Octane Fitness Pro4700 Shown to be Ergonomically Superior

Given the ongoing, growing popularity of elliptical cross trainers, many additional elliptical models and new types of alternative movement trainers have been introduced in the past few years. It is important to evaluate and understand these new market entries in terms of their safety and effectiveness for exercisers.

This analysis compared six commercial alternative movement cardiovascular trainers to the Octane Fitness Pro4700, representing best-in-class elliptical cross trainers. The goal of this comparison was to determine the relative effectiveness and safety of each machine by evaluating each in the areas of movement mechanics, stride length and reactive stride length.

Reciprocal Motion Trainers

Reciprocal motion trainers use an arc-like or bow movement designed to mimic the center of gravity over stairs while climbing a steep incline. Two units were considered in this category: the Cybex Arc Trainer and FreeMotion Strider.

Effectiveness

Results showed reciprocal trainers used fewer muscles than the Pro4700 elliptical trainer. In fact, a recent research study (Turner, et. al, 2010) showed that working heart rates were lower on the Arc than on elliptical trainers at similar workloads. This can be attributed to the difference in muscle recruitment required between the two modalities.

The elliptical recruits more muscles, so exercisers experience greater intensity, a higher cardiac output and more caloric expenditure, which ultimately translate to greater effectiveness and improved results.

Safety

Reciprocal motion trainers use stepping as the primary action, which is repeated hip flexion. An average step height for a flight of stairs is 7”; however, the FreeMotion Strider allows hip excursion up to 44”—an extreme range of motion (ROM). Repeated, significant hip flexion on reciprocal motion trainers can lead to tight hip flexor muscles, nerve impingement, lower back pain and even loss of function.

In contrast, Octane’s Pro4700 elliptical motion simulates walking, jogging and running, and utilizes an adjustable stride length range (18”-26”) within normal walking mechanics. Each exerciser can select the stride lengths that are most comfortable for him or her, even varying the length according to pace and direction, thereby virtually eliminating any risk of excessive hip flexion and related conditions.

User-defined Motion Trainers

User-defined motion machines allow users to choose from two independent, mechanically different motions, either an elliptical or a stepping motion. For this analysis the Precor AMT and Technogym Vario were evaluated.

Effectiveness

Maintaining an up-and-down stepping motion with good form on a user-defined motion trainer requires significant concentration and cognition, given the flexibility of movement within the equipment. The rate of perceived exertion (RPE) increases with increased this thought process, which can negatively influence the ease of exercise and perception of enjoyment, reducing the likelihood of exercise adherence and, therefore, reducing long-term effectiveness.

The motion of the Octane Pro4700 elliptical is a Central Pattern Generator, meaning the brain starts the motion which the body can then maintain without active thought. Because elliptical motion simulates walking, a primitive motion, it does not require ongoing cognition to continue. A Central Pattern Generator is therefore a more natural movement at a lower perceived exertion, which increases enjoyment and adherence and thereby effectiveness.

Safety

The user-defined motion trainers analyzed here both allow for extensive hip flexion; in fact, the Vario stride length extends up to 33”. Similar to the dynamics of reciprocal motion trainers, repeated, exaggerated hip flexion can cause tight hip flexors, nerve impingement and potential peripheral neuropathies over time.
Because the Octane elliptical uses a walking motion, users maintain a safe ROM at the hip joint with natural mechanics, thereby significantly decreasing potential for nerve impingement.

Also, on the AMT, the mechanical actions of individuals may vary substantially with different body builds, thereby changing the predictability of exercise mechanics and stresses on the body. For example, tall exercisers can “tower” over the AMT and push on the handles using their body weight with gravity, which provides greater force and changing the mechanics and exertion of the lower body. A smaller exerciser cannot do this and therefore must pull the handles, which makes the exercise feel harder and changing the stress on the lower body. This variability makes it difficult to predict safe, stress-free motion for all users.

The biomechanically correct design of the Octane Pro4700 ensures that the exercise mechanics on the Octane Pro4700 remain consistent and safe, regardless of the user’s body build.

**Adjustable Incline Trainers**
Adjustable incline trainers, such as the Precor EFX and Matrix Ascent, use elliptical motion with an incline platform that exercisers can manipulate.

**Effectiveness**
The Ascent machine incorporates a 7” to 12” “step-over height” in its built-in step motion, which actually appears to shorten the stride length, thus reducing efficacy and workload.

With a large adjustable stride length range of 18”-26”, the Pro4700 accommodates all exercisers comfortably regardless of height, fitness level and any medical contraindications that may affect stride length. Longer strides within the elliptical motion facilitate a greater ROM, more muscle work and better results.

**Safety**
A serious design issue with adjustable incline trainers is that they permit huge inclines and/or step heights that are unnatural and cause a tremendous amount of hip flexion. Repeated hip flexion can lead to sciatica and femoral nerve compression, pinched nerves and even chronic peripheral neuropathies.

**Octane’s lower-body motion** incorporates Body-Mapping Ergonomics and does not utilize adjustable incline, but instead replicates walking, jogging and running, which are natural motions that do not compress the nerves with repeated use.

**Elliptical CrossTrainers with Reactive Movement Feature**
Reactive movement is an interactive ergonomic feature in which the stride length automatically adjusts according to user output, as measured by speed (RPMs). This technology is exclusive to Octane Fitness, and is featured on the Pro4700 elliptical cross trainer. Specifically, if exercisers decrease pace by five RPMs, the Pro4700 SmartStride feature decreases stride by one inch; and if pace increases, stride increases accordingly.

None of the alternative movement trainers incorporate such a feature.

**Effectiveness**
By reacting to an exerciser’s pace, SmartStride maintains cardiac output, which keeps up intensity and heart rate, making workouts more efficient and effective, and ultimately impacting cardiovascular benefits and caloric expenditure.

**Safety**
SmartStride adjusts within the individual users’ specific range of comfort and natural motion, ensuring a stride range within normal walking mechanics, eliminating the risk of excessive hip flexion and related conditions as ascribed above to the alternative movement trainers.

**Conclusion**
When compared to reciprocal movement trainers, user-defined movement trainers and adjustable incline trainers, the Octane Pro4700 was determined to be the most effective based on:

- Use of the greatest number of muscles with a natural movement
- A Central Pattern Generator is incorporated, and by definition is a more natural, enjoyable movement
- Accommodation of all exercisers comfortably regardless of height, fitness level and any medical contraindications that may affect stride length. Longer strides within the elliptical motion facilitate a greater ROM, more muscle work and better results.
- Reactive movement maintains a constant cardiac output for anti-aging benefits, greater muscle endurance and more caloric expenditure
- The elliptical movement pattern (with no adjustable incline) does not require excessive, repeated hip flexion, and thereby reduces risk of developing pinched nerves, low back pain, peripheral neuropathies and loss of function.
Furthermore, the Octane Pro4700 was determined to be the safest based on:

- The elliptical movement pattern (with no adjustable incline) does not require excessive, repeated hip flexion, and thereby reduces risk of developing pinched nerves, low back pain, peripheral neuropathies and loss of function.
- Bio-mechanically correct design that ensures the exercise mechanics on remain consistent and safe, regardless of the user’s body build.
- Replication of walking, jogging and running, which are natural motions that do not compress the nerves with repeated use.
- Reactive movement (SmartStride) that maintains a constant cardiac output for anti-aging benefits, greater muscle endurance and more caloric expenditure and adjusts for the comfort of individual exercisers.

The following chart summarizes the analysis components of this study.

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>ARC TRAINER</th>
<th>PREMOTION STRIDER</th>
<th>PRECOR AMT</th>
<th>TECHNOGYM VARIO</th>
<th>PRECOR EFX</th>
<th>MATRIX ASCENT</th>
<th>OCTANE PRO4700</th>
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REFERENCES


For more information, contact Octane Fitness at www.octanefitness.com or 888-OCTANE-4.

About Amy Ashmore

Amy Ashmore, Ph.D., holds a doctorate in Kinesiology from the University of Texas at Austin. She is an assistant professor of exercise science and sports management at the University of Tampa in Florida and is published in the areas of stretching, strength training, kinesiology and biomechanics.