH: Yes! We're exploring how this same approach—smart, motion-activated vibration technology—can help with other musculoskeletal conditions and mobility challenges. Our goal is to continue building science-backed solutions that help people affected by musculoskeletal pain.

EGT: What advice would you give to inventors looking to bring an idea to life?

JH: My biggest advice is to start with a real problem that matters to you and to others, and to have a true understanding of the problem you're solving. From there, be ready to be persistent, adaptable and willing to learn things outside of your comfort zone.

Don't let setbacks discourage you. The process of bringing an idea to life will present challenges, but being resilient, flexible and staying connected to your "why" are key. 📞

Details: somatxdesign.com

Edith G. Tolchin has written for *Inventors Digest* since 2000 (edietolchin.com/portfolio). She is the author of several books, including "Secrets of Successful Women Inventors" (<https://a.co/d/fAGivZJ>) and "Secrets of Successful Inventing" (<https://a.co/d/8dafJd6>).



Improved quadriceps muscle function was among the findings published in peer-reviewed journals.

AI ABCs

3 TERMS, 3 DIFFERENT MEANINGS

Artificial intelligence terms “machine learning,” “deep learning” and “neural networks” are often mistakenly used interchangeably. This causes confusion—and if there’s one thing AI does not need to be associated with, it’s more confusion.

So don’t become frustrated to the point of tears. Think tiers.

IBM has a palatable way of boiling this down. Think of the three terms “as a series of AI systems from largest to smallest, each encompassing the next.”

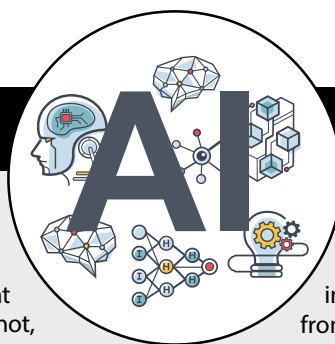
The one-paragraph summary says that, of course, AI is the overarching system. Machine learning is a subset of AI, with deep learning a subset of machine learning. Neural networks make up “the backbone of deep learning algorithms.”

(Many of you know what an algorithm is by now. If not, the best definition we’ve seen calls it a finite sequence of instructions that a computer must perform to solve a well-defined problem. It’s this process that determines rankings for search engines and more.)

Definitions for the three linked terms, from GeeksforGeeks:

Machine learning is a branch of AI that allows algorithms to uncover hidden patterns within datasets, allowing them to predict new, similar data without specific programming for each task. This makes machine learning especially useful for tasks that involve large amounts of data and complex decision-making.

Deep learning mimics neural networks of the human brain, letting



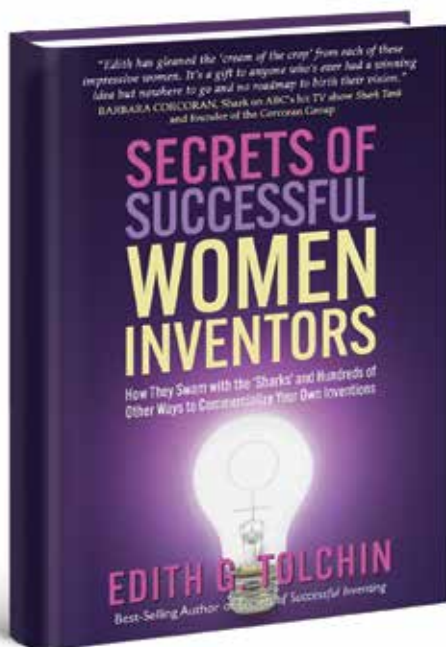
computers autonomously uncover patterns and make informed decisions from vast amounts of unstructured data. This is

changing the way machines understand, learn and interact with complex data. Deep learning requires abundant computing power and huge amounts of data.

Computer **neural networks** are machine learning models that mimic the complex functions of the brain. These models consist of interconnected nodes or neurons that process data, learn patterns and enable tasks such as pattern recognition and decision-making. Their ability to learn from vast amounts of data affects technologies such as natural language processing, self-driving vehicles and automated decision-making.

—Reid Creager

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“... A gift to anyone who’s ever had a winning idea...” Read the compelling stories of 27 esteemed, hard-working women inventors and service providers, (many of whom have appeared on “Shark Tank”). All have navigated through obstacles to reach success and have worked hard to change the stats for women patent holders, currently at only about 13 percent of all patents.

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Available for purchase at Amazon (<https://tinyurl.com/334ntc3w>), Barnes & Noble, and edietolchin.com.



Edith G. Tolchin
(photo by Amy Goldstein Photography)

Edith G. Tolchin knows inventors!

Edie has interviewed over 100 inventors for her longtime column in *Inventors Digest* (www.edietolchin.com/portfolio). She has held a prestigious U.S. customs broker license since 2002. She has written five books, including the best-selling *Secrets of Successful Inventing* (2015), and *Fanny on Fire*, a recent finalist in the Foreword Reviews INDIE Book Awards.



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Inventors

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