# Trikke Report

## The Research on the health benefits and energy usage of riding a Trikke

| | | | |
|---|---|---|---|
| **Date:** | March 12, 2007 | | |
| **Research by:** | The Expertise Centre of Movement Technology | - | The Hague |
| | Clinical Human movement Science (IFKB) | - | Amsterdam |
| **For:** | Trikke Europe | - | The Netherlands |
| **Report by:** | Trikke Europe | - | The Netherlands |

*Supported by The Provincial State Department for Research On Innovation, Netherlands.*

**This report is based on:**

# Research on the health benefits and energy usage of riding a Trikke

**by**

**The Expertise Centre of Movement Technology at the the Hague University (ECBT) together with the Institute for fundamental and Clinical Human movement Science (IFKB) at the University of Amsterdam.**

**The Netherlands, March 2007**

---

## Introduction

Since the revolutionary introduction of the Trikke in 2002, all users are aware that riding a Trikke is fun and a very healthy way of getting from A to B. They all have their own story of losing weight, getting fit or getting into a healthier lifestyle.
Riding a Trikke feels like a workout. After an active ride you can feel that all main muscle groups in your body have supported your motion.

Nowadays there is an increasing attention for the benefits of fitness. Since people 'move less, eat more and focus on 'quality outdoor leisure time', there is a growing need for an 'efficient' fitness gear to have fun with. In addition, in the USA as well as in Europe, a serious worry aroused about Obesities on epidemical level.

If Trikke turns out to be this new fitness gear, for kids and adults, we can bring a great addition to this market.

**Research and results**

In April 2006 Trikke Europe gave the ECBT in The Hague an assignment to investigate the health benefits of riding a Trikke.
The ECBT is the Expertise Centre of Movement Technology at the `The Hague University´.
Together with the University of Amsterdam, the ECBT started in August 2006, a research on the physical benefits of riding a Trikke cambering vehicle.
Recently, the researchers published the results.

The researchers asked themselves the following questions:

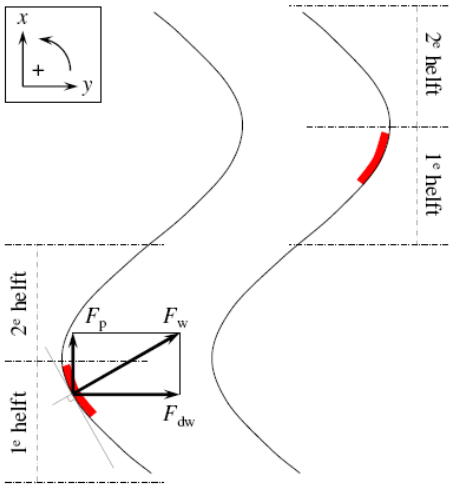
1. ***How is muscle power used to generate forward momentum?***
2. ***What is the energy use when riding a Trikke?***
3. ***How do these results compare to other "Fun" sports?***
4. ***How fast can you learn to ride a Trikke?***

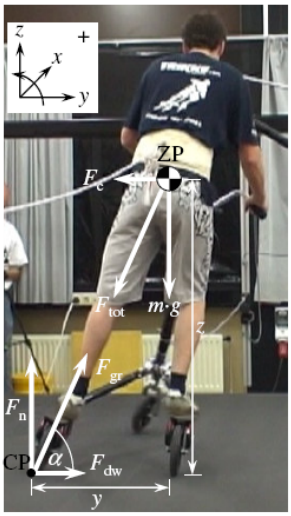
## *1. How is muscle power used to generate forward momentum?*

For this part of the research, the team analysed the Trikke motion; the curves of the Trikke in relation to the use of power. This (bio)mechanical research was done by analyzing the Trikke ride concerning displacement of the centre of gravity, momentum of the impuls, power of the impuls, speed and behaviour of the wheels.

The research team found out that for riding a Trikke, the next mucle groups are especially in use:

≈ Upper leg muscles
≈ Buttock muscles
≈ Upper arm muscles
≈ Shoulder muscles




In their report the team stressed that you can train these muscles by riding a Trikke and that the green joints aren't stressed since there is no impact.

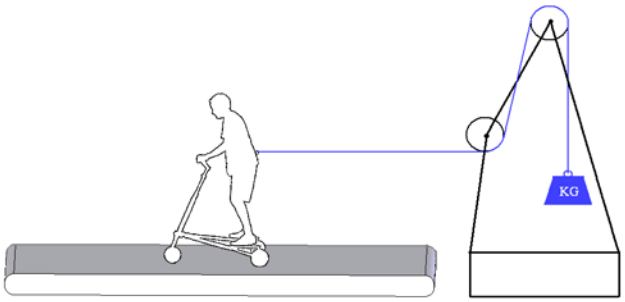
## *2. What is the energy use when riding a Trikke?*

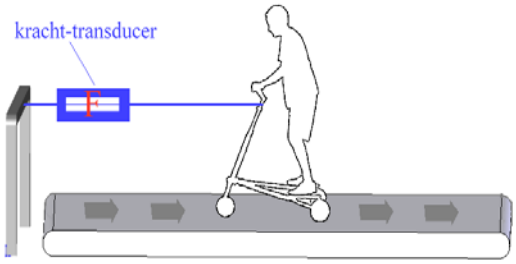
First the research team had to specify the efficiency of Trikke riding. After that, the energy use could be determined. Finally they could compare these figures to other methods of propulsion.

The following questions needed to be answered:

- how much external energy is needed to ride a Trikke
- how much metabolic energy is needed to provide this external energy on the Trikke. If these values are both known, the efficiency of Trikke riding can be determined. After that statements can be made about how many calories are burned during a Trikke ride.

These studies were conducted on a giant treadmill. This skate roller band at the Movement Technology faculty of the Amsterdam University, is an ideal testing environment; all natural and outdoor conditions can be simulated. A pulley system with weight, functioned as normal air resistance or extra head wind.




By attaching the Trikke to a power transducer, the roll resistance could be determined.

*Test rides at the University of Amsterdam*

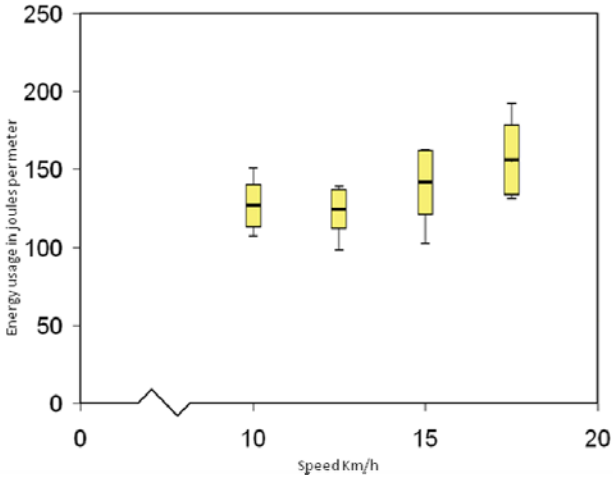
The test riders, between 20 and 50 years, have done a test of 4 runs. Each run was 5 minutes. The test rides where on 4 different speeds with speed related drag, simulated with the weight pulley system. To measure the amount of used energy, the exhaled air is being analysed. During 4 runs of 5 minutes, the Oxygon machine calculated the Respiratory Exchange Ratio (RER) and the oxygen usage of all riders. Only the average values of the final two minutes of each run are being used, since this is when the body is in its most steady state. To convert these values to kilojoules the tables of “Åstrand” have been used.

The results can be seen in the table below.

| Speed [km/h] | Speed [m/s] | Joule/meter [j/m] (sd) |
|---|---|---|
| 10 | 2.8 | 126,6 (13,3) |
| 12,5 | 3.5 | 124,3 (12,5) |
| 15 | 4.2 | 141,7 (20,6) |
| 17,5 | 4.9 | 156,0 (22,5) |

**Efficiency**
The efficiency of riding a Trikke is, according to the results of this research, between 8.1% and 11.4% at the measured speeds.
In comparison with other sports, the efficiency of riding a Trikke is much is lower than riding a bike and cross-country skiing, it's between the efficiency of ice-skating and swimming. The researchers noticed that the efficiency of the Trikke seems to increase at higher speeds.

**Energy use**
The energy use of riding a Trikke is shown in the graph at the right. These are the results of the test riders on the 4 runs of 5 minutes on 4 different speeds.



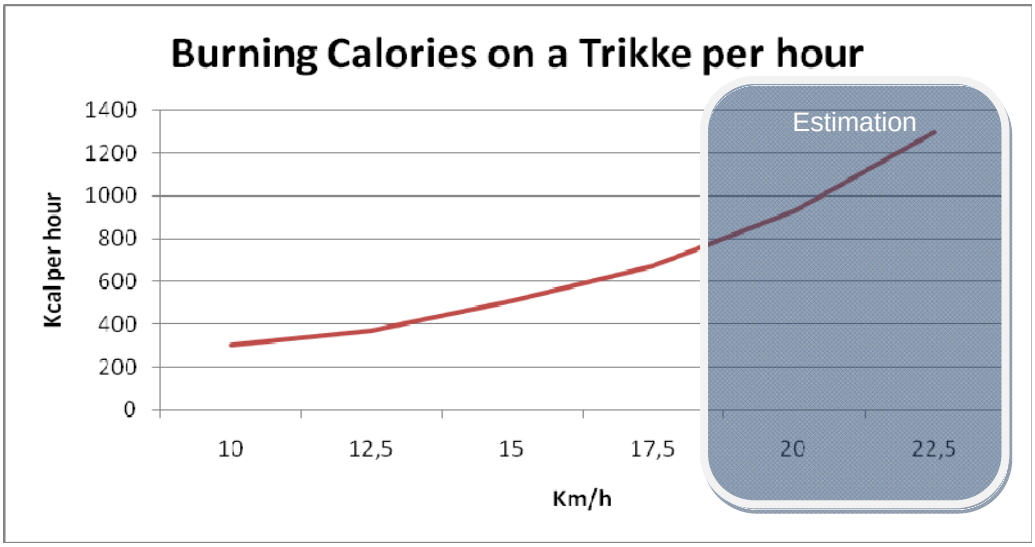

It shows us that to ride a Trikke at 15 km/h an average person needs to deliver 145 joules for every meter. For 1 kilometre you need to deliver up to 145000 joules or 145 kilojoules.

When we recalculate this into Calories we see the following results.

| **Trikke** | | | | | | |
|---|---|---|---|---|---|---|
| km/h | mph | KJ/m | | meter | **KJ** | **Kcal** |
| 10 | 6,2 | 126,6 | 1 hour | 10000 | **1266** | **302** |
| 12,5 | 7,8 | 124,3 | 1 hour | 12500 | **1554** | **371** |
| 15 | 9,3 | 141,7 | 1 hour | 15000 | **2126** | **508** |
| 17.5 | 10.9 | 156.0 | 1 hour | 17000 | **2808** | **671** |

*1 kCal = 4,1876 kJ*

These values are for an average male of 1,75 m and 75 kilo.
See also next graph.




*Burned calories on speeds above 17.5 km/h are estimates*

## *3. How do these results compare to other "Fun" sports?*

After the research on the Trikke was done, the comparison with other sports/activities shows us clear figures. We learned already that you burn 500 Kcal in a one hour Trikke ride, on the easy average speed of 15 km/hour. This in comparison with other activities:

- ≈ Jogging at 6-7 km/h you burn around 350-400 Kcal per hour.
- ≈ Aerobics classes burn about 450 Kcal per hour.
- ≈ Walking at a normal pace, and playing Golf (without a golf cart), each burn around 250 to 280 Kcal per hour.

- ≈ Power walking or Nordic Walking can burn over 400 Kcal an hour. So can riding a bicycle or an exercise bike at the gym.

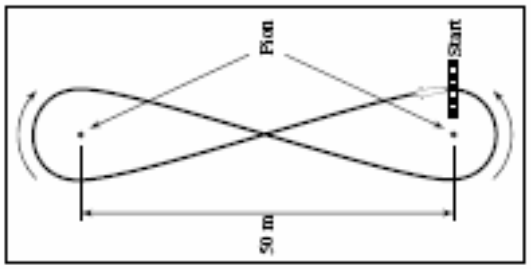
- ≈ Housework can burn 100 to 200 Kcal per hour, depending on the activity level.
- ≈ Inline skating burns around 430 Kcal per hour
- ≈ Cross country Skiing burns around 560 Kcal per hour.

## *4. How fast can you learn to ride a Trikke?*

As every user experienced, you can ride a Trikke instantly, but propelling it is for some 2nd nature and for some very hard work. But on average what would the learning curve be?

For research on the learning curve 10 test riders (eight beginners) rode a same track 10 days, for 15 minutes. The circumstances were perfectly stable. The measurements were focused on the time progress on the track

The research team found out that starters can call themselves a 'pro' after 2 hours riding. All starters propel themselves right away and had fun too.




In addition, the easy learning curve of riding a Trikke is way better than learning to ride a bike, (inline)skates or skateboard.

## *Conclusion*

According to the results of the research on health benefits and energy usage of riding a Trikke we can say that:

- For riding a Trikke, these muscle groups are especially in use:
  - ≈ Upper leg muscles
  - ≈ Buttock muscles
  - ≈ Upper arm muscles
  - ≈ Shoulder muscles

- So you can train these muscles and thereby toning your body by riding a Trikke.

- When riding 15 km/h on a Trikke, an average person burns 500 Kcal per hour. When riding at 17,5 km/h an average person burns up to 700 kcal per hour.

- Concerning the energy use, riding a Trikke is comparable with in line skating, jogging and cross-country skiing (langlaufen).

- It's very easy to learn how to ride a Trikke; everybody can propel and ride a Trikke. To master Trikke riding you need a maximum of 2 hour practice.

The researchers furthermore believe that the Trikke can play a big role in the fight against obesities under children and adults worldwide.

~~~
~~~

**So we know now that :**

***riding a Trikke is***

***fast to learn,***

***safe, easy on your joinst,***

***great to lose weight***

***and perfect for toning the whole body.***

***The test persons also found Trikking very addictive!***

**We may send this message out to the world.**

~~~

Trikke Europe is grateful for the extended efforts for this research by:

- ≈ University of The Hague, Expertise Centre of Movement Technology. ECBT,
- ≈ University of Amsterdam, the Institute for fundamental and Clinical Human movement Science (IFKB)
- ≈ The Provincial State Department for Research On Innovation

**Trikke Europe**
The Hague, The Netherlands,
12 March 2007
~~~