

# Weighing the Evidence: A Primer on Choosing Products for Brain Health

Gail Eskes, Ph.D., Dalhousie University

Halifax Main Public Library

April 24, 2014

# Roadmap



- Where do you get information?
- What is good evidence?
- Other considerations
  - What are you trying to achieve?
  - Costs and benefits
- Limits of science

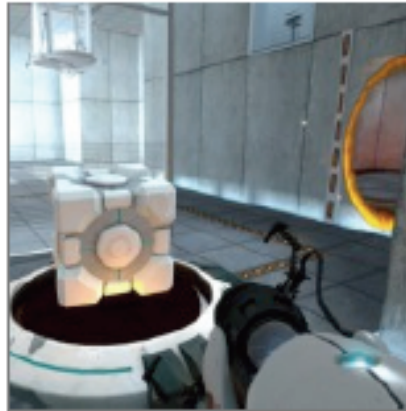


# The Press is Full of News About Brain Games

## Videogames That Make You Smarter

Oliver J. Chiang, 10.27.09, 06:00 PM EDT

"Brain games" are enjoying an intellectual renaissance.



In Pictures: [Videogames That Make You Smarter](#)

BURLINGAME, Calif. -- Videogames with zombies, gunfights, prostitutes, super heroes or explosions usually make the headlines. But the so-called brain game genre is enjoying a quiet success and injecting the industry with a fresh take on what's fun.

### In Pictures: [Videogames That Make You Smarter](#)

"It's almost like an [insurance policy](#). You can't really go wrong playing these games, and it's enjoyable," says Ian Bogost, an associate professor at the [Georgia Institute of Technology](#), who researches and designs videogames.

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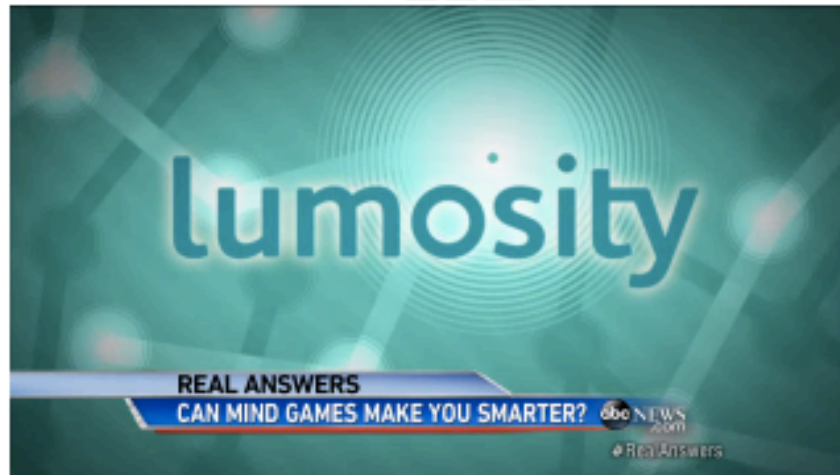
ABC NEWS BLOGS > TECHNOLOGY > SCIENCE

## Science

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### Mind Games Grow in Popularity as Exercise for the Brain

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by Linsey Davis Mar 17, 2014 2:02pm

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Many claims are seen in the news –  
should you believe them?

The image shows a screenshot of a news article from US News Health. The page has a dark blue header with the US News logo and social media icons. Below the header is a navigation bar with categories like HOME, HOSPITALS, DOCTORS, HEALTH INSURANCE, NURSING HOMES, and HEALTH & WELLNESS. A promotional banner for brain training is visible. The main article title is 'Moderate Drinking May Help Prevent Alzheimer's, Other Dementia'. The sub-headline reads 'Lower risk of brain impairment seen in those who enjoy alcohol, but don't overdo it, review finds'. Below the article information, there is a 'HealthDay' logo and a date of 'Aug. 16, 2011'. At the bottom, there is a 'SHARE' button and a short summary of the article's findings.

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# HEALTH

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Try brain training tested by dozens of researchers

## Moderate Drinking May Help Prevent Alzheimer's, Other Dementia

Lower risk of brain impairment seen in those who enjoy alcohol, but don't overdo it, review finds

HealthDay | Aug. 16, 2011 | Leave a Comment | SHARE

**HealthDay**

TUESDAY, Aug. 16 (HealthDay News) -- Drinking moderate amounts of alcohol, especially wine, may lower the risk of dementia, according to a review of previous research.

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26 March 2012 Last updated at 21:02 ET

# Chocolate 'may help keep people slim'

[COMMENTS \(251\)](#)**By Michelle Roberts**

Health reporter, BBC News

**People who eat chocolate regularly tend to be thinner, new research suggests.**

The findings come from a study of nearly 1,000 US people that looked at diet, calorie intake and body mass index (BMI) - a measure of obesity.

It found those who ate chocolate a few times a week were, on average, slimmer than those who ate it occasionally.



Chocolate contains antioxidants but is also high in fat and sugar

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## BRAIN HEALTH



### New Brain Games

Build your brain power with these free brain games:

- [The Right Word \(Language\)](#)
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- [The Squeaking Mouse \(Memory\)](#)
- [Secret Files \(Attention\)](#)
- [Decipher \(Executive Function\)](#)

### Boost Your Brain

#### 50 Ways to Work Your Noggin

By Heather Boerner

Want to keep your brain in top shape? You can help keep it limber through what you do every day. [Try these 50 brain pleasers.](#)



Even AARP is promoting brain games!



## But notice the disclaimer:

### **Brain Game Disclaimer**

AARP.org does not represent that playing any of the games on AARP.org, including those referred to a “brain game,” will improve or maintain the health or brain function of any user. All materials on AARP.org, including games, are for informational or entertainment purposes only and are not a substitute for medical diagnosis, advice, or treatment for specific medical conditions.

**HAPPYneuron** Brain fitness for life

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**Scientifically Designed:** Developed by leading neurologist Bernard Croisile, M.D., Ph.D

**Proven Results:** Backed by numerous scientific studies.

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Many companies make brain games and claim to have “scientific” evidence or validation – but do they?

**HAPPYneuron** Brain fitness for life

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### Scientific Validation

Below is a list of scientific studies either on the HAPPYneuron method or on the use of HAPPYneuron games in a medical context (SBT-Pro, PEPCo, ACTIVITAL; ReCoS, ReCoD).

**Conditions for Maximizing Effects of 90 Days of Brain Training** 350

The cognitive performances of HAPPYneuron users improved (with no regard to age, gender, or educational level) over a training period including 3 to 5 sessions per week of 30 to 40 minutes each. The great diversity granted by the vast HAPPYneuron game catalog considerably increases the transfer of skills to daily life activities.

Tarpin-Bernard F., Croisile B. Conditions for Maximizing Effects of 90 Days of Brain Training (2012).

[Summary](#)

**Increased employability of the unemployed aged 50+ through cognitive training?** 87

Using the HAPPYneuron program allows to improve cognitive performance in unemployed people over the age of 50. A transfer effect was also shown for certain tasks, including improved self-esteem, thus increasing “employability”.

B. Godde, C. M. G. Noack, C. Windisch & C. Voelcker-Rehage, Increased employability of the unemployed aged 50+ through cognitive training? (2011).

[Summary](#)

# Check the Evidence Carefully!

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## Published Scientific Studies

The many studies conducted on the exercise technologies in BrainHQ collectively show that they improve cognitive performances, auditory memory, visual memory, ability to perform everyday tasks, driving safety, processing speed, health-related quality of life, and much more. These studies are listed below.

Article Title	Lab/University	Categories
Feasibility of computerized brain plasticity-based cognitive training after traumatic brain injury	Department of Rehabilitation Medicine, Mount Sinai School of Medicine, New York, NY	Attention, Brain Speed, Memory
Improvement in memory with plasticity-based adaptive cognitive training: results of the 3-month follow-up.	Leonard Davis School of Gerontology, University of Southern California	Attention, Brain Speed, Memory
Interim analyses from a randomised controlled trial to improve visual processing speed in older adults: the Iowa Healthy and Active Minds Study.	University of Iowa	Attention, Brain Speed

# So let's take an example:



The image is a screenshot of a BBC News article. At the top, the BBC logo is on the left, and navigation links for News, Sport, Weather, Travel, iPlayer, TV, and Radio are on the right. Below this is a red banner with 'NEWS HEALTH' in white. A secondary navigation bar contains links for Home, US & Canada, Latin America, UK, Africa, Asia, Europe, Mid-East, Business, Health, and Sci/Environ. The article is dated 26 March 2012 and was last updated at 21:02 ET. The main headline is 'Chocolate 'may help keep people slim'' with 251 comments. The author is Michelle Roberts, a health reporter for BBC News. The article text states that people who eat chocolate regularly tend to be thinner, based on a study of nearly 1,000 US people. It notes that those who ate chocolate a few times a week were, on average, slimmer than those who ate it occasionally. To the right of the text is a close-up photograph of several pieces of dark chocolate, with a small 'SPL' logo in the bottom right corner. Below the photo, a caption reads: 'Chocolate contains antioxidants but is also high in fat and sugar'.

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26 March 2012 Last updated at 21:02 ET

## Chocolate 'may help keep people slim'

COMMENTS (251)

**By Michelle Roberts**  
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The findings come from a study of nearly 1,000 US people that looked at diet, calorie intake and body mass index (BMI) - a measure of obesity.

It found those who ate chocolate a few times a week were, on average, slimmer than those who ate it occasionally.



Chocolate contains antioxidants but is also high in fat and sugar

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## **Association Between More Frequent Chocolate Consumption and Lower Body Mass Index**

**C**hocolate has shown favorable metabolic associations with blood pressure (BP),<sup>1-3</sup> insulin sensitivity,<sup>1</sup> and cholesterol level.<sup>3</sup> Chocolate is rich in antioxidant phytonutrients like catechins that could contribute to favorable relationships of chocolate consumption to insulin sensitivity and BP. However, because chocolate is often consumed as a sweet and bears calories, there are concerns related to its intake.

Here is the study:

*Archives of Internal Medicine*  
Vol. 172, pages 519-521

“We hypothesized that the benefits of modest frequent chocolate intake might extend to reduced fat deposition, potentially offsetting the added calories”

# How did they study this?

- 1,018 healthy men and women, ages 20-85 yrs
- “How many times a week do you consume chocolate?” (average = 2 times/week reported)
- Also measured BMI, food questionnaire to determine calorie intake, physical activity, mood
- Findings: Higher frequency of chocolate consumption was correlated with a lower BMI – even when take activity, calories, mood and saturated fats intake into account.
- Conclusions? Could there be other factors? E.g., willingness to report accurately if overweight.
- Cause-effect? Would eating more chocolate make you lose weight?

# Let's look at this one

10 December 2013 Last updated at 06:37 ET

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## Exercise 'significant role' in reducing risk of dementia, long-term study finds



Regular exercise was a factor which could reduce decline in dementia

**Exercise throughout a person's life plays a significant role in reducing the risk of developing dementia, a study spanning 35 years has found.**

The Cardiff University study which began with 2,235 men from Caerphilly in 1979 found factors including diet and not smoking had an impact on preventing illnesses developing in older age.

### Related Stories

**Exercise 'is good dementia therapy'**

**World dementia cases 'set to treble'**

# Healthy Lifestyles Reduce the Incidence of Chronic Diseases and Dementia: Evidence from the Caerphilly Cohort Study

**Peter Elwood<sup>1\*</sup>, Julieta Galante<sup>1</sup>, Janet Pickering<sup>1</sup>, Stephen Palmer<sup>1</sup>, Antony Bayer<sup>1</sup>, Yoav Ben-Shlomo<sup>2</sup>, Marcus Longley<sup>3</sup>, John Gallacher<sup>1</sup>**

**1** Cochrane Institute of Primary Care and Public Health, Cardiff University, Cardiff, United Kingdom, **2** School of Social and Community Medicine, University of Bristol, Bristol, United Kingdom, **3** Welsh Institute for Health and Social Care, University of South Wales, Pontypridd, United Kingdom

2,235 men (age 45-59) were followed for 30 years  
1979 – healthy behaviours recorded  
2004 - cognitive state was determined



# Odds of dementia

Healthy behaviour	Cognitive impairment	Dementia
Non-smoking	.74	.95
BMI 18-25	1	1.06
Fruit/vegetables 3/ day	.79	.80
Regular exercise	.62	.41
Alcohol intake <3 units	.68	.65

Conclusions? Does exercise prevent dementia?  
Can only conclude that it is “associated” with less risk. What about other factors such as other health problems, other treatments?

# These studies use an epidemiological design

- Descriptive, observational study
- Purpose is to examine associations among factors: what predicts the outcome of interest?
- Strengths
  - Large representative population
  - Long term study
  - Can look at interaction of a number of factors, or examine factors that can't be studied ethically in any other way
- Weaknesses
  - Can't determine cause and effect
  - Can't measure everything (3<sup>rd</sup> hidden variable?)
  - Measures limited, many based on self-report
  - Can't control what people do in a long term study

# Cause-effect conclusions need randomized, clinical trials (RCTs)

## Effects of Cognitive Training Interventions With Older Adults

### A Randomized Controlled Trial

Karlene Ball, PhD

Daniel B. Berch, PhD

Karin F. Helmers, PhD

Jared B. Jobe, PhD

Mary D. Leveck, PhD

Michael Marsiske, PhD

John N. Morris, PhD

George W. Rebok, PhD

David M. Smith, MD

Sharon L. Tennstedt, PhD

Frederick W. Unverzagt, PhD

Sherry L. Willis, PhD

for the ACTIVE Study Group

**Context** Cognitive function in older adults is related to independent living and need for care. However, few studies have addressed whether improving cognitive functions might have short- or long-term effects on activities related to living independently.

**Objective** To evaluate whether 3 cognitive training interventions improve mental abilities and daily functioning in older, independent-living adults.

**Design** Randomized, controlled, single-blind trial with recruitment conducted from March 1998 to October 1999 and 2-year follow-up through December 2001.

**Setting and Participants** Volunteer sample of 2832 persons aged 65 to 94 years recruited from senior housing, community centers, and hospital/clinics in 6 metropolitan areas in the United States.

**Interventions** Participants were randomly assigned to 1 of 4 groups: 10-session group training for memory (verbal episodic memory; n=711), or reasoning (ability to solve problems that follow a serial pattern; n=705), or speed of processing (visual search and identification; n=712); or a no-contact control group (n=704). For the 3 treatment groups, 4-session booster training was offered to a 60% random sample 11 months later.

**Main Outcome Measures** Cognitive function and cognitively demanding every-

*Ball et al., 2002, JAMA, 288, 2271-2281*

# ACTIVE study

(Advanced Cognitive Training for Independent and Vital Elderly)

- 2,832 adults between 65 and 94 years
- **Randomly** assigned to (like the flip of a coin):
  - No contact **control group** that receives no intervention. or
  - 10 group sessions of training on memory, reasoning or speed abilities (5-6 weeks long)
- **Outcome** assessment at baseline, post intervention, 2 annual post tests after that
  - Trained and untrained abilities
  - Activities of daily living (driving, problem solving, ADLs)

# Results

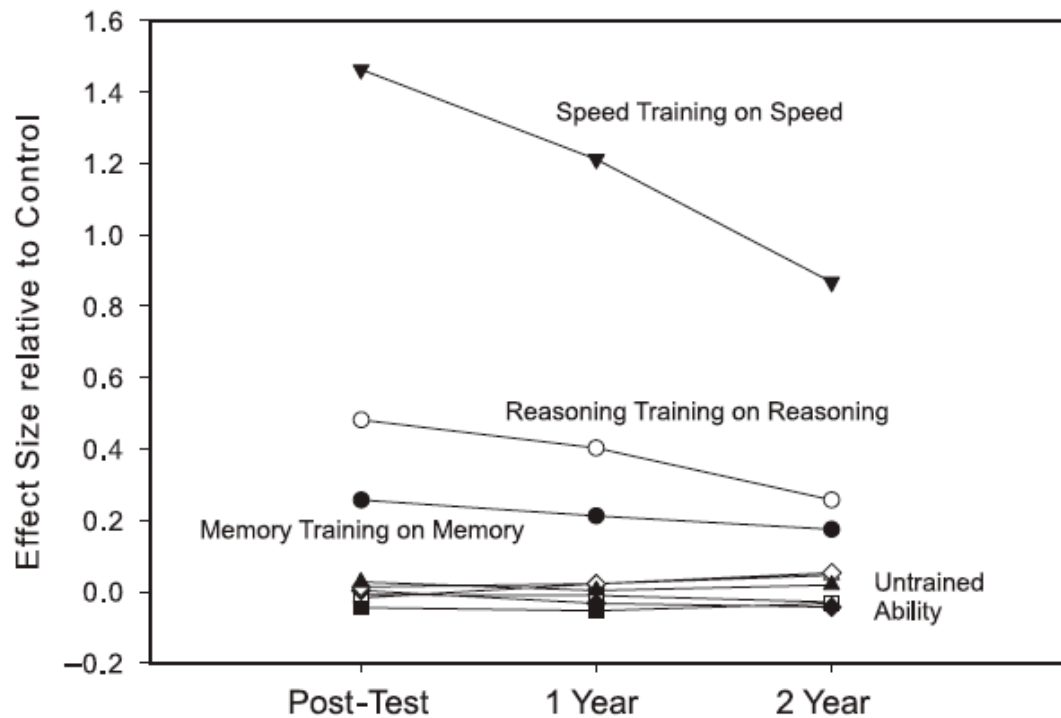


Fig. 4. Summary results from the ACTIVE (Advanced Cognitive Training for Independent and Vital Elderly) cognitive training intervention (Ball et al., 2002). The three “training” functions refer to training-specific performance, and the functions labeled “untrained ability” refer to performance on abilities other than what was trained. See the text for details.

Speed training = better speed

Reasoning training = better reasoning

Memory training = better memory

# Motor Vehicle Crashes over 6 years

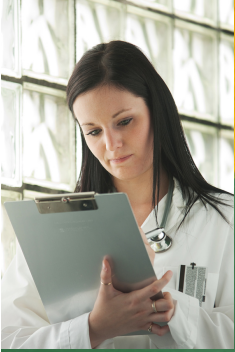
## Cognitive Training Decreases Motor Vehicle Collision Involvement of Older Drivers

*Karlene Ball, PhD,<sup>\*†</sup> Jerri D. Edwards, PhD,<sup>‡</sup> Lesley A. Ross, PhD,<sup>\*†</sup> and Gerald McGwin, Jr., MS, PhD<sup>†§||</sup>*

N= 908 older drivers (M age = 73.1)

- Control group:  $6.28 \times 10^{-6}$  crashes/mile
- Memory group:  $5.87 \times 10^{-6}$  crashes/mile
- Reasoning group:  $4.65 \times 10^{-6}$  crashes/mile
- UFOV group:  $3.62 \times 10^{-6}$  crashes/mile<sup>\*\*\*</sup>

# What makes this a good study? (also called an RCT study)



Large number of participants



Random assignment  
with control groups



Adequate dose



Relevant outcome measures



# Randomized controlled trials (RCTs)

- Groups are equated at the beginning by random assignment
- Then the groups are exposed to different treatments
- Compare groups to see if the difference in treatments creates different outcomes



# Randomized controlled trials (RCTs)

- **Strengths**

- Use randomization to match groups at the beginning
- Have control groups to make comparisons meaningful
- Usually more in depth measures
- Considered “gold standard evidence”

- **Weaknesses**

- Smaller number of people studied – generalize to you?
- Comparison groups may limit conclusions – only better than what it is compared to
- Often only short interval follow-ups

# Key words/ideas to look for when reading about a study

- Randomized to groups of reasonable size (20 or more)
- Good comparison (control) group that is equivalent to intervention, except for that one treatment of interest
- Intervention is well described
- Outcomes are relevant (and more than just similar to what was practiced)
- “Single or double blind” (participants and/or assessors did not know what group they were in to eliminate expectation bias)

## Where is the evidence?: Peer Reviewed Journals (scientific claims are reviewed by other independent scientists)

- Google Scholar: <http://scholar.google.ca/>
- Halifax Public Library databases:  
<http://www.halifaxpubliclibraries.ca/>
- PubMed: <http://www.ncbi.nlm.nih.gov/pubmed>
- Cochrane Library: Systematic reviews  
<http://www.thecochranelibrary.com>
- Web of Science – journal impact factor (statistics on whether other scientists read and cite the articles from that journal)
- Open access journals (free to everyone – but be careful! Check to make sure they use peer-review)
- Treatment trials should be registered on [clinicaltrials.gov](http://clinicaltrials.gov)

# Other considerations when you are trying to decide whether to try something

- What are you trying to achieve? Evidence for the intervention should be targeted to your goal
  - “Make my memory better” – e.g., do the studies measure memory?
  - “Prevent dementia” – do they measure dementia risk?
  - “Keep my driving safe” – do they measure driving
- Costs and benefits
  - What does it cost me? (Money, time, disappointment?)
  - How big are the benefits expected to be? (e.g., effect size may be “statistically” significant, but will it make a difference in your life?)


# Limits of Science – answers take many years with many studies




WIRED WELL

## Do Brain Workouts Work? Science Isn't Sure

By TARA PARKER-POPE MARCH 10, 2014, 7:39 PM 80 Comments

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For a \$14.95 monthly membership, the website [Lumosity](#) promises to “train” your brain with games designed to stave off mental decline. Users view a quick succession of bird images and numbers to test [attention span](#), for instance, or match increasingly complex tile patterns to challenge memory.



James Steinberg



Thanks for your attention!

Any questions?

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