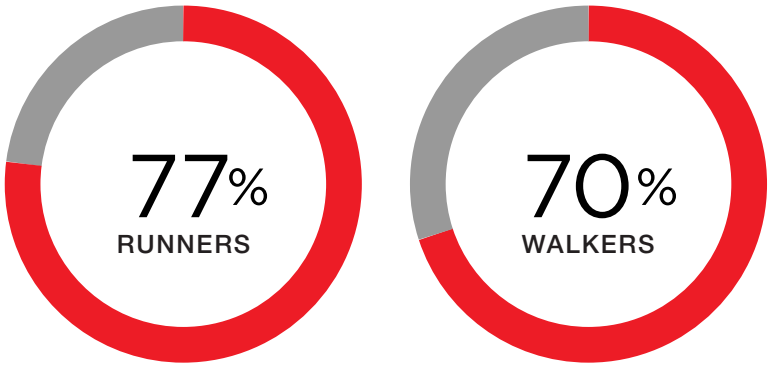
STAR TRAC®
MADE TO PERFORM

The Department of Kinesiology at California State University, Fullerton, conducted a research study to measure and compare running impact and absorption. The measurements were taken for running over ground vs on a traditional treadmill vs our innovative Star Trac FreeRunner™ treadmill with the new aluminum deck and belt system, the HexDeck.

THEY CHOSE THE HEXDECK TREADMILL!



HEXDECK REDUCES IMPACT

↓26%

THE HEXDECK TREADMILL FEELS...

"SOFTER"

"EASIER ON THE JOINTS"

"LIKE RUNNING ON A TRACK"

NEARLY 2X USAGE

Industry leading data provided by EcoFit shows FreeRunner being chosen 2:1 over slat-style treadmills.

"IF WE COME UPSTAIRS TO DO OUR CARDIO AND SEE THE FREERUNNER IS BUSY WE'LL GO DO SOMETHING ELSE ... BECAUSE THAT'S THE ONE THAT WE WANT"

—DEMARIA DAY
YMCA MEMBERSHIP SUPERVISOR

The study had two primary objectives:

1) to determine whether there is significant, measurable benefit to users on the new HexDeck system;
2) to determine whether the biomechanics created by the new HexDeck system are safe for users.

SUMMARY OF RESULTS

The quantitative findings:

- The HexDeck design significantly reduces impact compared to the traditional deck design
- Users required greater effort to attenuate shock on the traditional deck treadmill – more knee bend and increased quadriceps activity – at the same speed
- The HexDeck design does not add risk to treadmill running v traditional deck design

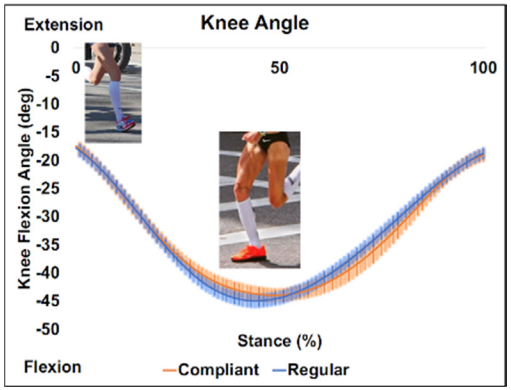
The subjective/qualitative findings:

- Users significantly favored the HexDeck treadmill v traditional
- Common themes in comments were that the HexDeck treadmill feels "softer," "easier on the joints" and "like running on a track"

DETAILED RESULTS

The primary finding was that there was lower impact acceleration at the leg with the HexDeck treadmill compared to the regular treadmill during running. No difference was observed in head acceleration, and thus more shock attenuation was necessary on the regular treadmill. There was also more vertical displacement of the center of mass on the HexDeck treadmill, and this was predominately during the stance phase of running. We observed no shift in the distribution of footfall patterns between treadmills, and all runners maintained their natural footfall pattern observed during overground trials.

In comparing joint angles between treadmills, data suggest a larger knee flexion angle in the regular treadmill compared to the HexDeck treadmill. This was accomplished via greater knee flexion ("bending of the knee"), and larger quadriceps activity. In other words, additional effort is required on the traditional treadmill design to maintain the same speed as on the HexDeck.



In subjective feedback, the HexDeck treadmill scored significantly higher in overall rating than the traditional treadmill (8.46±1.10 vs. 7.38±1.51). 77% of subjects indicated that they would select the HexDeck treadmill for running, compared with only 17% that would select the traditional treadmill (6% indicated no preference). A similar proportion preferred the compliant treadmill (70%) compared to the regular treadmill (20%) for walking. Common themes in survey data included a preference for the HexDeck treadmill because it was soft during landing, softer on joints, provided more giveback, provided more cushion for feet, made running feel easier, and was generally more comfortable.

Real responses from study participants:

- It was more comfortable. Very easy to run on
- The landing and running felt softer, less impact. It felt softer than the other treadmill.
- The feel of the treadmill was smooth and comfortable. It didn't feel like I needed much effort to run on this treadmill. After 5 minutes it still felt smooth.
- Running was smooth and easier on the joints. It feels really good on the knee joint.
- Felt a little strange, but once you become accustomed to the pace it feels completely normal. I felt the suspension working especially when changing speeds from walking to running.
- Felt easier than treadmill 1. Running felt like less work.
- Walk felt normal, running felt the same as running on a track.
- It felt like there was more shock absorption and softer surface.

- Not as hard; more “give” to it, walking felt easier than on the first treadmill felt like it absorbed more of my force
- Felt nice and soft; easier on the body, felt more absorption from surface, softer
- Felt more like a track, felt good on feet and had good shock absorption.
- Very soft and easy on legs. Low impact on the feet
- Immediately noticed the surface was more cushion-like. It felt softer to step on. My feet felt less hard impact compared to the other treadmill.
- Run – 10/10 like I was running on a track or wood floor in terms of bounce/reaction response.
- At first it felt like running next to the water at the beach; at the end of 5 minutes like I had just run on a track
- Felt really light on my feet, no thumping my feet; more flat surface; easier to walk on
- Gave more back, more like running outdoors
- Buttery feeling. The machine had no lagging feel.
- Very comfy. Low cushion on landing but very nice rebound. Felt like a track. Very smooth padding
- Very light and soft, felt like there wasn’t a lot of force going on the treadmill, so it felt better
- Walking felt smoother. Not as rough and hard as the other treadmill. Running felt much easier, less pain in my shins and feet.
- Lots of give, really easy on the foot. Felt like I was ready to go again after 5 minutes.

INTERPRETATIONS

The use of the HexDeck treadmill can 1) reduce impact acceleration at the lower limb and 2) simultaneously reduce loading of the knee joint and demand of the knee joint musculature. These objective findings from the biomechanical data mirror the subjective feedback provided by subjects after participation.

A note on walking: on average, subjects in this study were of normal weight. Those with higher body mass may experience a reduction in impact acceleration during walking on the HexDeck treadmill that is similar to normal weight individuals who are running.

In comparing the treadmills, the compliant treadmill provides a surface that reduces impact acceleration and demand on the knee joint. This was reflected by larger impact acceleration on the traditional treadmill deck, which was mitigated via additional motion at the knee joint and activity in surrounding musculature. This finding was also supported by the subjective feedback provided by subjects (softer landing and easier on knee joint and foot). These adaptations may provide benefit for runners with a history of bone stress injury who are often subject to high tibial acceleration or patellofemoral pain syndrome (runner’s knee) who may experience pain from additional knee stress.

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