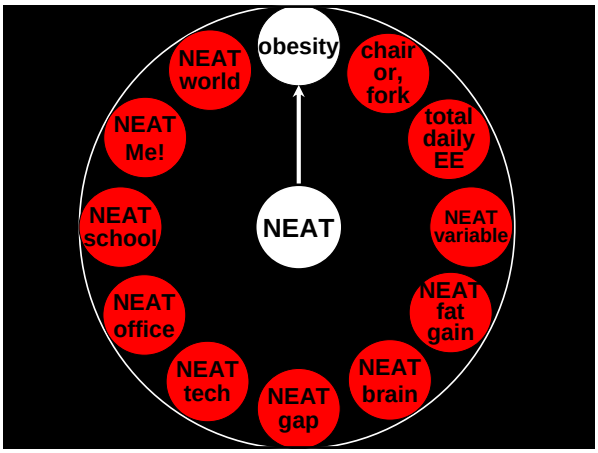
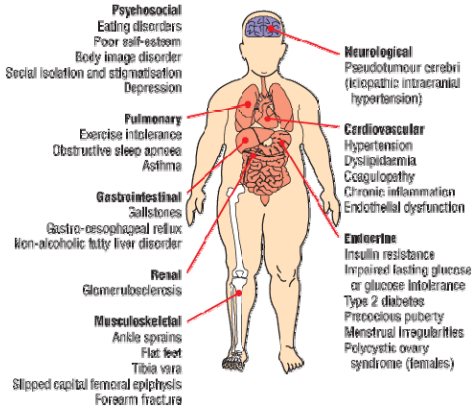
# N–E–A–T
# Non-exercise Activity Thermogenesis

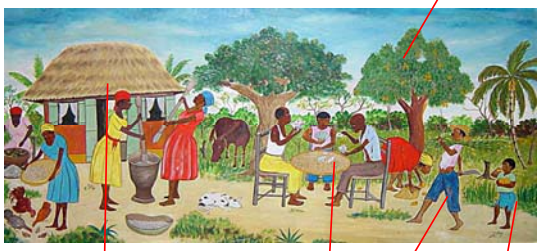


NEAT = 2000kcal/day

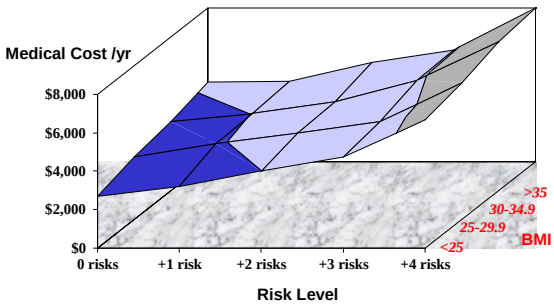
150 YEARS

NEAT = 700kcal/day




Kline S, NEJM




Musich, et al AJHP. 18(3):264-268.

*Chinese Medical Journal 2007; 120(11):1043-1050*

# Medical progress

## Obesity in China: Causes and solutions

James A. Levine

## NEAT: Non-Exercise Activity Thermogenesis

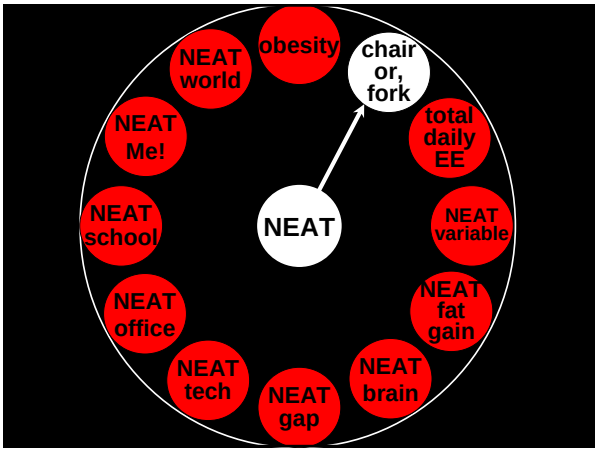
Obesity is global

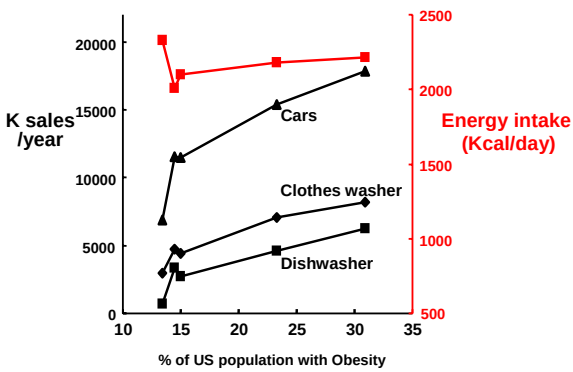
Effects every body organ

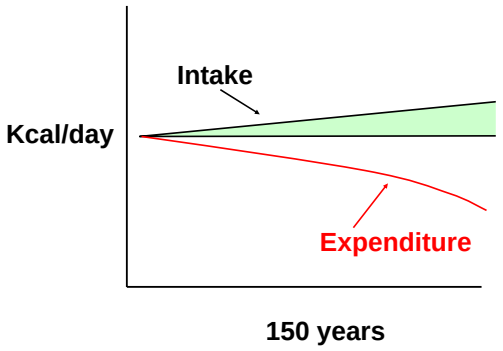
the mind, the spirit

Effects all aspects of society

*high social cost*



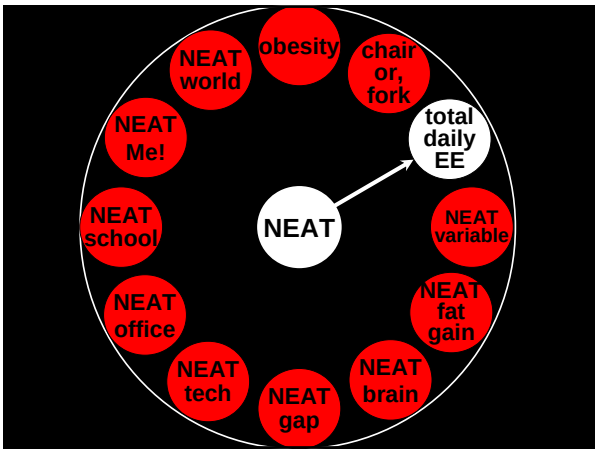



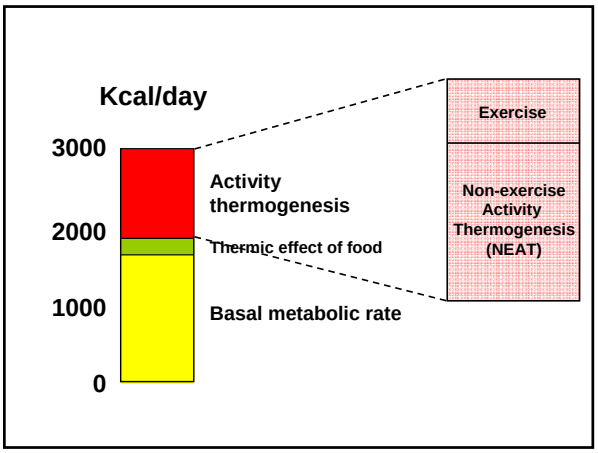




## NEAT: Non-Exercise Activity Thermogenesis

Obesity is the result of positive energy balance:

*Energy intake IN EXCESS of expenditure*

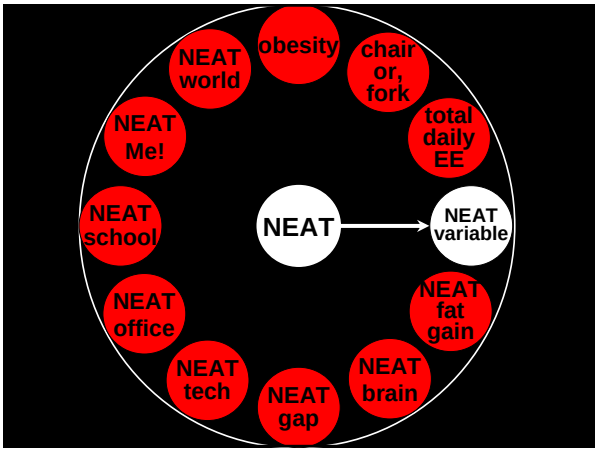


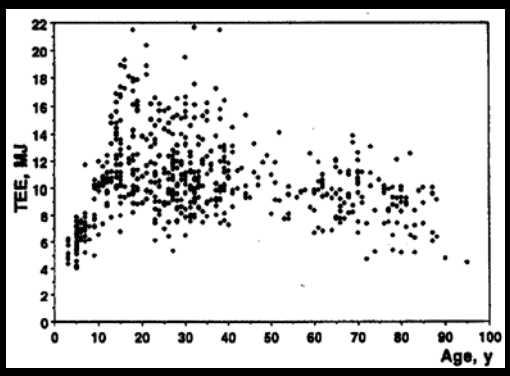




## NEAT

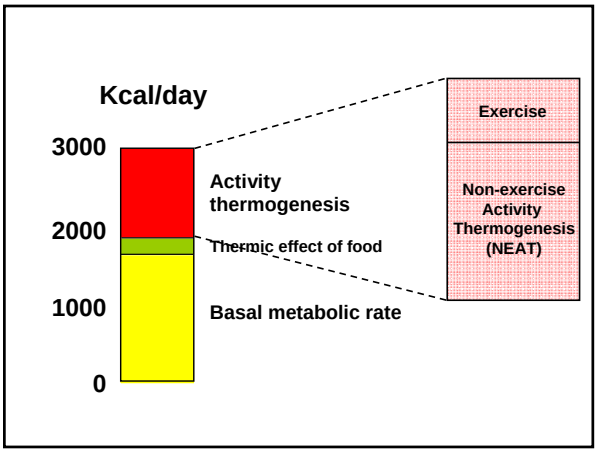
# NEAT:

# Non-Exercise Activity Thermogenesis




Black, *Eur J Clin Nutr* 50:72



## NEAT variability: effect of work

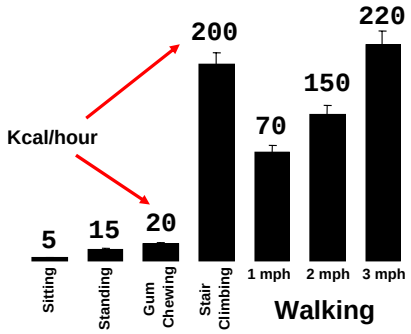
| Occupation-type | NEAT (kcal/day) |
|---|---|
| Chair-bound | 300 |
| Seated work: no option of moving | 700 |
| Seated work: discretion & requirement to move | 1000 |
| Standing work; e.g. homemaker, shop assistant | 1400 |
| Strenuous work; e.g. agriculture | 2300 |

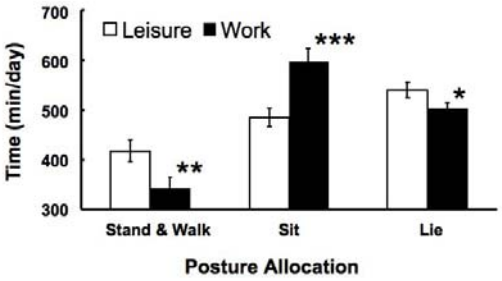
**Data assuming BMR = 1600 kcal/day**

**Black, *Eur J Clin Nutr* 50:72**

**NEAT-measurements**

## NEAT variability: effect of play



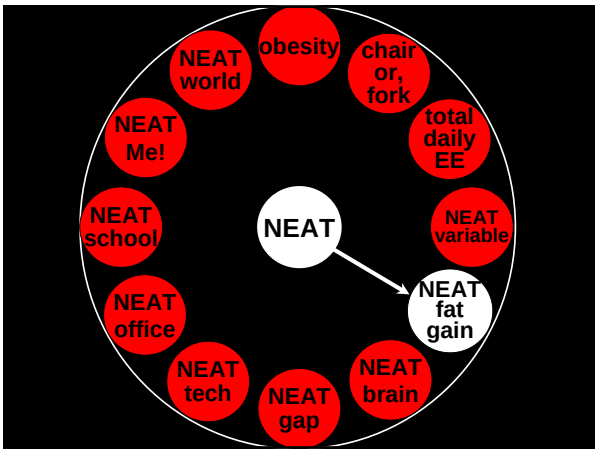

## NEAT: Non-Exercise Activity Thermogenesis

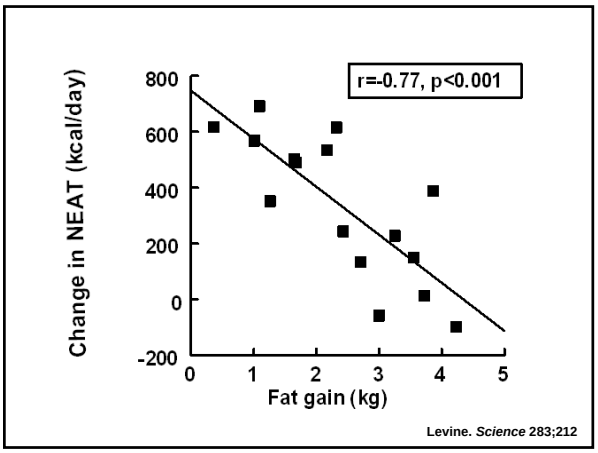
The great variability in daily energy expenditure – is largely explained by NEAT

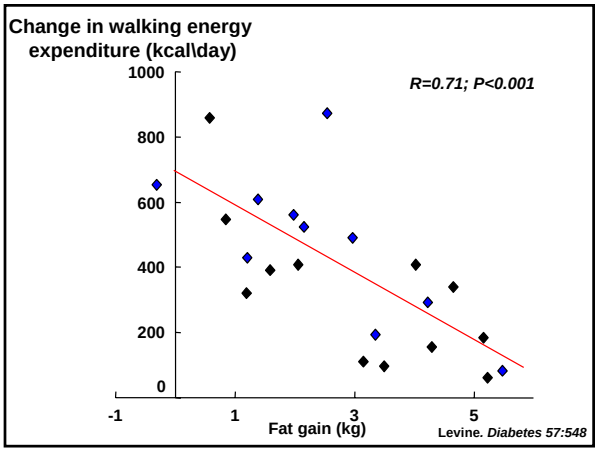
## NEAT: Non-Exercise Activity Thermogenesis

The great variability in daily energy expenditure – is largely explained by NEAT

*Because of variable work and leisure*



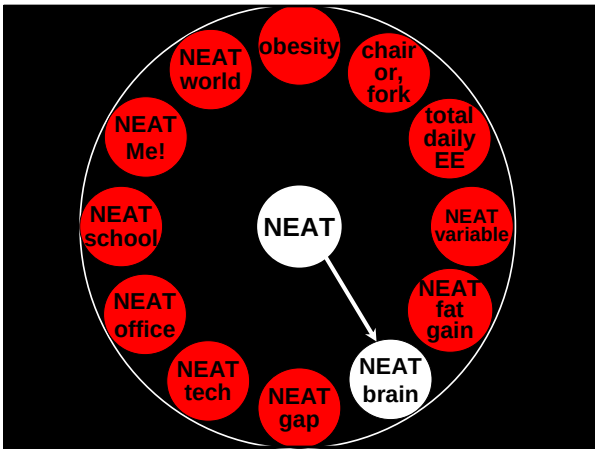



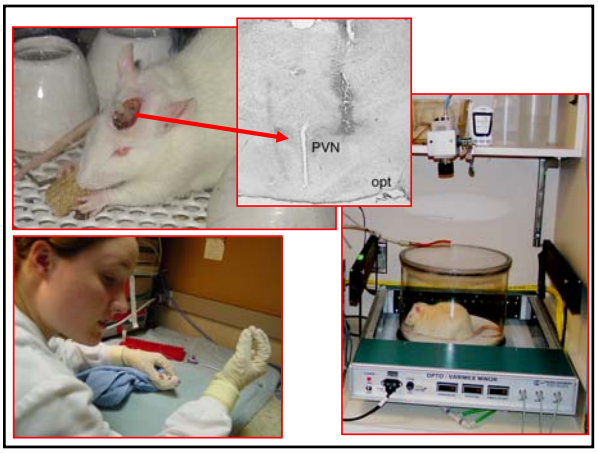

## NEAT: Non-Exercise Activity Thermogenesis

Overfeeding:

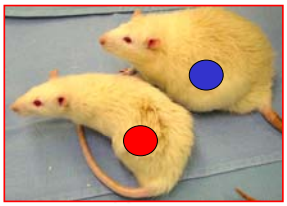
low NEAT response = fat gain

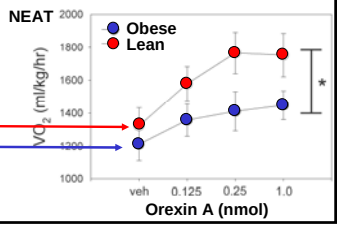
high NEAT response = stay thin



## Orexin





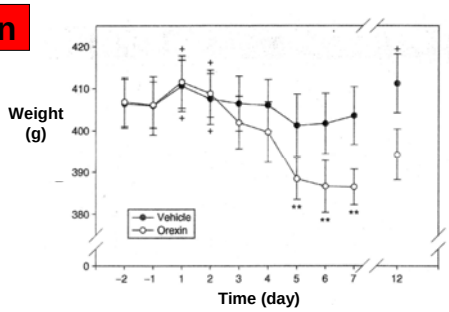

Orexin increases NEAT more in:

lean rats

than obese

Kiwaki *AJP* 2004, Novak *AJP* 2006

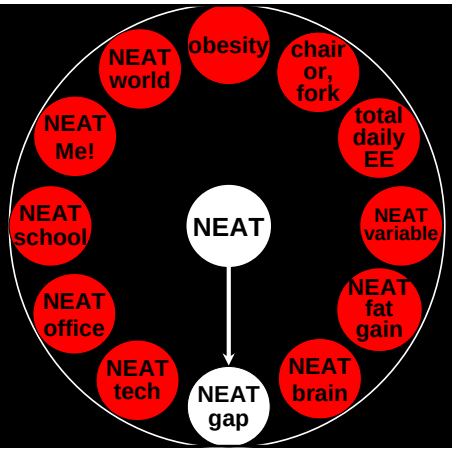
## Orexin




Novak *Obesity* 2009

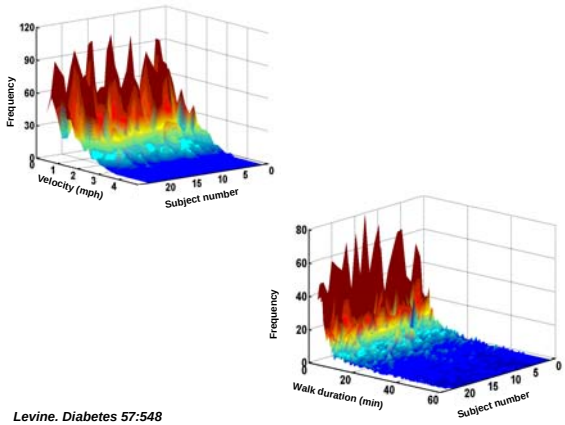
## NEAT: Non-Exercise Activity Thermogenesis

NEAT driven in the brain

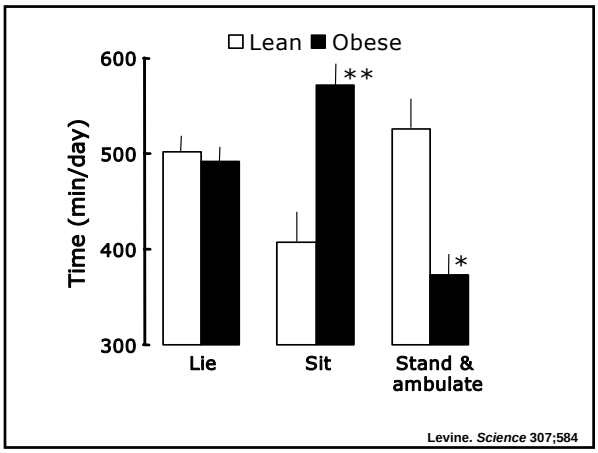


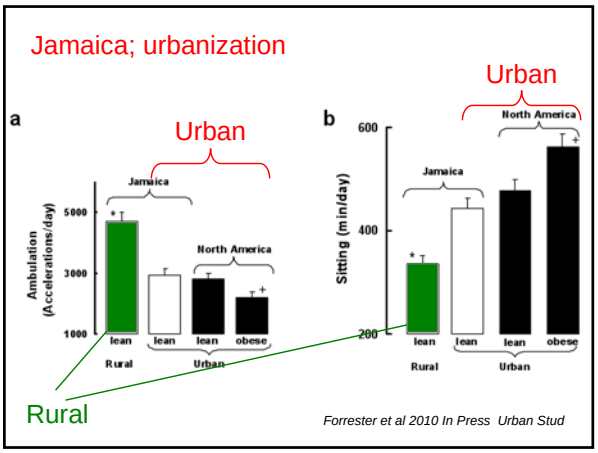
Body postures

Movements e.g. walking




*Levine. Diabetes 57:548*



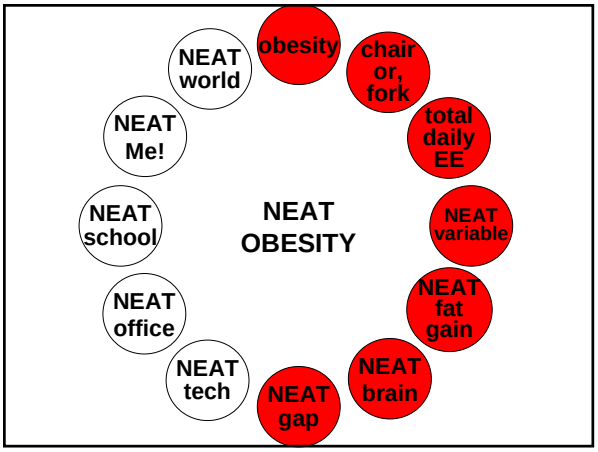

## NEAT: Non-Exercise Activity Thermogenesis

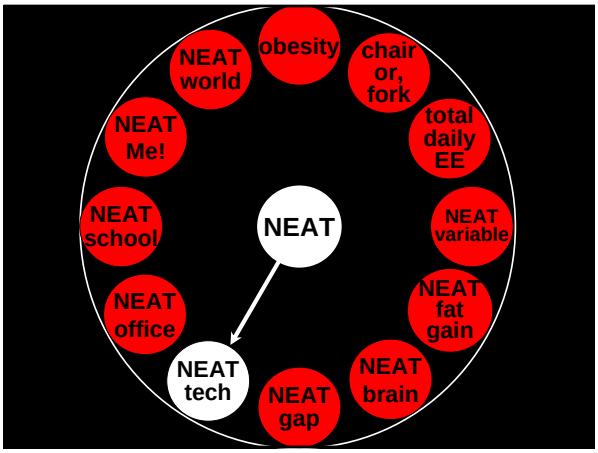
NEAT low in obesity

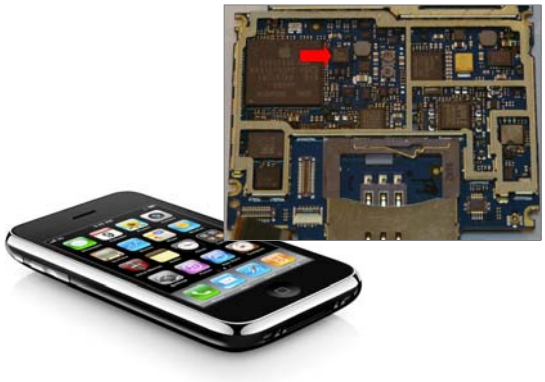
NEAT high in the thin

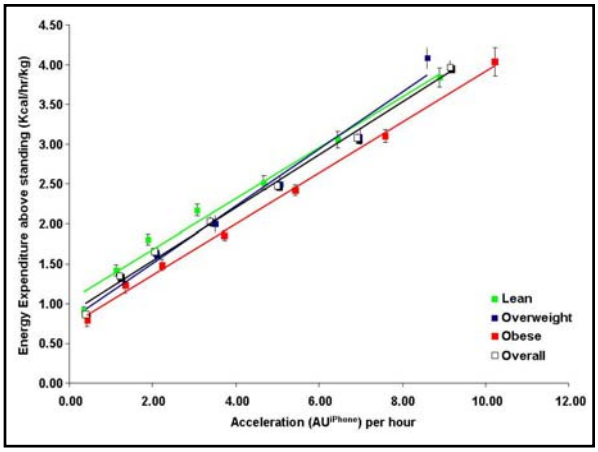
Walk and burn: 100-150 kcal/hour

*Lots of little walks count*



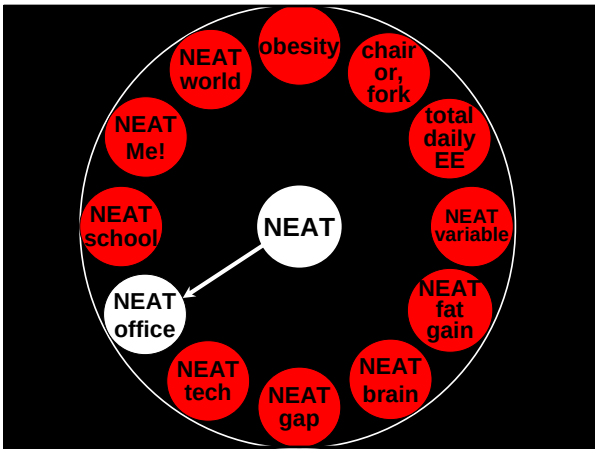





## NEAT: Non-Exercise Activity Thermogenesis

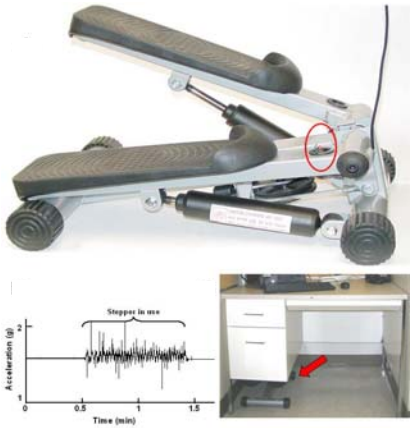
NEAT can be accurately and precisely measured -

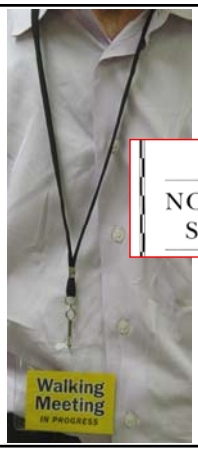
in the laboratory and in free-living people.



*NASA "Design of the future" 2005*

## Strategic partnerships…….




Richard Rybolt

NO CHAIRS MAKE FOR SHORT MEETINGS

Radio host gets in spin and rides at wo

Amanda Meade

AS breakfast radio shows go, it was as innocent as Kylie and Jackie O's shorts are sordid.

Hobart breakfast host Andy Muirhead rode himself into radio history on Friday, making his show the first ABC program to be broadcast while the host was pedaling on an exercise bike.

As a Ride to Work Day National Ambassador, the Local Radio 936 host wanted to promote the benefits of cycling so he put a call out for exercise bikes for the studio.

After a short practice ahead of Friday, Muirhead managed to pedal while talking between 5.30am and 5.45am. He did start to breathe rather heavily during the weather reports.

"I don't want to be a pacemaker, puff puff. I think I'll be fine," he said before the show. Some bulletin and traffic reports, a few minutes of silence. Guests, including ABC TV's Justin Murphy, journalist Danielle McKay and comedian Gavin Bartholeyn, all cycled too.

Even three local mayors took part, making the background noise from the wheels rather loud while they chatted about the message behind Ride to Work Day, which is on October 24.

Muirhead told Media after the show that he wanted to promote the day well ahead of time so people "could dust their bikes off and get ready for it".

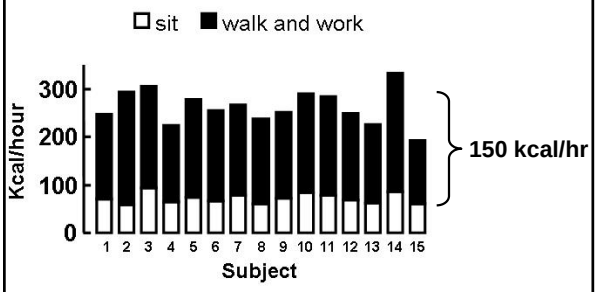
"We've done it from the back of aircraft sings and navy carriers, but never a whole show while pedalling. I cause mayhem doing the weather. It probably made me think I'll never complain about reading the weather again!"

Muirhead, 34, is the darling of the ABC in Tasmania, where he has been hosting the national TV show The Collectors for the past five years on top of his breakfast radio shift and a career as a stand-up comic.

The Collectors was one of five local shows that were regional TV production funding from the Set

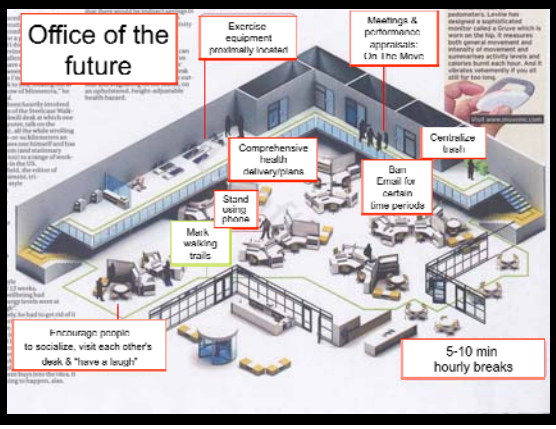
Pedalling start: Andy Muirhead does his ABC radio breakfast show from the saddle of an exercise bike

## AN EXTRA 150 KCAL/HR – without breaking a sweat




WHO Class 1 obesity

*Levine 2007 Br J Sp Med*




**NEAT-ECG**
**Expert consult group**

**NEAT**
**Platinum programs:**
**Productivity**
**Health**
**Health cost containment**

**NEAT**
**Company wide programs:**
**Health care delivery**
**&evaluations**

## NEAT-personalized support

SALO Project Search

EMERSON Process Management

**55 U.S. corporations**

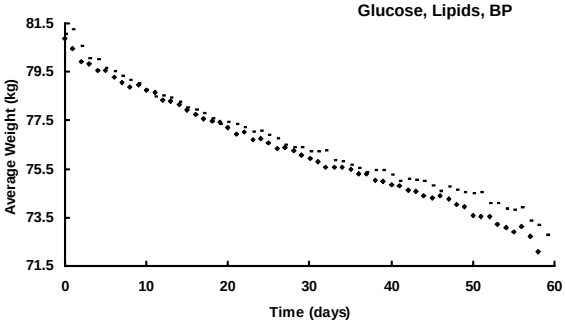
usbank Five Star Service Guaranteed

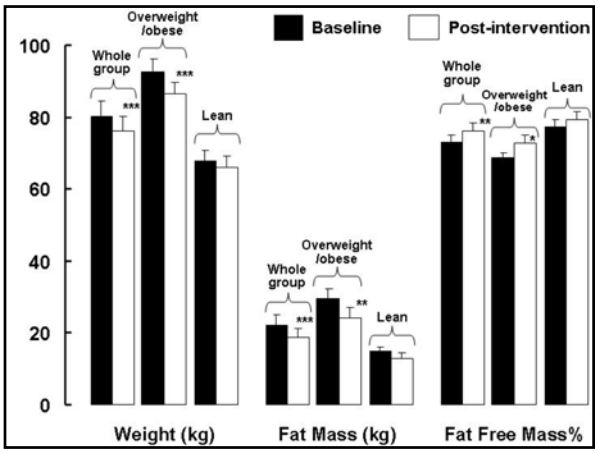
MALL OF AMERICA

BEST BUY

GENERAL OFFICE PRODUCTS

MORRISON FENSKE & SUND





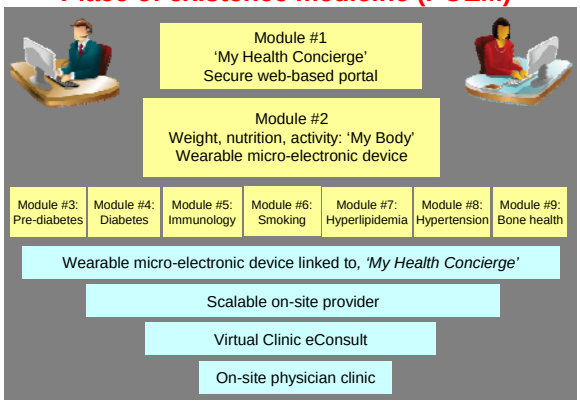

## Deployment planning platforms

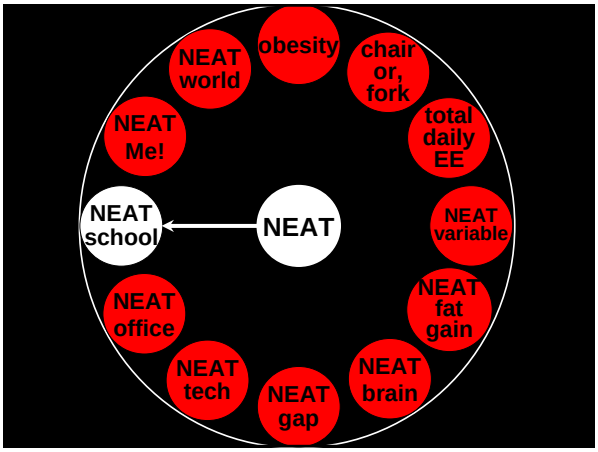
*Behavior science + exercise physiology + medical*

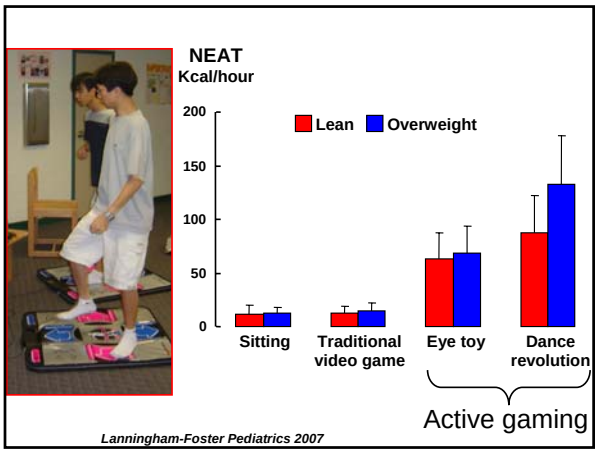
*Management, law + ROI (economics) + health care systems + quality of life*

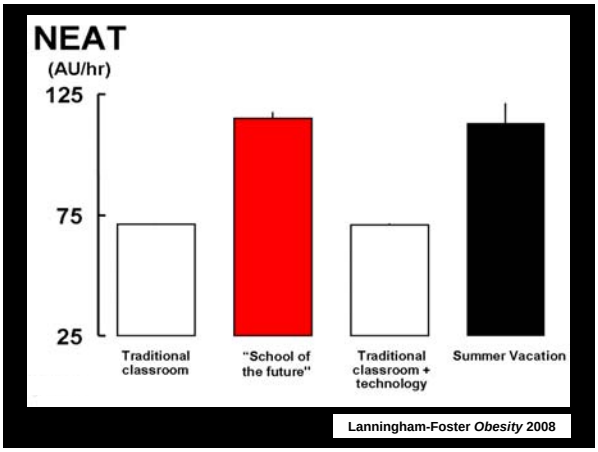
*Technology + Record systems + Mobile platform + E-presence*

## Place of existence medicine (POEM)

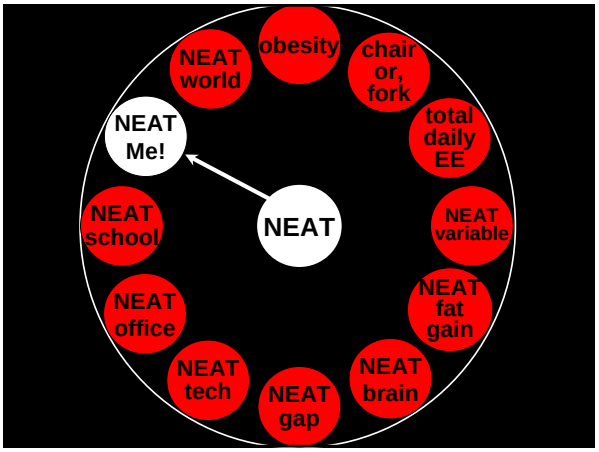


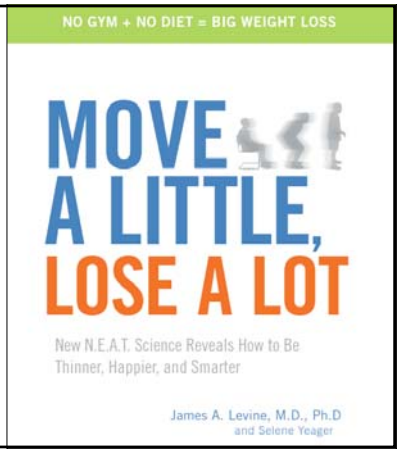

NEAT
Kcal/hour
200
150
100
50
0
Lean
Overweight
Sitting
Traditional video game
Eye toy
Dance revolution
Active gaming
Lanningham-Foster Pediatrics 2007


NEAT
(AU/hr)
125
75
25
Traditional classroom
"School of the future"
Traditional classroom + technology
Summer Vacation
Lanningham-Foster *Obesity* 2008

The New York Times
In a City in Italy, the Schoolchildren Walk Where Once They Rode

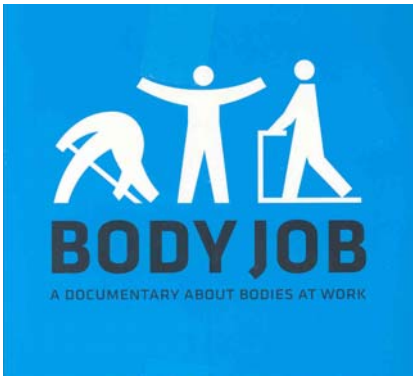


The book:




Crown
Random house
January 2009

The movie:

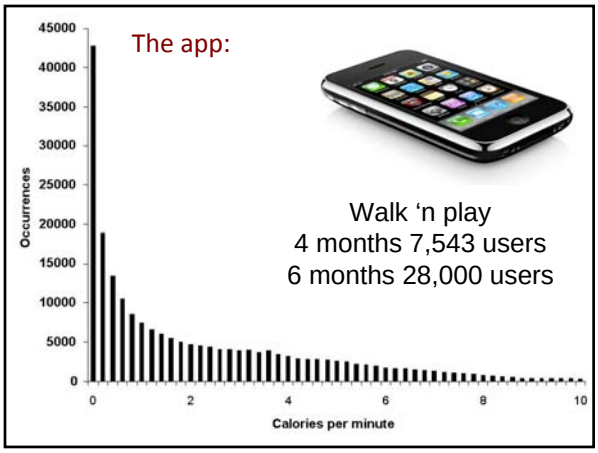


The device:

muve
SEE YOU LATER
elevator.
that anyone can succeed.

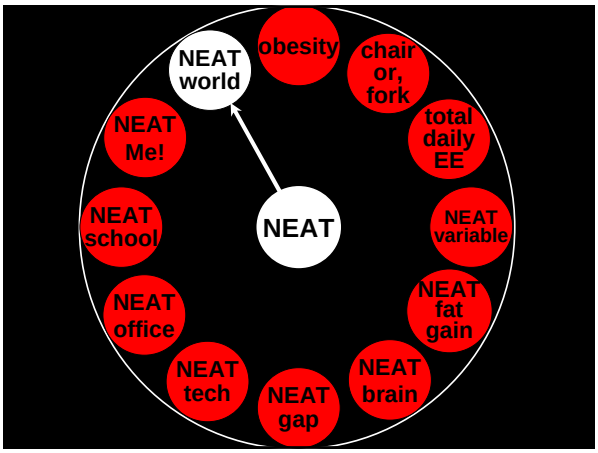
GrUVe

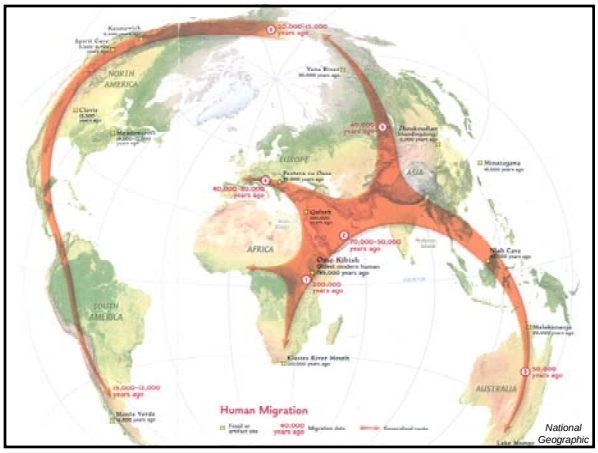
Home
Description
Personnel
Images and videos
Publications
Experimental Study
NEAT-o-Games


The app:
Walk 'n play
4 months 7,543 users
6 months 28,000 users
Occurrences
Calories per minute
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
2
4
6
8
10

FITTER.ME
Energy
Protein
Fat
Carbohydrate
Mean (SEM)
Levine BMJ 295: 369
3 months 3,500 users

The suit:


NEAT
NEAT world
obesity
chair or, fork
total daily EE
NEAT variable
NEAT fat gain
NEAT brain
NEAT gap
NEAT tech
NEAT office
NEAT school
NEAT Me!


Human Migration
National Geographic

# N–E–A–T
# Non-exercise Activity Thermogenesis

## Move a little lose a lot

Week 1  Planting the seeds of change

Week 2  Dream it - do it

Week 3  Create and explore

Week 4  Mind your body

Week 5  Self-discovery

Week 6  Commitment

Week 7  Your world