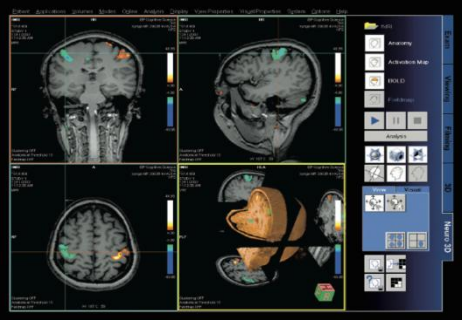

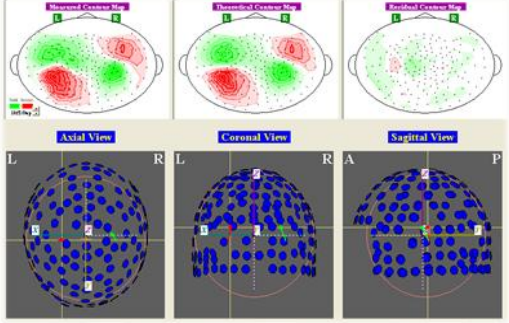

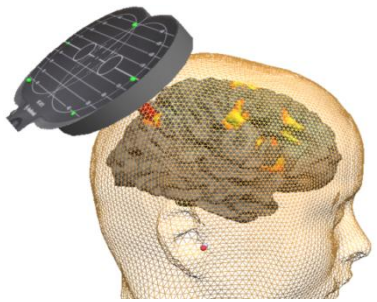

FOODS FOR MOODS AND MINDS

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Food Industry Forum 29/08/11

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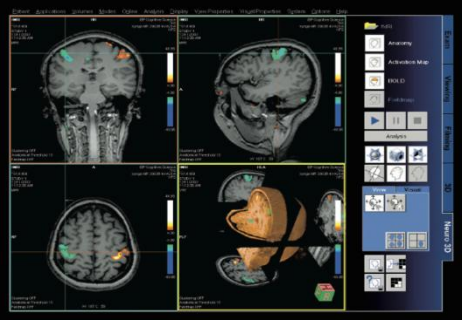
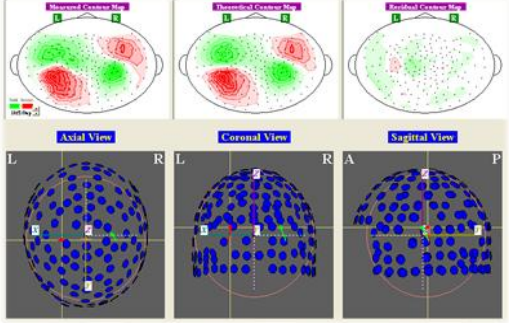
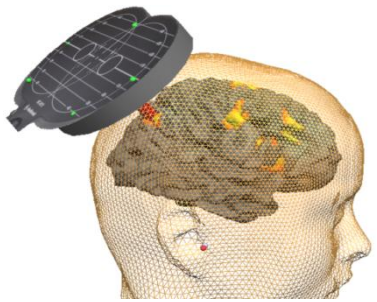
NICM

THE NATIONAL INSTITUTE OF COMPLEMENTARY MEDICINE

Collaborative Centre for Neurocognition







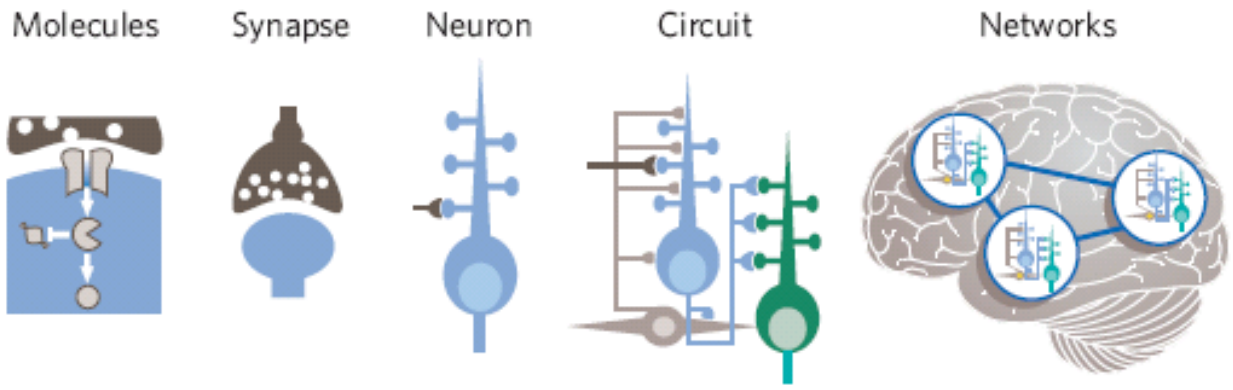
psychopharmacology

fMRI, MEG

Current studies include 'ARCLI': large (N > 600) 12-month 4-arm intervention trial in elderly

- cognition
- brain mapping
- biomarkers
- genotyping

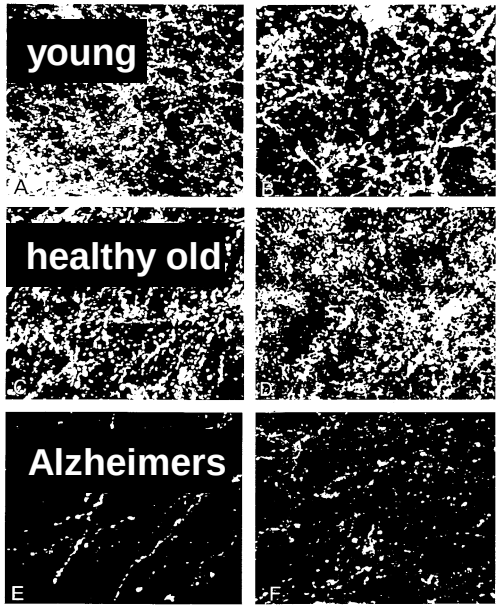
Optimal mental performance

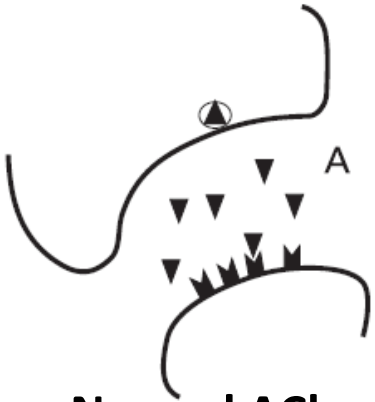


A ‘magic bullet’ for dementia?

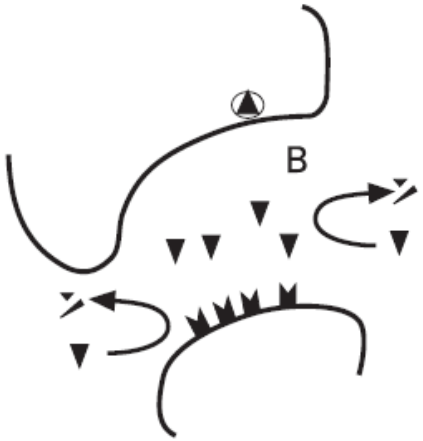
ACh degeneration

Alzheimer disease

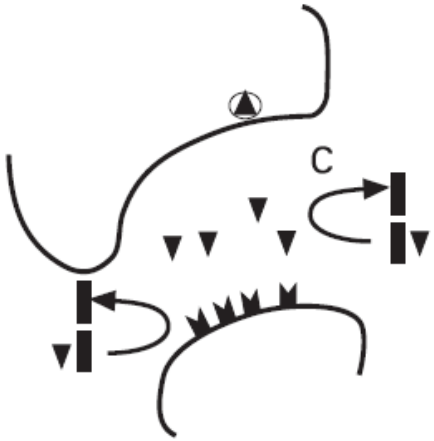




Normal ACh transmission

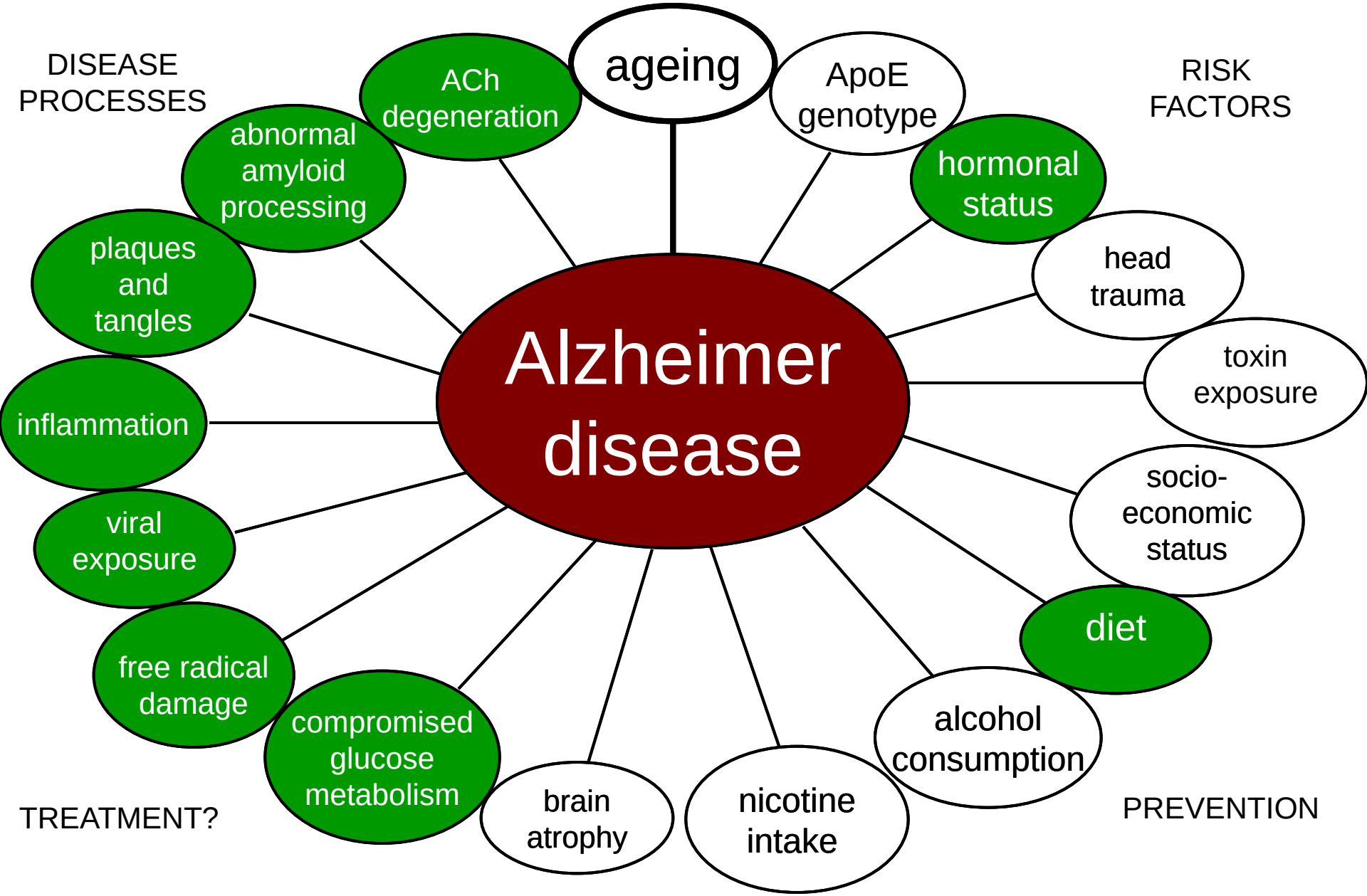


Action of Cholinesterase

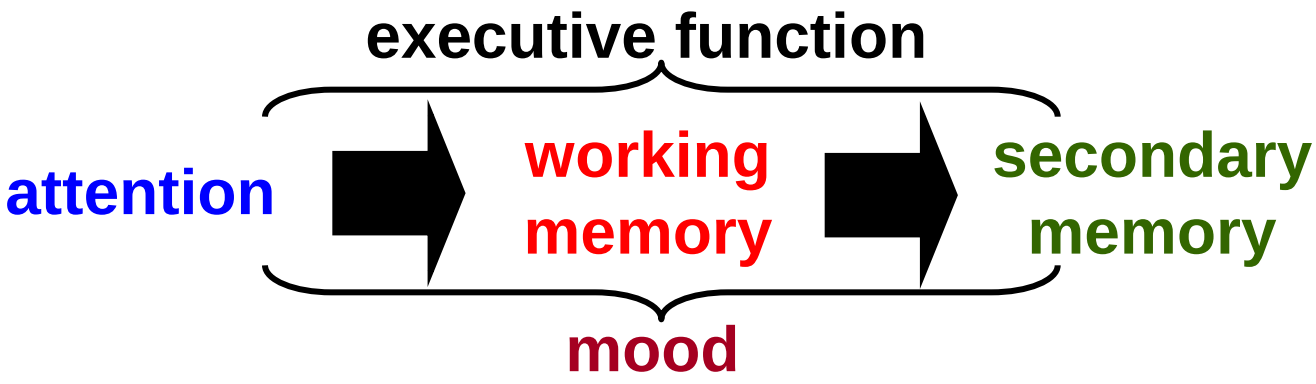


Cholinesterase Inhibitors

A ‘magic bullet’ for dementia?

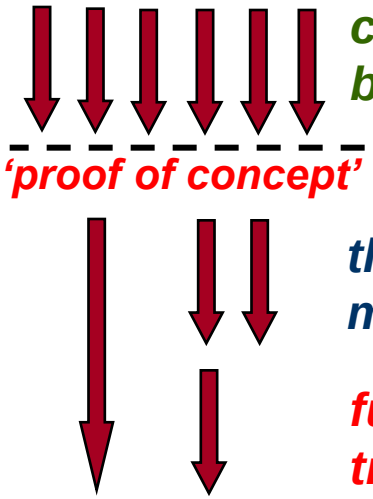


a simple model of cognition



Top down strategy: capturing behavioural effects in humans

- Focus on 'safe' treatments/interventions thought to improve mood and/or cognition from
  - history/tradition
  - anecdote
  - market



comprehensive behavioural screen

'proof of concept'

theory-driven/ mechanistic studies

full-blown clinical trials

PLANT EXTRACTS

- ***Ginkgo biloba***
- ***Panax ginseng****
- ***Ginseng quinquefolius****
- ***Ginkgo-ginseng combination***
- ***Melissa officinalis****
- ***Salvia officinalis****
- ***Salvia lavandulaefolia****
- ***Valerian***
- ***Guaraná****
- ***Ginkgo-phosphatidylserine****
- **Cocoa polyphenols***
- ***Bacopa monnieri****
- **Pycnogenol***
- **Enzogenol***
- **EGCG**

OTHERS

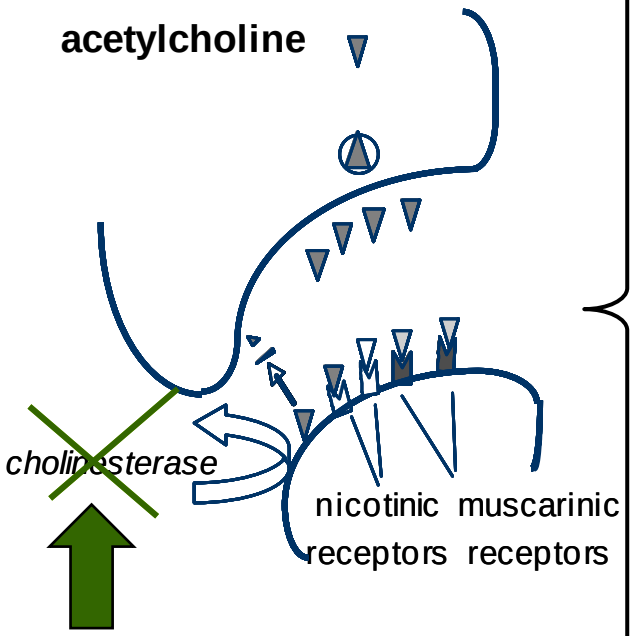
- **oxygen***
- **glucose**
- **aromatherapy oils**
- **caffeine**
- **theanine**
- **water**
- **chewing gum***
- **alcohol [low dose]**
- **DHA**
- **multivitamins**

*first controlled human study [11/14]

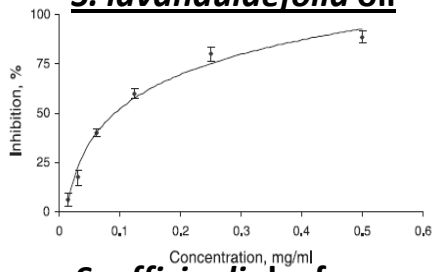
e.g. Salvia (sage)

- Historical use (Ayurvedic, Chinese, European)
  - "It is singularly good for the head and brain and quickeneth the nerves and memory" (John Gerard, 1597)
  - "Sage will retard that rapid progress of decay that treads upon our heels so fast in latter years of life, will preserve faculties and memory, more valuable to the rational mind than life itself" (John Hill 1756)
- Laboratory studies
  - +ve effects on memory in young adults
  - +ve effects on memory (and attention) in the elderly
  - +ve mood effects
  - +ve 'everyday' memory performance
  - cholinesterase inhibition

Salvia extracts cholinergic activity and cognition

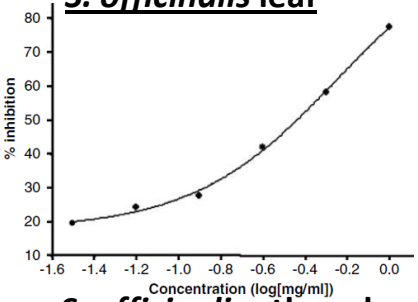


***S. lavandulaefolia* oil**



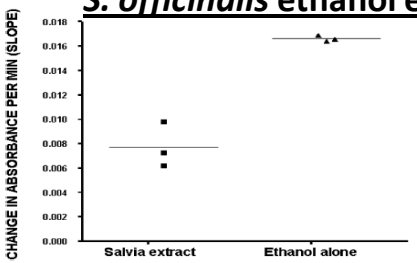
Tildesley et al (2003; 2005):
Improved 2° memory

***S. officinalis* leaf**



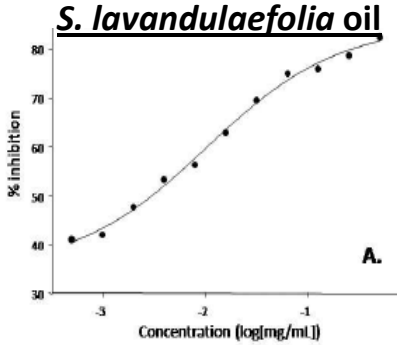
Kennedy et al (2004):
Improved attention
(no 2° memory measure)

***S. officinalis* ethanol extract**



Scholey et al (2008):
Improved 2° memory
& attention (elderly)

***S. lavandulaefolia* oil**



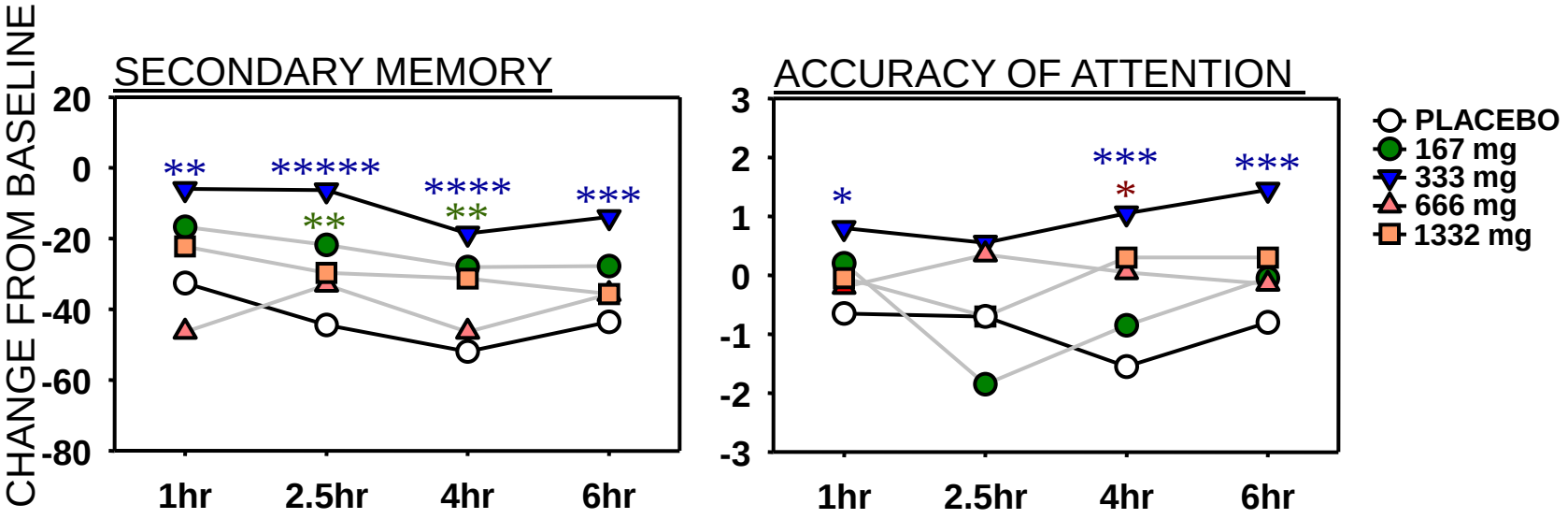
Kennedy et al (2011):
Improved 2° memory

Psychopharmacology (2008) 198:127–139
DOI 10.1007/s00213-008-1101-3

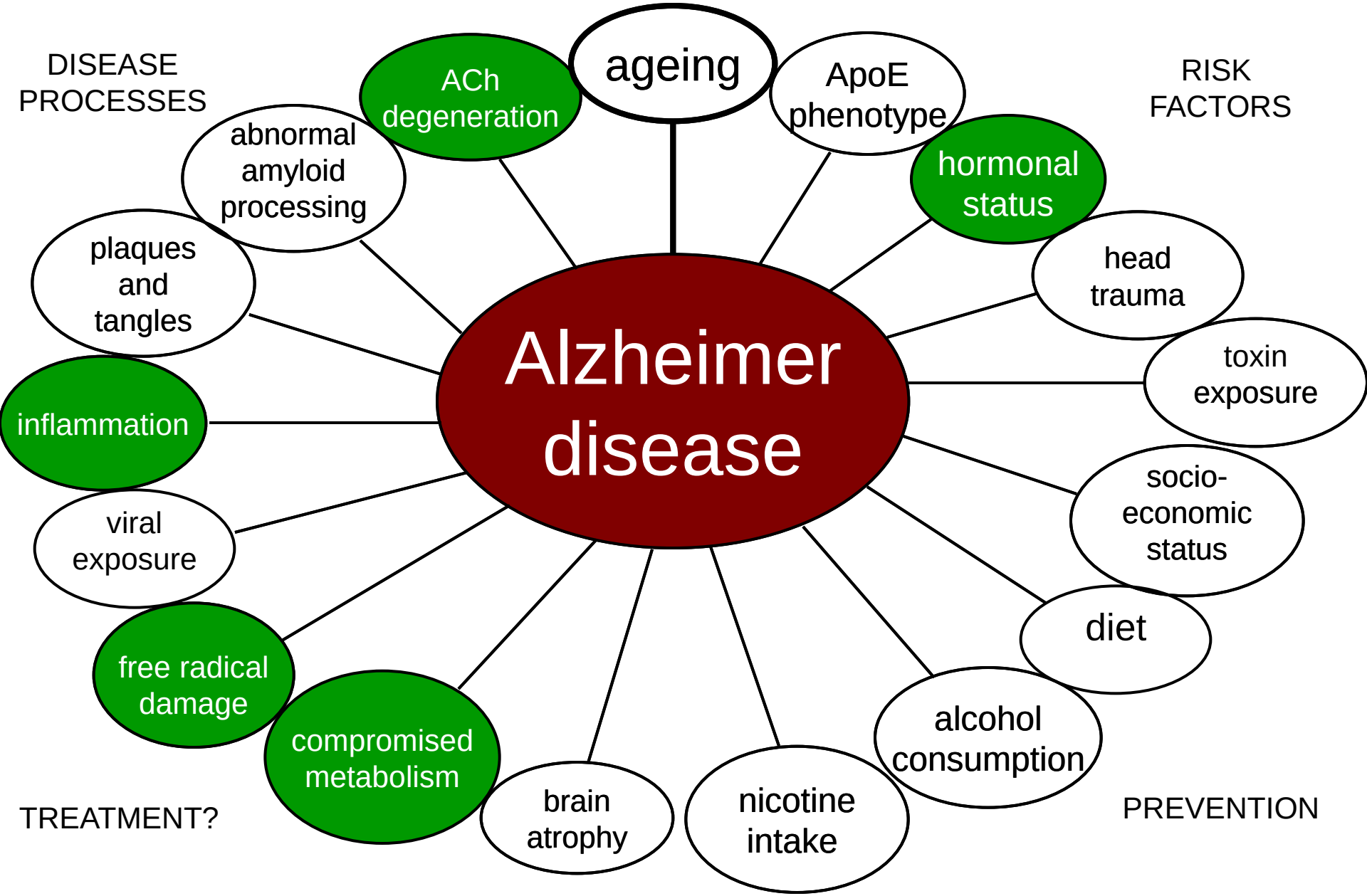
ORIGINAL INVESTIGATION

An extract of *Salvia* (sage) with anticholinesterase properties improves memory and attention in healthy older volunteers

Andrew B. Scholey · Nicola T. J. Tildesley · Clive G. Ballard · Keith A. Wesnes · Andrea Tasker · Elaine K. Perry · David O. Kennedy

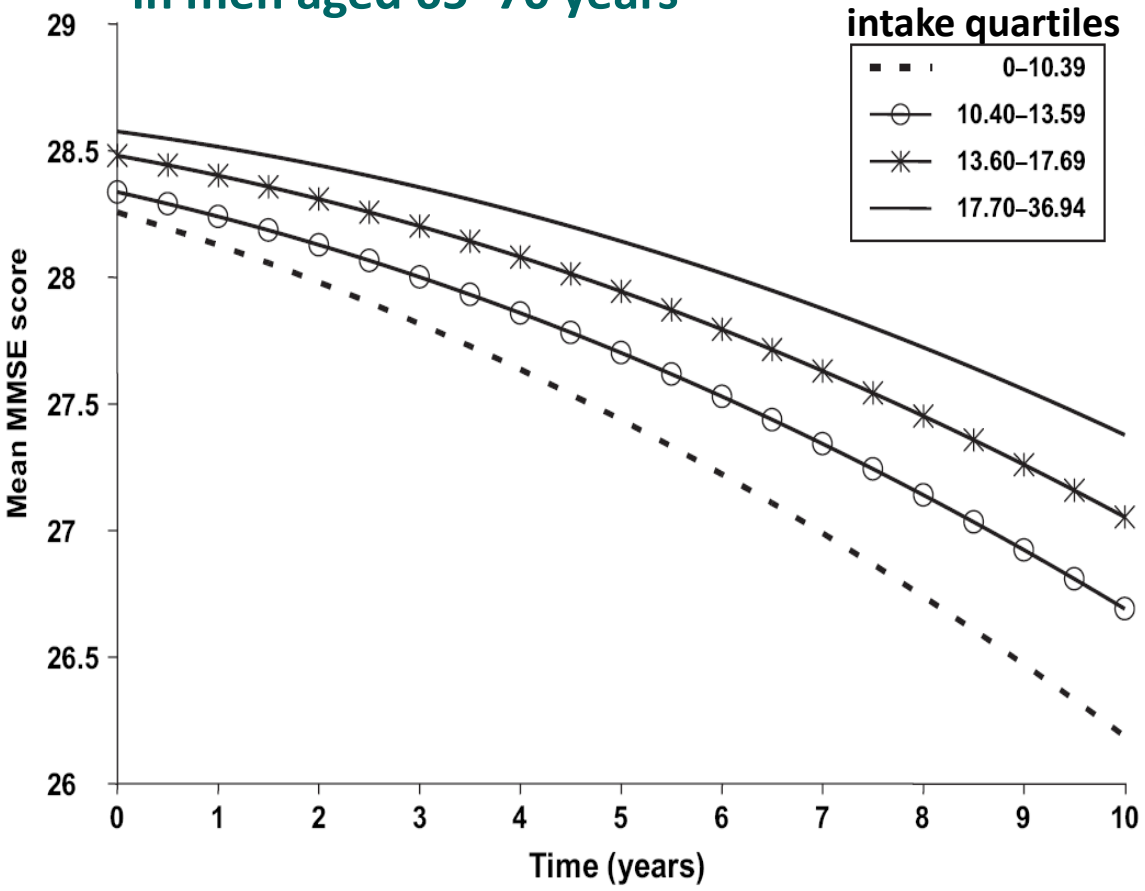


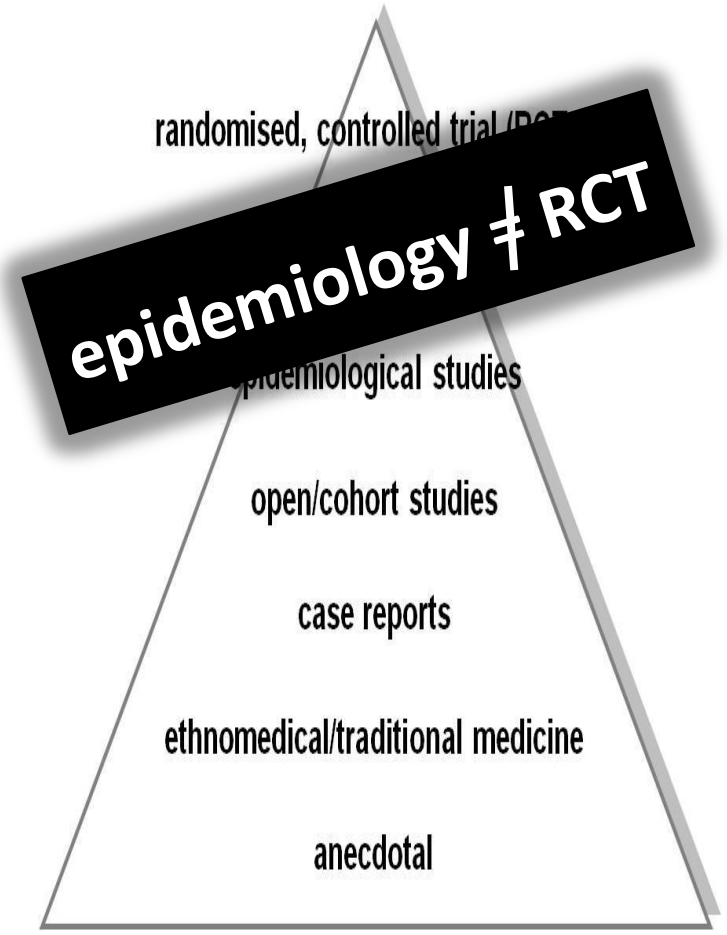
Salvia properties



Cocoa flavanols

Flavonoid intake and cognitive decline in men aged 65–70 years





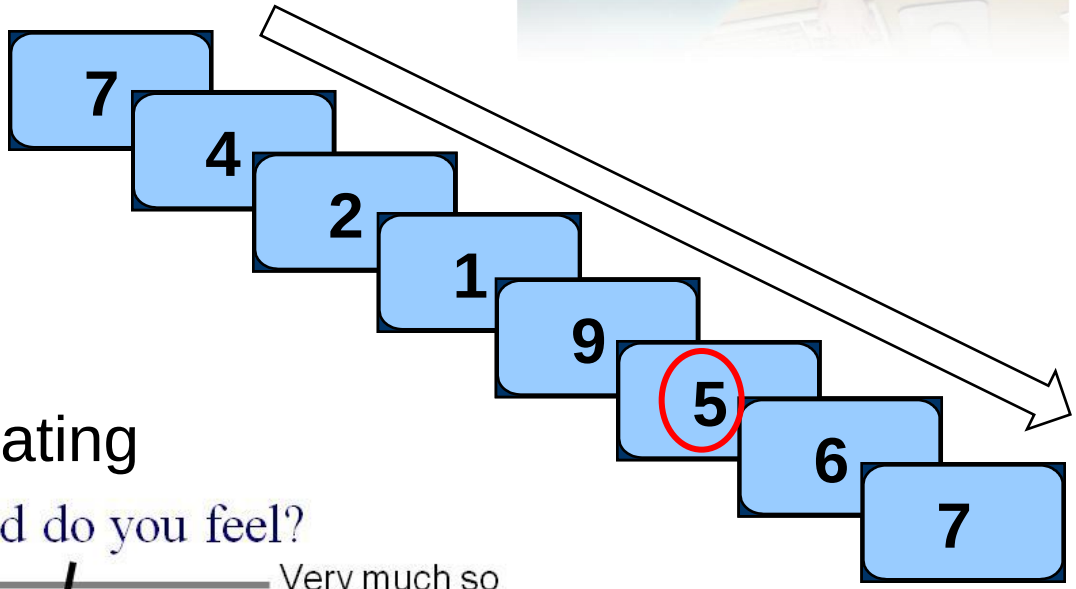
Letenneur L et al. (2007) Am J Epidemiol;165:1364–1371

Cognitive Demand Battery

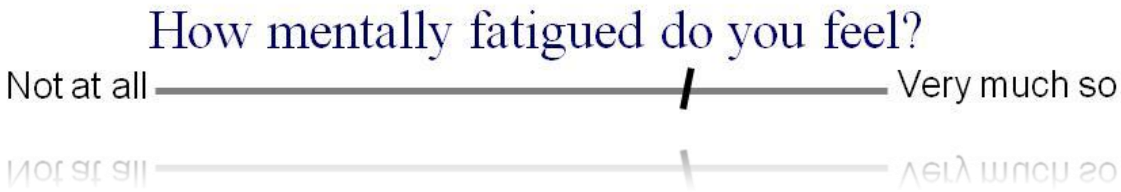
- [2 min] Computerised Serial Threes
  - repeated subtraction of 3 from random starting number between 800 and 999
  - e.g. 984-981-978-975……

- [2 min] Computerised Serial Sevens

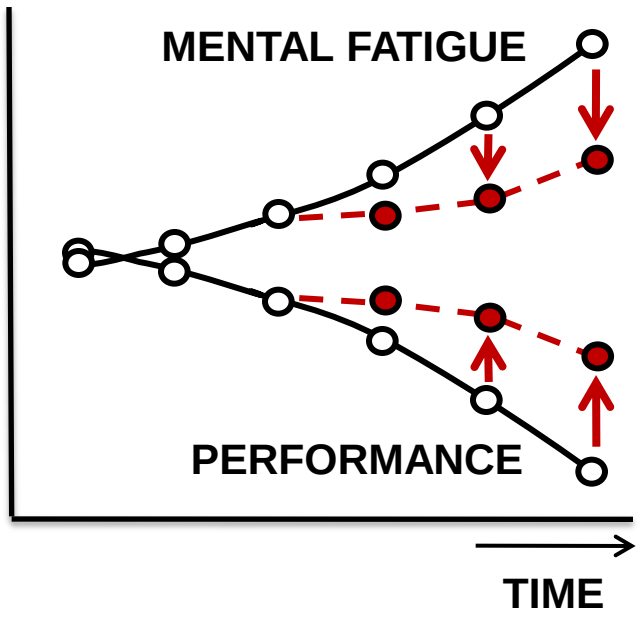
- [5 min] RVIP
  - Detect target string (3 odd/3 even) amongst rapid digit presentation



- [1 min] Mental fatigue rating



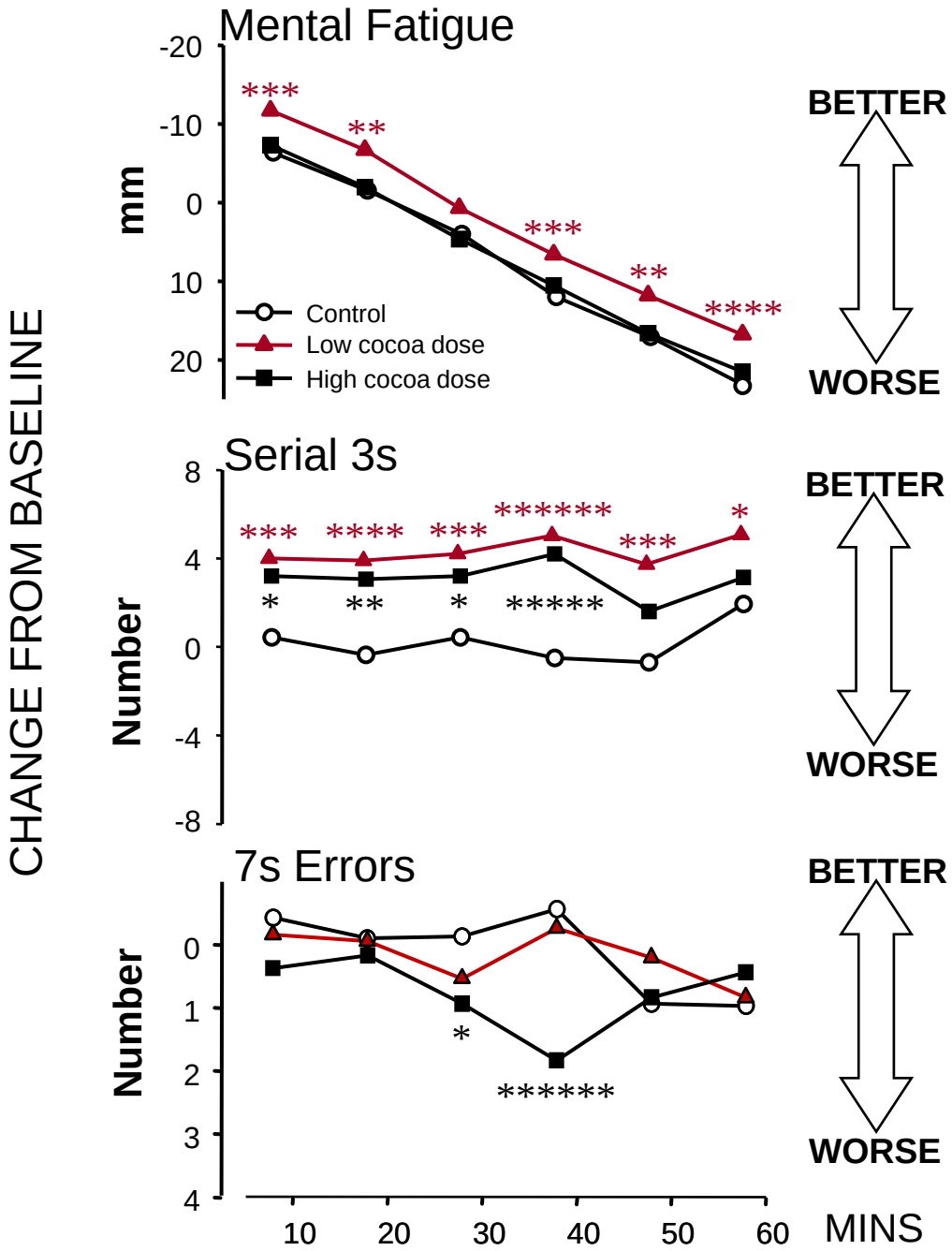
Cognitive Demand Battery



INTERVENTION

- -glucose
- -caffeine,
- -herbals/supplements
- -guaraná-vits
- -chewing gum
- -PUFAs
- -cocoa flavanols (this study)

Results.



Coincides with
-peak serum flavanol
-peak FMD
-peak cerebral blood flow

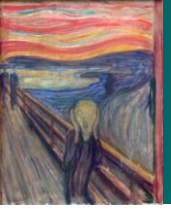
Scholey A et al (2010) *J Psychopharm* 24, 1505–1514.

Melissa officinalis [Lemon Balm]

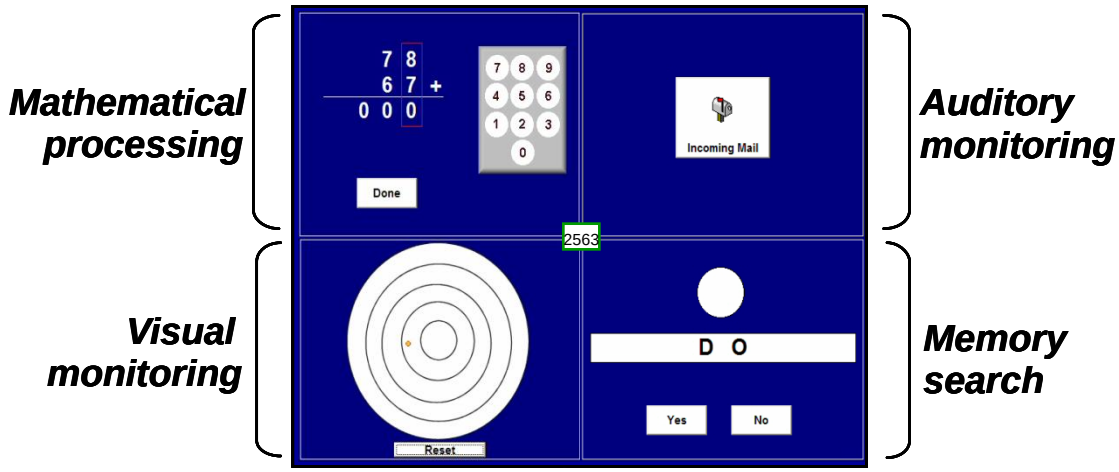
- Appears in '*Historia Plantarum*' [approximately 300 BC] and the '*Materia Medica*' [approximately 50-80 BC]
- e.g. Paracelsus [16th Century] indication for "all complaints supposed to proceed from a disordered state of the nervous system".
- e.g. Culpepper [1616-1654]

  "It causeth the Mind and Heart to becom merry…. and driveth away al troublesom cares and thoughts out of the mind arising from Melancholly…takes away grief, sorrow and care, instead of which it produceth joy and mirth"

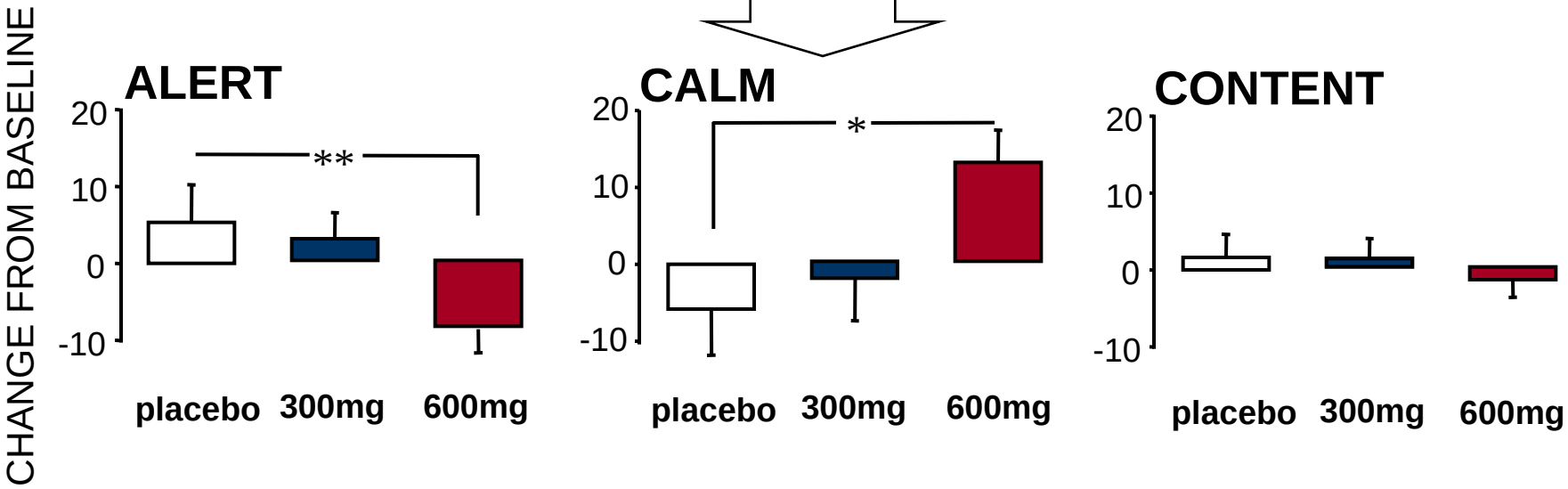
laboratory studies confirm positive mood/anti-stress effects



multi-tasking framework



20 min



Appetite 56 (2011) 143–147

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Research report

Behavioural effects of a 10-day Mediterranean diet. Results from a pilot study evaluating mood and cognitive performance

Laura McMillan, Lauren Owen, Marni Kras, Andrew Scholey *

NICM Centre for Neurocognition, Brain Sciences Institute, Swinburne University, 400 Burwood Road, Melbourne, VIC 3122, Australia

Table 1
Effects of diet change on mood. Mean (±SD) mood at baseline (pre-diet) and at day 10 (post-diet) in the diet change (DC) and no change (NC) groups are shown. Probabilities associated with Group × Time interactions are shown (****$p < .001$).

	DC		NC		Group × Time
	Pre-diet	Post-diet	Pre-diet	Post-diet	Interaction (p)
Profile of Mood States					
Depression	21.92 ± 7.23	18.83 ± 5.44	23.18 ± 10.99	21.17 ± 7.59	.58
Anxiety	18.00 ± 5.10	14.50 ± 2.94	16.91 ± 14.75	14.75 ± 2.90	.51
Anger	17.33 ± 6.34	14.42 ± 3.70	17.09 ± 8.38	15.3 ± 5.37	.32
Vigour	20.00 ± 4.24	23.67 ± 5.60	22.64 ± 7.38	17.58 ± 4.21	.00****
Fatigue	16.17 ± 5.20	12.17 ± 4.41	14.18 ± 6.98	14.08 ± 3.63	.16
Confusion	11.83 ± 4.57	10.75 ± 4.09	10.55 ± 4.32	9.73 ± 2.49	.67
Total disturbance	65.25 ± 27.06	47.00 ± 17.13	59.27 ± 37.32	57.91 ± 22.09	.06
Bond-Lader Visual Analogue Scale					
Alert	53.63 ± 9.76	70.06 ± 7.35	60.72 ± 14.16	51.70 ± 17.48	.00****
Content	66.08 ± 12.49	78.97 ± 8.59	70.21 ± 14.91	59.81 ± 15.14	.00****
Calm	58.38 ± 14.52	60.04 ± 17.32	62.82 ± 15.85	55.87 ± 19.89	.38

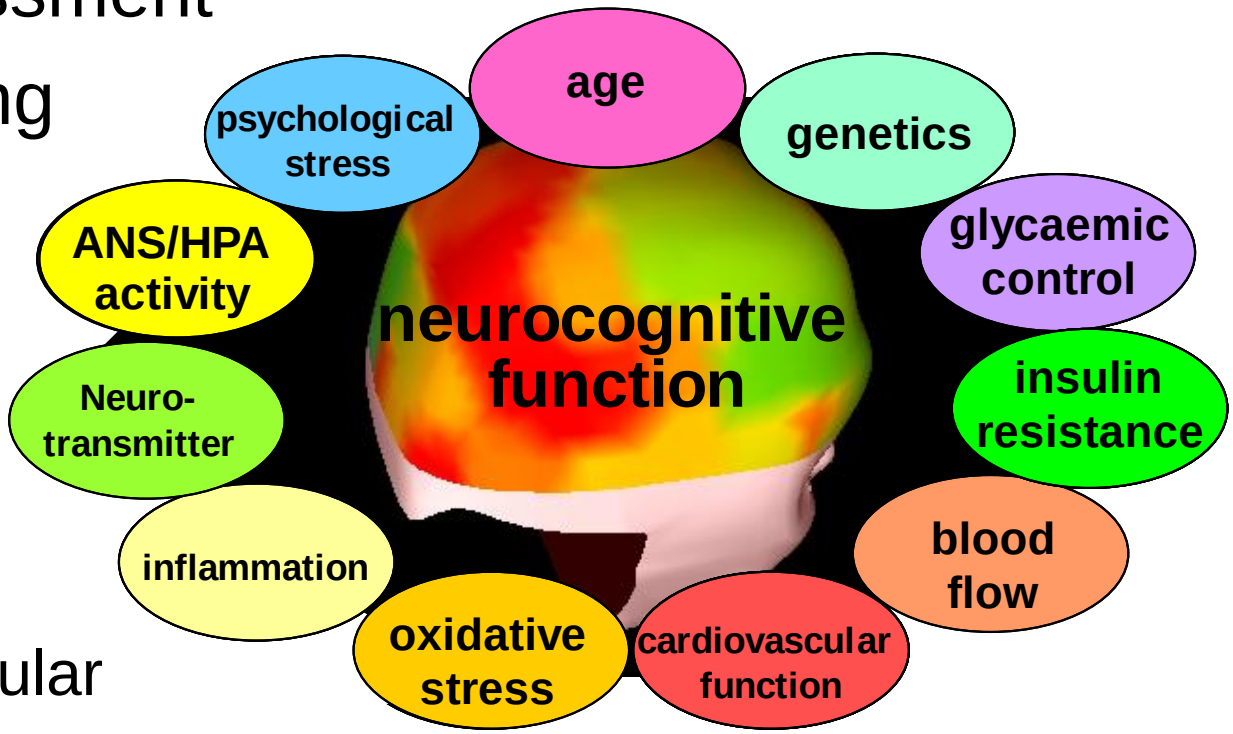
follow-up study confirms results and suggests effects may emerge after 5 days

Summary and issues

- complex dose-time-task interactions
- Acute/chronic effects can be dissociated
- what about combinations?
  - e.g. sage + melissa + bacopa + ginseng +?
- mechanisms?
  - full receptor/enzyme screening
  - co-monitoring physiological activity/biomarkers
  - In vivo receptor blocking studies
- refinement
  - sometimes better effects from less ‘refined’ products?
- standardisation
  - GMP
  - GLC/MRI fingerprinting
- standardisation
- standardisation

Human Psychopharmacology capabilities

- cognitive testing
- mood assessment
- brain imaging
  - EEG
  - fMRI
  - MEG
  - TMS
- biomarkers
  - cardiovascular
- field testing
  - internet
  - mobile phones



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