patients with Hodgkin's disease.⁴ Kupffer's cells may be one source of endogenous pyrogen in man and it is interesting that sustained fever is more common in patients with hepatic Hodgkin's disease. All our patients had hepatic Hodgkin's disease and fever of several days' duration. Human leucocytes produce endogenous pyrogen *in vitro* when exposed to endotoxin: this response is blocked by the cytotoxic agent actinomycin C.⁵ Production of endogenous pyrogen in our patients may have been inhibited by the cytotoxics, the homeostatic mechanisms controlling temperature causing prolonged rebound hypothermia.

Though we have no certain explanation for the abrupt onset of hypothermia, these observations raise several points. How often does hypothermia complicate cytotoxic treatment? Hypothermia often escapes diagnosis because low reading thermometers are not used. As it may be a serious complication in the old and weak, patients with sustained fever during cytotoxic treatment should be carefully observed.

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Cycling in patients with chronic airflow limitation

Patients with chronic airflow limitation have reduced exercise tolerance when walking due to breathlessness.¹ Conventional treatment—for example, with β_2 agonists or portable oxygen—leads to only modest improvement in exercise tolerance (roughly 10%).^{2,3} While walking is a relatively efficient means of propulsion, cycling is considerably better.⁴ We have investigated cycling in patients with severe chronic airflow limitation.

Present study

We studied seven patients (five men; mean age $61.6 \pm$ SD 11.0 years) with severe chronic airflow limitation (forced expiratory volume in one second 0.80 ± 0.24 l; forced vital capacity 2.21 ± 0.82 l). All were non-smokers and were being maintained with inhaled bronchodilators, which were withdrawn on study days. Variables studied were breathlessness and exercise tolerance, and ventilation and oxygen consumption.

Patients cycled around a rectangular tarmac track (100 × 80 m; Wapping Sports Centre) using three cycles—a bicycle (Dawes Ladybird: five gears, 15 kg), an NHS tricycle (Pashley Ltd: three gears, 25 kg), and a lightweight tricycle (K Rogers Ltd: 10 gears, 15 kg). Walking tests were performed across the width of the track. Patients were instructed to go as far as they could in six minutes on each of the three cycles and during a six minute walk. The distance travelled and breathlessness induced (10 cm visual analogue scale; range not breathless to extremely breathless) were noted. Tests were performed in random order, with an hour's rest between tests.

In a separate study we compared ventilation, oxygen consumption, and distance travelled in the seven patients when (a) walking for six minutes at their own reduced pace and (b) tricycling for six minutes at the normal walking pace of AAW. Patients wore a close fitting facemask, and total ventilation and oxygen consumption were measured for each six minute period (Oxylog; P K Morgan Ltd).

RESULTS

Patients adapted quickly to the cycles, though several (especially those with bicycle experience) had initial difficulty cornering on the tricycle.

Exercise tolerance and breathlessness—Patients cycled between three and four times further than they walked in six minutes (289 ± 75 m). Of the three cycles, the greatest distances were achieved with the lightweight tricycle (1147 ± 197 m) and the bicycle (1055 ± 278 m): distances covered with these machines were significantly greater than with the NHS tricycle (833 ± 192 m) ($p < 0.05$). Patients were significantly less breathless after the lightweight tricycle (visual analogue scale 6.8 ± 2.2) than after the NHS tricycle (8.1 ± 0.8), the bicycle (7.6 ± 2.8), and walking (7.9 ± 2.7), despite having travelled the greatest distance ($p < 0.05$).

Ventilation and oxygen consumption—When patients tricycled at the walking pace of AAW they travelled at twice their own walking speed (4.47 ± 0.79 km/h *v* 2.26 ± 0.73 km/h; $p < 0.001$). This was achieved at lower ventilation (20.5 ± 5.2 l/min *v* 22.3 ± 6.5 l/min) and with a lower oxygen consumption (577 ± 183 ml/min *v* 662 ± 182 ml/min); hence the efficiency of tricycling was more than twice that of walking.

Comment

We tested three readily available cycles. The bicycle was chosen for lightness and ease of mounting. The NHS tricycle is designed for use by mentally and physically disabled adults. It is heavy and not ideal for use with breathless patients but was tested because it is prescribable. The lightweight tricycle was modified from a tricycle designed for racing by fitting standard handlebars. It is light, stable, and has a low rolling resistance.

Patients with severe airflow limitation increased the distance travelled in six minutes up to fourfold by cycling. Patients travelled furthest and were least breathless on the lightweight tricycle. Tricycling was more than twice as efficient as walking in terms of oxygen consumption, and also patients could adopt a good breathing posture on the tricycle by fixing the upper thorax and may be able to sustain a greater ventilation with less discomfort. The tricycle is stable at slow speeds and if a patient became breathless he can stop without dismounting, being in an ideal posture to recover. Shopping and supplemental oxygen can be carried with minimal disadvantage.

We believe that lightweight tricycles might be useful in rehabilitating patients with chronic airflow limitation. They are relatively cheap to buy (£250) and maintain and are a good form of exercise. All of the patients were severely disabled by breathlessness when walking and were amazed to have covered between half a mile and one mile (0.8 and 1.6 km) in six minutes when cycling. The improvement in distance travelled on the tricycle compared with walking (297%) was almost 30 times greater than achieved with conventional medical treatment^{2,3} (table).

Mean percentage improvements in distances travelled in six minutes' walking and using the three cycles. (Seven patients with severe chronic airflow limitation)

	Salbutamol	Portable oxygen	Tricycle
Improvement in 6 minute distance (%)	10	12	297

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