

# Coffee and Cake, how can these be related to Human Performance ? A personal Journey through some Sports Science Research

Professor Lars Mc Naughton  
Department of Sport and Physical Activity  
Edge Hill University

**Association for Public Service  
Excellence  
Sport and Leisure Conference**

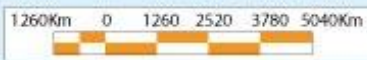
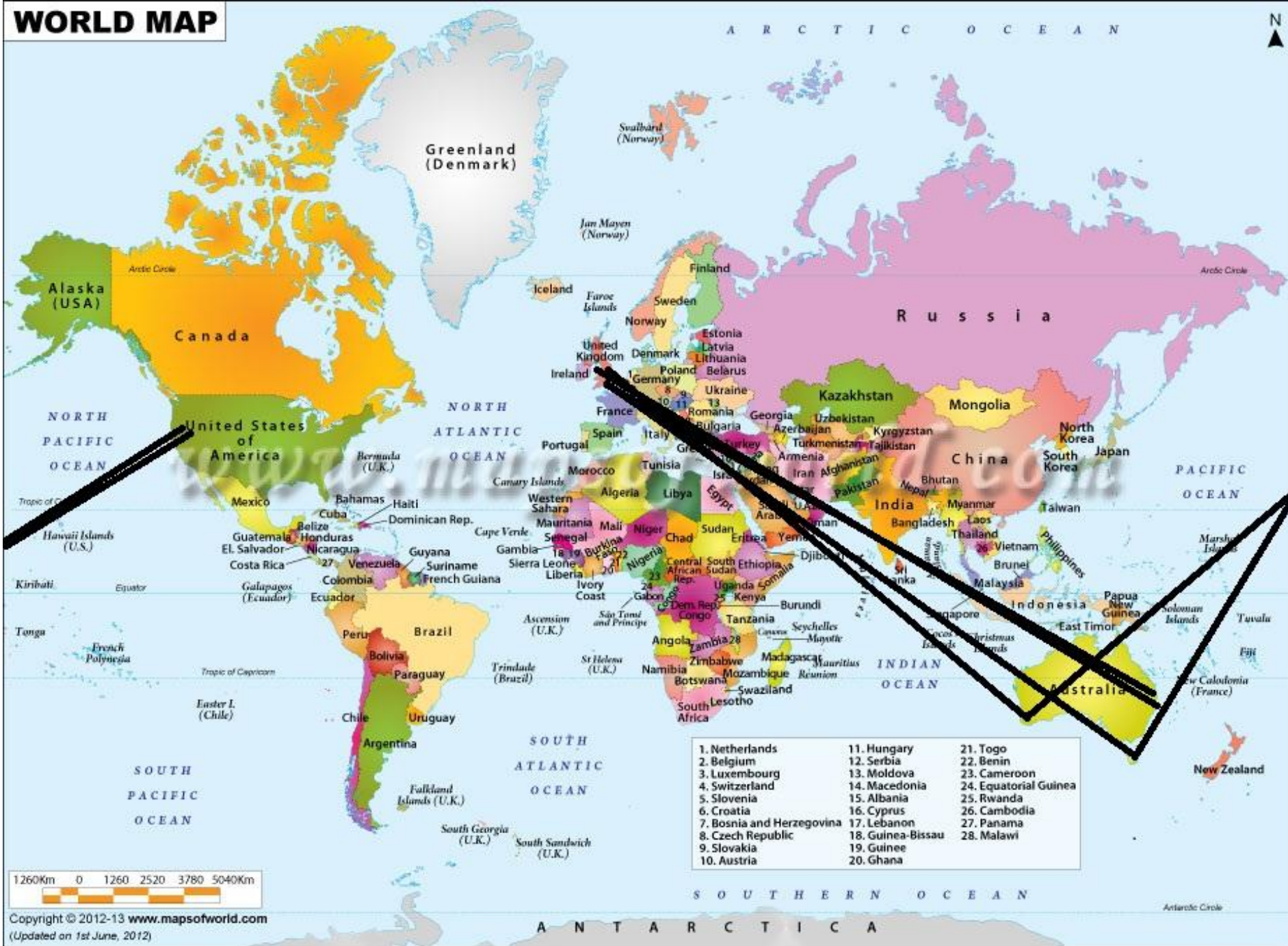
# Coffee, muffins and Maximal Performance: A personal Journey through some Sports Science Research

## Aims for today:

1. **Smile!**
2. **Take home some lessons and a little additional knowledge**
3. **Anything else is a bonus!**

# WORLD MAP

A R C T I C O C E A N



- |                           |                   |                       |
|---------------------------|-------------------|-----------------------|
| 1. Netherlands            | 11. Hungary       | 21. Togo              |
| 2. Belgium                | 12. Serbia        | 22. Benin             |
| 3. Luxembourg             | 13. Moldova       | 23. Cameroon          |
| 4. Switzerland            | 14. Macedonia     | 24. Equatorial Guinea |
| 5. Slovenia               | 15. Albania       | 25. Rwanda            |
| 6. Croatia                | 16. Cyprus        | 26. Cambodia          |
| 7. Bosnia and Herzegovina | 17. Lebanon       | 27. Panama            |
| 8. Czech Republic         | 18. Guinea-Bissau | 28. Malawi            |
| 9. Slovakia               | 19. Guinea        |                       |
| 10. Austria               | 20. Ghana         |                       |

A N T A R C T I C A

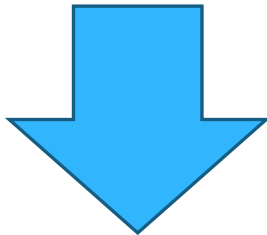
Antarctic Circle

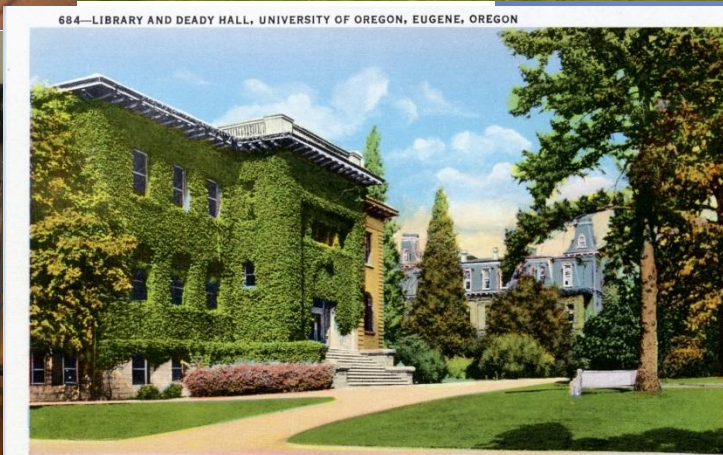
# My Personal Journey through Academia

Started life here, PE teacher at South Fremantle High School



Three years here before MSc and PhD  
at the University of Oregon (<http://www.uoregon.edu/>)





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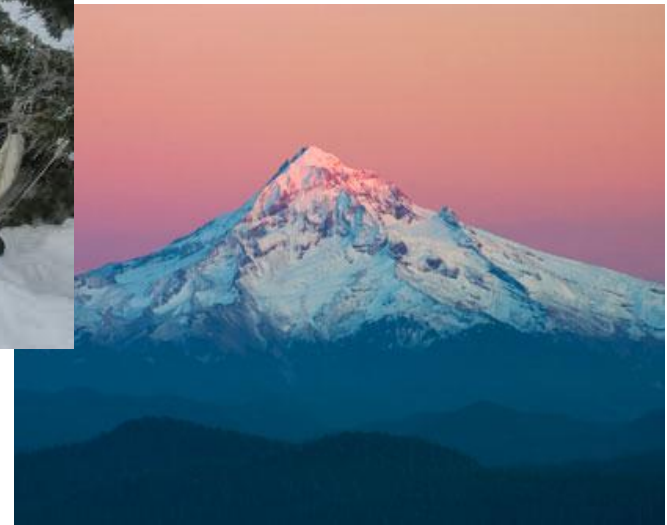
# My Personal Journey through Academia

- \* For fun - did an MSc in Outdoor Education and spent lots of time in the outdoors, hiking, climbing as a part of my GTA post!

Three Sisters



Mount Hood



# My Personal Journey through Academia

- \* Started PhD in 1980, finished at the end of 1984 – University of Oregon, Eugene [www.uoregon.edu](http://www.uoregon.edu)
- \* Contributions of arm and trunk muscles to posture control – supervisor Professor Marjorie Wollacott –

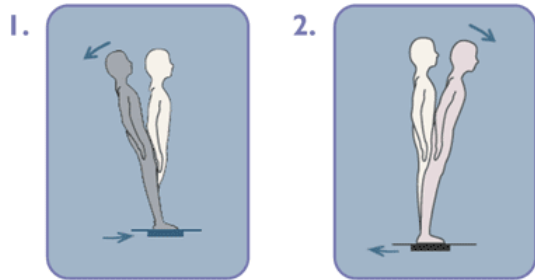
**Her areas of expertise include the development of balance control in normal children and in children with motor problems such as cerebral palsy and Down Syndrome. She is also exploring the factors leading to loss of balance function in the older adult, and in patients with motor disorders such as stroke and Parkinson's disease, in order to improve the quality of life and independence of adults well into old age.**



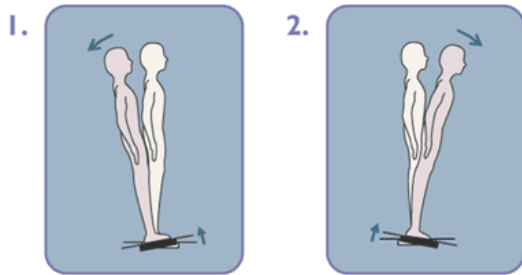
- \* Pivotal time for learning – at least that Research is an important part of an academic's life!

# PhD Work

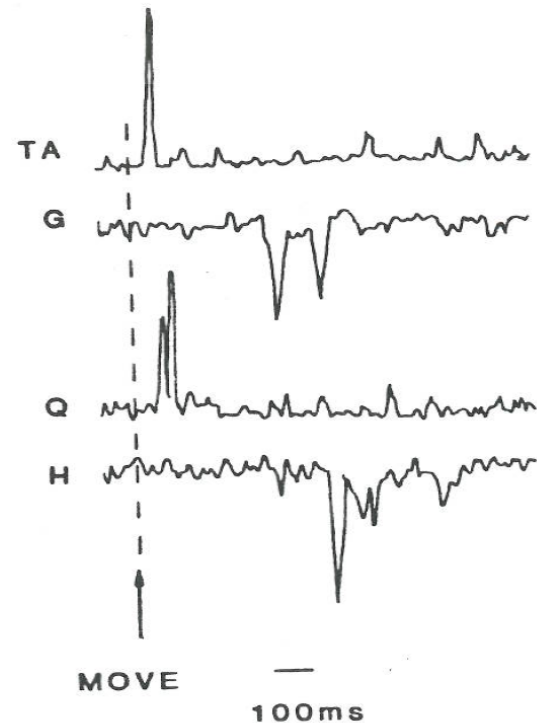
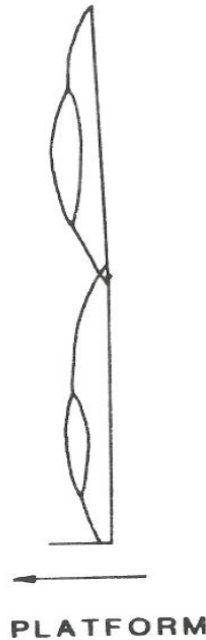
Example of Forward/Backward translations and response of lower limb muscles



Forward/Backward Translations



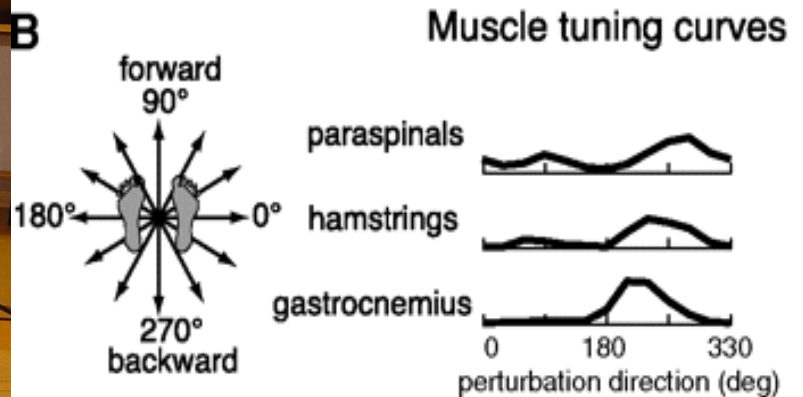
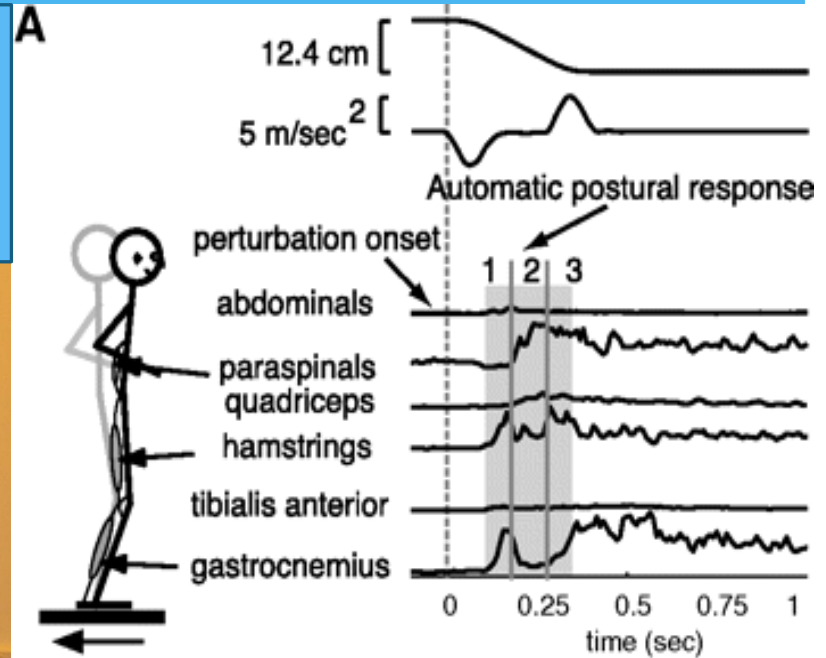
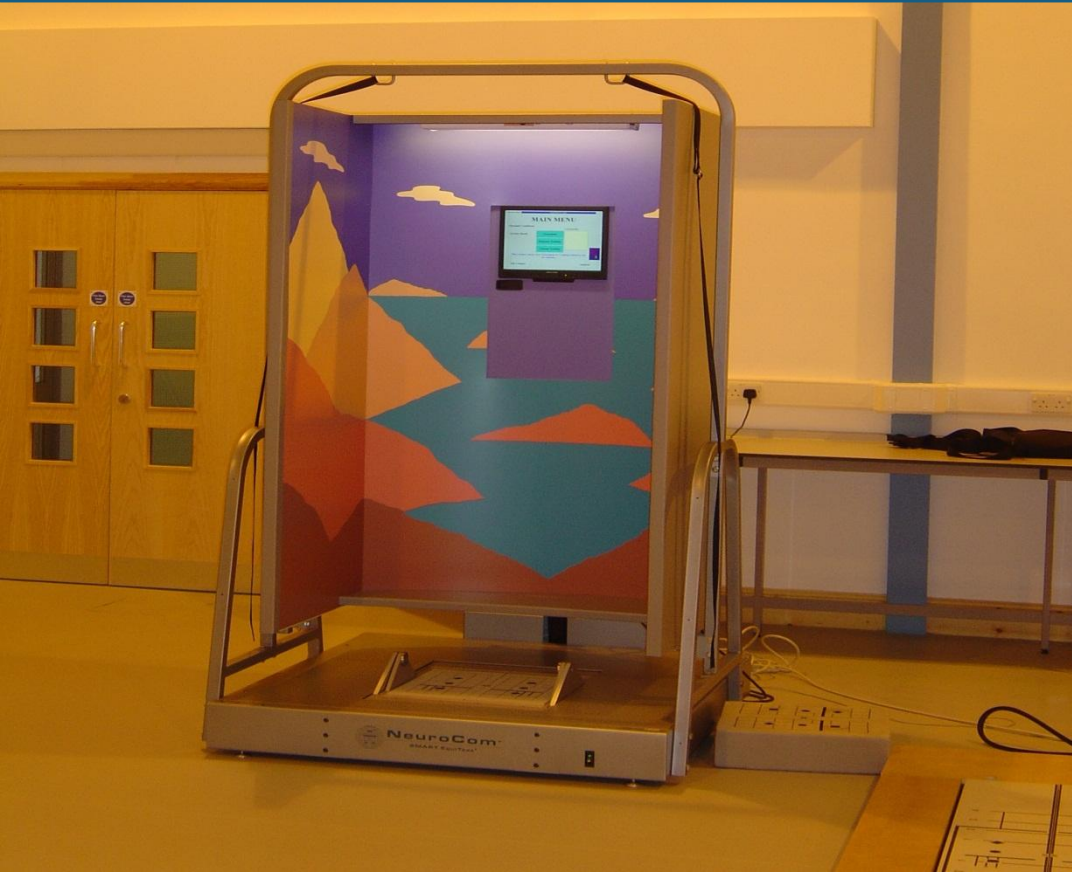
Toes Up and Toes Down Rotations





# PhD Work

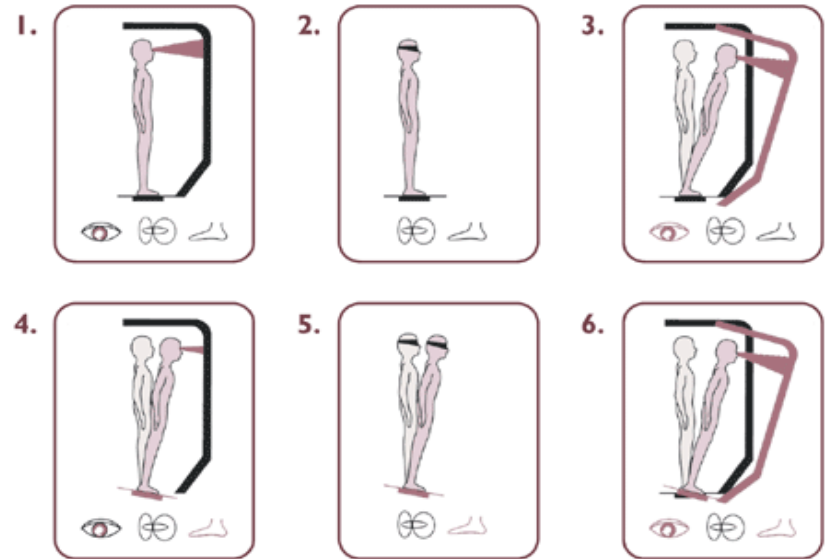
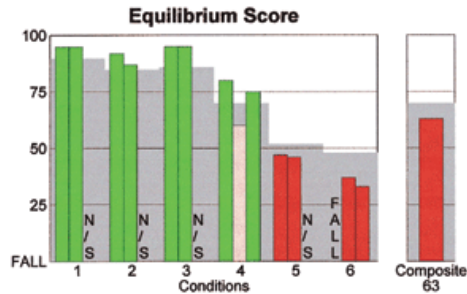
Platform has moved “on” significantly and is now used to diagnose a variety of conditions which might be involved in falling (next slide)



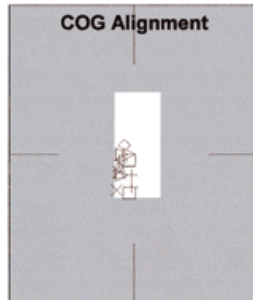
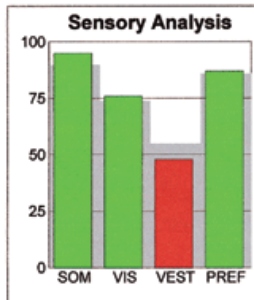
# PhD Work

## Sensory Organization Test

(Sway Referenced Gain: 1.0)



Sensory Organization Test



### Ratio

Somatosensory (SOM)

Visual (VIS)

Vestibular (VEST)

Preference (PREF)

### Comparison

Condition 2  
Condition 1

Condition 4  
Condition 1

Condition 5  
Condition 1

Condition 3 + 6  
Condition 2 + 5

### Functional Relevance

Patient's ability to use input from the *somatosensory system* to maintain balance

Patient's ability to use input from the *visual system* to maintain balance

Patient's ability to use input from the *vestibular system* to maintain balance

The degree to which a patient relies on visual information to maintain balance, even when the information is incorrect.

# PhD Work

Falling is a serious and frequent occurrence in people aged 65 and over. Each year, 35% of over 65s experience one or more falls. About 45% of people aged over 80 who live in the community fall each year—10-25% of such falls will sustain a serious injury<sup>1</sup>.

Up to one in three over 65s (3.4m) suffer a fall each year, costing the NHS an estimated £4.6 million a day, or £1.7 billion per year<sup>2</sup>.

The implications for this work are that we can help prevent people from falling through cognitive and exercise training programmes and thus prevent or limit the amount of cost to our national health care system.

<sup>1</sup> Falls and Fractures—Effective Interventions in Health and Social Care. Department of Health, 2009.  
[www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_103146](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_103146)

<sup>2</sup> Older People's Experiences of Falls and Bone Health Services (England), Royal College of Physicians, 2008.

# My Personal Journey through Academia



## Faculty of Education

- \* **Another time for pivotal learning since it simply taught me that:**
  - \* **if you want to be research active then you have to do what you can do!**
  - \* **Students can be a great resource and the learning is two way!**
  - \* **Involve your colleagues, and**
  - \* **If you don't ask you don't get!**

# My Personal Journey through Academia

So I want to be research active but in the Faculty of Education, with no money for science, and no other research active colleagues in my area within the faculty.

\* What to do?

A. Seek help from, students, colleagues in other Faculties and people outside and,

B. Pick work that can be done

HENCE, .....



# Coffee

- \* 1,3-7 -trimethylxanthines
- \* A cup of drip brewed coffee has about 115 milligrams of caffeine, an espresso (and percolated coffee) about 80mg, while instant coffee has about 65mg of caffeine.
- \* Tea has about 40mg of caffeine (**so, why drink it???**)
- \* Decaffeinated coffee is not totally caffeine free, containing about 3mg of caffeine (**so, why drink it???**)
- \* A 8oz can of Coca-Cola has about 23mg of caffeine, and Pepsi Cola approximately 25mg., while an ounce of chocolate contains about 20mg.
- \* A single shot of espresso (about 30 mL) has about 185 mg (2000 mg/L) of caffeine.
- \* A single cup of coffee (about 200 mL) has about 115–175 mg (560–850 mg/L) of caffeine.
- \* **Coffee is the world's most popular stimulant:** 4 out of 5 Americans drink it, consuming more than 400 million cups a day. Consumption in Scandinavian countries is more than 12kg (26lb) per capita. With more than 25 million people employed in the industry, coffee is one of the largest trade industries in the world.

# Coffee

## **The Perfect Coffee (well cappuccino!)**

- \* Take your Espresso coffee which should be about  $\frac{1}{3}$  of your cup.
- \* Pour heated milk into the cup, bringing it to  $\frac{2}{3}$  full. (Use your mixing spoon to separate the foam from the milk)
- \* Finally scoop out the desired amount of foam filling the final  $\frac{1}{3}$  of the cup. Having the foam rise above the cup is perfect.
- \* So,  $\frac{1}{3}$  coffee  $\frac{1}{3}$  foam &  $\frac{1}{3}$  milk will give you world class results every time.

Ref: [www.thesexykitchen.com](http://www.thesexykitchen.com)

# Coffee

- \* In humans, caffeine acts as a central nervous system stimulant, temporarily warding off drowsiness and restoring alertness. It is the world's most widely consumed psychoactive drug, but, unlike many other psychoactive substances, it is both legal and unregulated in nearly all parts of the world.
- \* To this end it was initially not banned by the IOC, then banned and now, not banned (but I am led to believe it is still measured and still viewed).
- \* **So what does the research tell us?**



# Caffeine

- \* **Mc Naughton, L.R.** (1986) The influence of caffeine ingestion on incremental treadmill running. *British Journal of Sports Medicine*, 20, 109-112.
- \* **Mc Naughton, L.R.** (1987) Two levels of Caffeine ingestion on blood Lactate and free fatty acid response during incremental exercise. *Research Quarterly for Exercise and Sport*, 58, 255-259.
- \* Flinn, S., Gregory, J., **Mc Naughton, L.R.**, Davies, P. & Tristram, S. (1990) Caffeine ingestion during incremental cycling to exhaustion in recreational cyclists. *International Journal of Sports Medicine*, 11, 188-193.
- \* French, C., **Mc Naughton, L.R.**, Davies, P., & Tristram, S. (1991) Caffeine ingestion during exercise to exhaustion in elite distance runners. *Journal of Physical Fitness and Sports Medicine*, 31:3, 425-429.
- \* Donnelly, K. & **Mc Naughton, L.R.** (1992) The effects of two levels of caffeine ingestion on excess post-exercise oxygen consumption in untrained females. *European Journal of Applied Physiology and Occupational Physiology*, 65, 459-463.

**Currently the Food and Drug Administration (FDA) National Center for Drugs and Biologics, lists more than 1000 OTC drugs as having caffeine as an ingredient.**

# Caffeine

- \* McNaughton (1987) demonstrated larger caffeine doses (10 and 15 mg.kg<sup>-1</sup> – so about the equivalent of 7-10 cups **AT ONCE!**) capable of increasing exercise time during a incremental progressive, cycle ergometer test.
- \* In the work of Flinn et al. (1990) we found that subjects in the caffeine trial worked significantly longer and performed more work ( $p < 0.05$ ) than they did in either the control or placebo trials. FFA's were also significantly higher in this trial.
- \* In the Donelly and McNaughton work (1992) we found, .....

# Caffeine

- \* Six untrained women aged 20.5, each subject underwent three test sessions at 55%  $VO_{2max}$  either in a control condition (CON) or with the CAF1 or CAF2 dose of caffeine.
- \* During exercise, oxygen consumption was found to be significantly higher in the CAF1 and CAF2 trials, compared to CON ( $P < 0.05$ ). During the hour post-exercise, oxygen consumption in CAF1 and CAF2 remained significantly higher than in CON ( $P < 0.05$ ).
- \* At all times throughout the exercise, free fatty acid (FFA) concentrations were significantly higher in the caffeine trials than in CON.
- \* The results of this study would suggest that caffeine is useful in significantly increasing metabolic rate above normal levels in untrained women during, as well as after, exercising at 55%  $VO_{2max}$ .

# Caffeine

**So the volumes of research would say that Caffeine can:**

1. Aid endurance exercise (60-85%  $\text{VO}_2\text{max}$ ; >1 hr duration) probably by mobilising more fat and enhanced neuromuscular facilitation
2. Enhance Reaction time (RT) and movement time (MT) can when taken in a 300 mg dose.
3. Stimulates epinephrine (adrenalin) release from the adrenal medulla

And more recent research also suggests that;

3. Vision may also be affected

# Caffeine and ???

So you cannot go to Starbucks, Neros or Costa Coffee and have a caffeine drink and NOT have something to eat with it (The Business gurus amongst us would say that once you have a customer in the shop you have to make the most of their wallet!)

**COSTA**  
FOR COFFEE LOVERS



CAFFÈ  
**NERO**

Other coffee shops are available!!!

**SO what NEXT??**

# Cakes and Muffins



**My personal choice for eating with my coffee is a Muffin!**

A basic formula for muffins is 2 cups flour, 2-4 tablespoons sugar, 2 1/2 teaspoons baking powder, 1/2 teaspoon salt, 1 egg, 1/4 cup oil, shortening or butter, 1 cup milk. When the fat, sugar and egg ratio in a recipe reaches double or more than this, you have reached the cake level.

**If you like cake this one would be awesome!**





# Muffins



## **Perfect Blueberry Muffins** (thanks to Nigella - <http://www.nigella.com/recipes/view/best-blueberry-muffins-3009>)

- \* 2 cups (approx 280 grams) Self Raising flour
- \* 3/4 tsp salt 1/3 cup (approx. 67 grams) sugar
- \* **2 tsp baking powder !!!!**
- \* 2 eggs
- \* 4 tbsp butter, melted
- \* 3/4 cup (175 ml) milk
- \* 2 cups (approx. 300 grams) blueberries, well-dried (raspberries or other “fruit stuff” that you prefer
  
- \* **Method**
- \* Makes 18 muffins
- \* Wash the blueberries and drain. Sprinkle a tea towel with flour and roll the blueberries in it. Wrap the now lightly floured berries and leave for a good 30 minutes or so to dry completely.
- \* Preheat oven to 425F/210C/Gas Mark 7.
- \* Sift the flour, salt, sugar, and baking powder into a large mixing bowl. AND In a separate bowl, beat the eggs. Add the melted butter and then the milk.
- \* Quickly stir the liquid ingredients into the dry, confining yourself to only 10-15 strokes. Leave the lumps as too much handling will result in tough muffins.
- \* Add the floured blueberries and the optional rind if you are using. Briefly fold in the berries. Spoon into the prepared muffin pans, allowing the mixture to fill about 2/3 of the cup. Bake in the hot oven for 15-20 minutes. Muffins will be a light golden colour when fully cooked. R
- \* Remove at once from their tins.

# Muffins

So now you are asking yourself what's the point of muffins???

Well it is twofold with regards to research

1. Sodium Bicarbonate – baking soda, you need it for muffins and you need it to perform high intensity exercise, and
2. Muffins = food and you need that too!



# Bicarbonate

**Mc Naughton, L.R.,** Siegler, J.C., Keatley, S. & Hillman, A. (2011) The effects of sodium bicarbonate ingestion on maximal tethered treadmill running, *Gazzetta Medica Italiana - Archivio per le Scienze Mediche* 170(1):33-9

Currell, K., Derave, W., Everaert, I., **Mc Naughton, L.**, Slater, G., Burke, L.M., Stear, S.J., Castell, L.M., (2011) A-Z of nutritional supplements: dietary supplements, sports nutrition foods and ergogenic aids for health and performance—Part 20, *Br J Sports Med* 2011; doi:10.1136/bjsports-2011-090020.

Peart, D.J., Taylor, L., Midgley, A.W., Towlson, C., Vince, R.V., & **Mc Naughton, L.R.** (2011). Pre-exercise alkalosis attenuates the heat shock protein 72 response to a single-bout of anaerobic exercise, *Journal of Science and Medicine in Sports*. 10.1016/j.jsams.2011.03.006,

Siegler, J., **Mc Naughton, L.R.**, Midgley, A.W., Keatley, S. & Hillman, A. (2010) Metabolic alkalosis, recovery and sprint performance, *International Journal of Sports Medicine* 31: 797-802. (30%)

Castell, L.M., Burke, L.M., Stear, S.J., **Mc Naughton, L.R.**, & Harris, R.C. (2010) BJSM reviews: A-Z of nutritional supplements: dietary supplements, sports nutrition foods and ergogenic aids for health and performance Part 5 (Sodium Bicarbonate and Sodium Citrate), *British Journal of Sports Medicine*, (Invited Review), 44:77-78.

Vanhatalo, A., **Mc Naughton, L.R.**, Siegler, J., & Jones, A.M. (2009) Effect of induced alkalosis on the power-duration relationship during 'all-out' exercise, *Med Sci Sports Exerc*, 42: 563-570 (30%).

**Mc Naughton, L.R.**, Siegler, J., & Midgley, A.W. (2008) The ergogenic effects of sodium bicarbonate, *Current Sports Medicine Reports*, 7:230-236 (60%). [Invited review].

Siegler, J.C., Keatley, S., Midgley, A.W., Nevill, A.M., **Mc Naughton, L.R.** (2007) Influence of pre-exercise alkalosis and recovery mode on the kinetics of acid-base recovery following intense exercise, *International Journal of Sports Medicine*, 28: 1-7.

Berger, N.J.A., **Mc Naughton, L.R.**, Keatley, S., Wilkerson, D.P., and Jones, A.P. (2006) Sodium bicarbonate ingestion alters the slow but not the fast phase of VO<sub>2</sub> kinetics, *Medicine and Science in Sports and Exercise*, 38: 1909-1917.

**Mc Naughton, L.R.**, & Thompson, D. (2001) Acute versus chronic sodium bicarbonate ingestion and anaerobic work and power output, *Journal of Sports Medicine and Physical Fitness*, 41: 456-462.

**Mc Naughton, L.R.**, Strange, N. & Backx, K., (2000) Effects of chronic bicarbonate ingestion on multiple bouts of anaerobic work and power output, *Journal of Human Movement Studies* 38: 307-322.

Strange, N., **Mc Naughton, L.R.** & Thompson, D., (2000) Sodium bicarbonate ingestion and its effects on maximal accumulated oxygen deficit (MAOD) in trained individuals, *Journal of Human Movement Studies*, 39: 311-323.

**Mc Naughton, L.R.**, Backx, K., Palmer, G., & Strange, N. (1999) Effects of chronic bicarbonate ingestion on the performance of high intensity work, *European Journal of Applied Physiology*, 80: 333-336.

**Mc Naughton, L.R.**, Dalton, B., & Palmer, G. (1999) Sodium bicarbonate can be used as an ergogenic aid in 1-hr time trial cycling, *European Journal of Applied Physiology and Occupational Physiology*, 80: 64-69.

**Mc Naughton, L.R.**, Ford, S. & Newbold, C. (1997) The effects of sodium bicarbonate ingestion on high intensity exercise in moderately trained women. *Journal of Strength and Conditioning Research*, 11, 98-102.

Coombes, J. & **Mc Naughton, L.R.** (1993) The effects of sodium bicarbonate ingestion on isokinetic power and endurance. *Journal Strength and Conditioning Research*, 7, 241-249.

**Mc Naughton, L.R.**, Davoren, B. and Graham, K. (1993) Diet and acid-base balance: A review. *Excel*, 8, 197-201.

**Mc Naughton, L.R.** (1992) Bicarbonate ingestion: effects of dosage on 60s cycle ergometry. *Journal of Sports Sciences*, 10, 415-423.

**Mc Naughton, L.R.** (1992) Bicarbonate loading and its use in Sports. *International Clinical Nutrition Review*, 12, 65-67.

**Mc Naughton, L.R.** (1992), Sodium bicarbonate ingestion and its effects on anaerobic exercise of differing durations. *Journal of Sports Sciences*, 10, 425-435.

**Mc Naughton, L.R.**, & Cedaro, R. (1992) Sodium citrate ingestion and its effects on anaerobic exercise of differing durations. *European Journal of Applied Physiology and Occupational Physiology*, 64, 36-41.

**Mc Naughton, L. R.**, Curtin, R., Perry, D., Turner, B., & Showell, C. (1991) Bicarbonate loading and the effects on anaerobic work and power output during cycle ergometer performance. *Journal of Sports Sciences*, 9, 151-160.

**Mc Naughton, L.R.**, & Cedaro, R. (1991) The effects of bicarbonate ingestion on elite rowing ergometer performance. *Australian Journal of Medicine and Science in Sports*, 23, 66-69.

**Mc Naughton, L.R.** (1990) Sodium Citrate and Anaerobic Performance implications of dosage. *European Journal of Applied Physiology and Occupational Physiology*, 61, 392-397.

Goldfinch, J., **Mc Naughton, L.R.** and Davies, P. (1988) Induced metabolic alkalosis and its effects on 400 m racing time. *European Journal of Applied Physiology and Occupational Physiology*, 57, 45-48.

# Bicarbonate

So based on my own and others research; the take home lessons about sodium bicarbonate are:

- \* Take in a dose of about 300mg/kg body mass
- \* Helps improve exercise of about 1-7/8 minutes as well as some intermittent sports like Judo and Boxing
- \* Maybe good for longer endurance exercise as well
- \* Don't use it for the first time in an important competition and make sure the first time you use it, there is a loo close by (just in case!)

# Collaborations

(hard to survive without them!)

## Ex Students (Under/Postgrads)

Deb Sweeney, Sue Hancock, Tracey Leach, Jo Goldfinch, Tim Smith, Jeff Coombes, Susan Flynn, Mark St-John, Kym Bramich, Denise Fletcher, David Preece, Matt Wesson, Ian Stewart, Dale Long, Mark Blake, Rebecca Walsh, Susan Flinn, John Gregory, Tony Long, Roger Croft, Judy Pennicott, Anita Atwell, Jo Smith, Chris French, Liz Johnston, Anita Atwell, Amanda Clingleffer, Karen Donnelly, Dave Thomas, Brad Dalton, Janine Tarr, David Buck, Rebecca Oakman, Karianne Backx, David Bentley, Matt Greig, Ric Lovell, Lee Taylor, Rob Lamyman, Simon Roberts, Jon Scott, Natalie Vanicek, Hollie Forbes, Katie Small, Bryna Christmas, Sandra Ramos, Laura Moore, Dan Peart, Angie Hillman,

and apologies to those who I have inadvertently missed

## Colleagues

Peter Davies, Brian Minikin, Jeff Coombes, Rob Fassett, Steven Tristram, Shayne Gorringe, David Kaufman, Rod Cedaro, Bill Davoren, Ken Graham, Greg Hannan, Dean Cooley, Todd Ryska, Gary Palmer, Karianne Backx, David Bentley, Gregoire Millett, Adrian Midgley, Matt Grieg, Ric Lovell, Jason Siegler, Gary Phillips, Andy Jones, Anni Vanhalato, Remco Polman, Peter Clough, Martin Matthews, Julian Hatcher, Simon Keatley, Andy Levy, Becky Vince, Leigh Madden, Marie Sandstrom, Rob Robergs, Zihong He, Sonya Marshall, Chris McLellan, Andy Sparks, Dave Marchant, Kelly Marrin, Craig Bridge,  
and apologies to those who I have inadvertently missed



# Almost the End!



If you are thinking of having a wine or beer or two a little later,  
then just think

**Research by David Preece (and others) would suggest:**



Alcohol has been used as an aid to performance for a considerable period of time in many athletic endeavours. Five sprinters and five middle distance athletes were tested to determine whether differing levels of alcohol (0.01 mg.ml<sup>-1</sup>, 0.05 mg.ml<sup>-1</sup> and 0.10 mg.ml<sup>-1</sup>) had differing effects upon performance times in the 100 m, 200 m, 400 m, 800 m and 1500 m events. Blood alcohol concentration (BAC) was estimated from breath alcohol concentration using a hand held Drager Alcotest 7310 and a Borkenstein Breathalyser. **Alcohol affected all but the 100 m event to varying degrees.** In the 200 m the performance decreased when the level of intoxication increased. This was not the case in the 400 m which showed a difference between the two lower levels of alcohol consumption (0.01 mg.ml<sup>-1</sup> to 0.05 mg.ml<sup>-1</sup>) but not between the 0.05 mg.ml<sup>-1</sup> and 0.10 mg.ml<sup>-1</sup>. In the middle distance events the 800 m was most adversely affected. We concluded that alcohol is not an ergogenic aid in so much that it does not improve performance. In the 100 m events, performance remained stable.

**Mc Naughton, L.R., & Preece, D. (1986)** Alcohol and its effects on sprint and middle distance running. *British Journal of Sports Medicine*, 20, 56-59.



# PERFORMANCE

**THE TAKE HOME LESSON IS:  
DON'T DRINK  
AND  
DRIVE!!!**



# More Take Home Lessons

(or what can we learn from elite athletes)

- \* They are talented
- \* They are focussed
- \* They train hard
- \* They play hard
- \* They take time to recover
- \* They eat well
- \* They drink well
- \* They work in a team
- \* Usually they (don't mean to) do dumb things
- \* They are resilient
- \* They are physically tough
- \* They are mentally tough, and
- \* **THEY SUCCEED!!**

# Finally

If you think listening and looking at me for the duration of this talk was scary?

**THEN???**



# THE END

I HOPE YOU HAVE ENJOYED THE  
TALK, AND IF THERE ARE ANY  
QUESTIONS I WILL BE HAPPY TO  
ANSWER THEM

([lars.mcnaughton@Edgehill.ac.uk](mailto:lars.mcnaughton@Edgehill.ac.uk))