Ginkgo biloba is not a smart drug: an updated systematic review of randomised clinical trials testing the nootropic effects of G. biloba extracts in healthy people

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CRD summary
This review assessed whether Ginkgo biloba enhanced cognitive function in healthy participants. The authors concluded that there was no convincing evidence that Ginkgo biloba had a positive effect on any aspect of cognitive performance in healthy people under the age of 60. The review had some methodological limitations, but the conclusions reflected the evidence and are likely to be reliable.

Authors’ objectives
To assess whether Ginkgo biloba enhanced cognitive function in healthy participants.

Searching
This review is an update of an earlier review by the same authors. The original review searched MEDLINE, EMBASE, AMED, CINAHL, PsycINFO and the Cochrane Central Register of Controlled Trials from inception to November 2001. The updated review searched the same databases from November 2001 to January 2007; search terms were reported. No language restrictions were applied.

Study selection
Placebo-controlled double-blind randomised controlled trials (RCTs) that assessed the effects of standardised Ginkgo biloba extracts on cognitive function in healthy participants aged 60 or less were eligible for inclusion. Studies of participants with age-related memory impairment or cerebral insufficiency, studies with confounding co-interventions and studies that assessed only neurophysiological parameters such as electroencephalogram (EEG) were excluded.

Almost half of the included studies assessed a single dose of Ginkgo biloba; the treatment period for the other studies ranged from two days to 13 weeks. Daily dosages ranged from 40mg to 600mg. The average age of participants ranged from 20 to 44 years, where stated. The outcomes assessed in the studies included reaction time, image recognition, speed and accuracy of attention, speed and quality of memory, alertness, contentedness, calmness, serial subtractions, mental flexibility, planning and mood (using different scales).

The authors stated neither how the papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
The validity of the included studies was assessed using the Jadad scale. The authors did not state how the validity assessment was performed.

Data extraction
Two reviewers independently extracted data. Disagreements were resolved by discussion.

Methods of synthesis
Studies were described separately and narratively synthesised in the discussion and conclusion sections of the review. Study details were presented in a table to enable the reader to assess differences between studies.

Results of the review
Fifteen RCTs were included in the review (551 participants): eight cross-over RCTs; and seven parallel group RCTs. Jadad scores ranged from 2 to 5 out of a maximum score of 5; the mean score was 2.8.

No significant difference was found between Ginkgo biloba and placebo for most outcomes measured in most of the included studies.
Six of seven studies that assessed single-dose *Ginkgo biloba* reported improvements in at least one outcome measure compared with placebo. The other study reported no significant difference between Ginkgo biloba and placebo for any of the outcomes measured.

Six of eight studies assessing longer term use of *Ginkgo biloba* found no treatment effect compared with placebo for any of the outcomes measured; two studies reported a significant difference for at least one outcome measure.

**Authors' conclusions**
There is no convincing evidence that *Ginkgo biloba* extracts, taken either as a single dose or over a longer period, had a positive effect on any aspect of cognitive performance in healthy people under the age of 60 years.

**CRD commentary**
The review addressed a clear question and was supported by appropriate inclusion criteria. Six electronic databases were searched for relevant studies. No language restrictions were applied, which reduced the potential for language bias. Limited attempts were made to identify unpublished studies. The authors did not report the methods used for study selection or validity assessment, so the potential for reviewer bias and error could not be assessed. Two reviewers independently extracted data from the included studies, which reduced the potential for bias and error.

The validity of the included studies was assessed using appropriate criteria; the included studies did not score very highly and some studies included only a small number of participants. Comprehensive details of the included studies were provided. Owing to the heterogeneity of the included studies (primarily the different dosages and extracts of *Ginkgo biloba* and different outcomes assessed) a narrative synthesis was appropriate, although the narrative synthesis presented was limited.

Although there were some methodological limitations to the review, the authors' conclusions reflected the evidence presented and are likely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors stated that the only reason for healthy people to take *Ginkgo biloba* would be the hope that it might prevent or delay the onset of cognitive impairment and/or dementia, but that this hope was unsubstantiated by any scientific evidence.

**Research:** The authors stated that there was little to be gained from further research on the nootropic effect of *Ginkgo biloba* in healthy participants. Future research should concentrate on whether *Ginkgo biloba* prevented and/or delayed the onset of cognitive decline and whether it was effective in the treatment of dementia.

**Funding**
Not stated.

**Bibliographic details**
Canter PH, Ernst E. *Ginkgo biloba* is not a smart drug: an updated systematic review of randomised clinical trials testing the nootropic effects of *G. biloba* extracts in healthy people. Human Psychopharmacology 2007; 22(5): 265-278

**PubMedID**
17480002

**DOI**
10.1002/hup.843

**Original Paper URL**

**Indexing Status**
Subject indexing assigned by NLM
MeSH
Adolescent; Adult; Aged; Cognition /drug effects; Female; Ginkgo biloba; Humans; Male; Middle Aged; Plant Extracts /pharmacology; Randomized Controlled Trials as Topic

AccessionNumber
12007003224

Date bibliographic record published
30/09/2008

Date abstract record published
26/08/2009

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.