

D. Experience with Active Passive Trainer (APT)

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Key Words

APT upper extremity ergometer VO2-Kgm correction

Introduction

For the exercise therapies of patients with some kind of disability of the lower extremities, the upper extremity ergometer are often used.

Recently much research has been conducted for the exercise physiology with the upper extremity ergometers and this research is producing inconsistent results for the upper and lower extremity exercises.

Many of the upper extremity ergometers are quite expensive and require special skill to operate.

For this research we got the chance to use the upper extremity ergometer, which is light weight, easy to operate and affordable. With this ergometer, we measured VO2 changes against the various loads and also measured the same with the bicycle ergometer.

Explanation of APT

APT (Active Passive Trainer, manufactured by Tzora Health Care Products) is compact and light weight (about 10 kgs) and quite portable. It can set the load with the combination of the number of the handle rotation (r.p.m) and the load levels. Five load levels are available.

The load setting procedure is easy, just pushing the buttons. By changing the handles to foot pedals, the exercise for the lower extremities can also be done, with the electric motor, the arms on the machine move automatically which allows the passive exercise to be done.

Research Method

Ten (10) healthy males, ages 24.4 +- 3.7 and the weights 67.2 +- 7.3 kgs, without cardiopulmonary disorder, participated in this research.

First, VO2 were measured with the bicycle ergometer. The load was set with 25w, 50w, 75w, 100w and 150w. with each load 2 minutes exercise was done. In between each exercise, 3 minutes.

Second, VO2 were measured with APT. the participants set on the chair and the height of the arms was adjusted to the level of the shoulder. The participants gripped the arm

handles with their arms almost straightly extended. The load was 6w, 12w, 24w, 72w, and 144 w.

2 minutes exercise was done for each load and after each exercise, 3 minutes rest was taken.

The result was presented on the graphs.

To get VO₂ values, the aero monitor, AE280S from Minato Inc. was used. The average VO₂ for the last 30 seconds of each 2 minutes exercise was designated as VO₂ value for the respective exercise with the various loads.

Results and conclusions

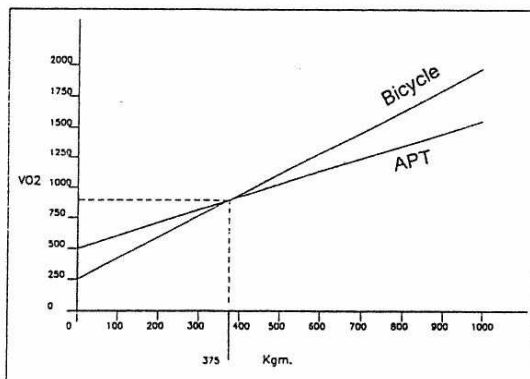
1. Peak VO₂

Bicycle ergometer	1,830	97.5 ml/m
APT	1,482.5	179.6 ml/m

p<0.05

2. VO₂/load

See the graphic presentation below.



With regard to the VO₂ comparison between one with the upper extremity ergometer and one with the lower extremity ergometer, ACSM reports that VO₂ with the lower extremity ergometer will be about 1.5 times larger than VO₂ with the upper extremity ergometer. Because the upper extremity ergometer requires the involvement of more muscle groups due to the fix of the upper body.

However, in Japan, there are many opposing researched – larger VO₂ with the lower extremity ergometer, comparing the peak VO₂, AT and Vt.

Our research resulted in the larger peak VO₂ with the bicycle ergometer than one with APT. however, as you can see from the graph, up to 375 kgm (62.5W), vo₂ values were larger with APT and from that 375 kgm point on, vo₂ values were larger with the bicycle ergometer.

By continuing to take vo₂ data with various patients, we would like to re-evaluate this graphic result.

APT, which we used for this research, is the excellent upper extremity ergometer for

training, setting the load with the combination of 5 different load levels and the various r.p.m . The correlation between vo2 and the load was 0, 912 ($r=0.912$) with our research result and showed very high correlation.

We believe that the APT can be used as the evaluation equipment with the reference to the graphic presentation for vo2 data. So, we would like to prepare the similar vo2 data for female and elderly people.