


Text mining for reducing screening workload: is it safe to use?

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Declaration of interests and funding

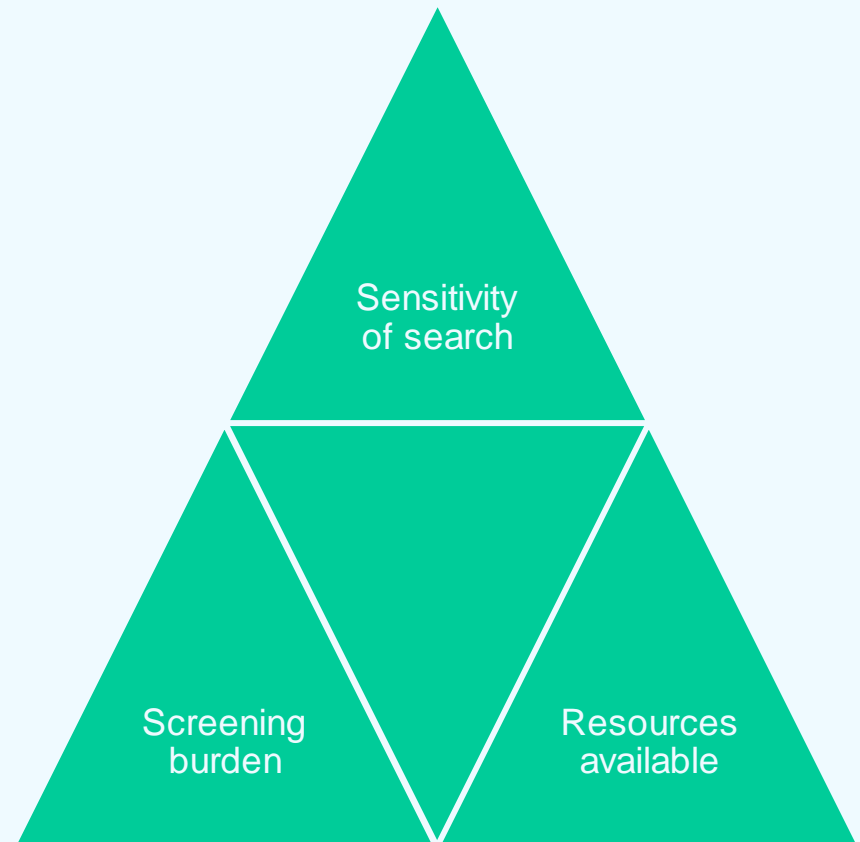
- James Thomas is co-lead of the Cochrane ‘Transform’ project, which is implementing some of the technologies discussed here. He also directs development & management of EPPI-Reviewer, the EPPI-Centre’s software for systematic reviews.
- The research project used for illustration was **funded by the Medical Research Council, UK**. The views and opinions expressed by authors in this presentation are those of the authors and do not necessarily reflect those of the MRC.

A vibrant, sunlit park scene. Large, leafy green trees dominate the upper half of the frame. In the middle ground, several people are sitting on black park benches. A small, active fountain is visible in the center-right. The foreground is a well-maintained green lawn with some scattered leaves and small dark spots. A semi-transparent blue rectangle is overlaid on the left side of the image, containing white text.

**Text mining
(machine learning)
to reduce
screening
workload: does it
work?**

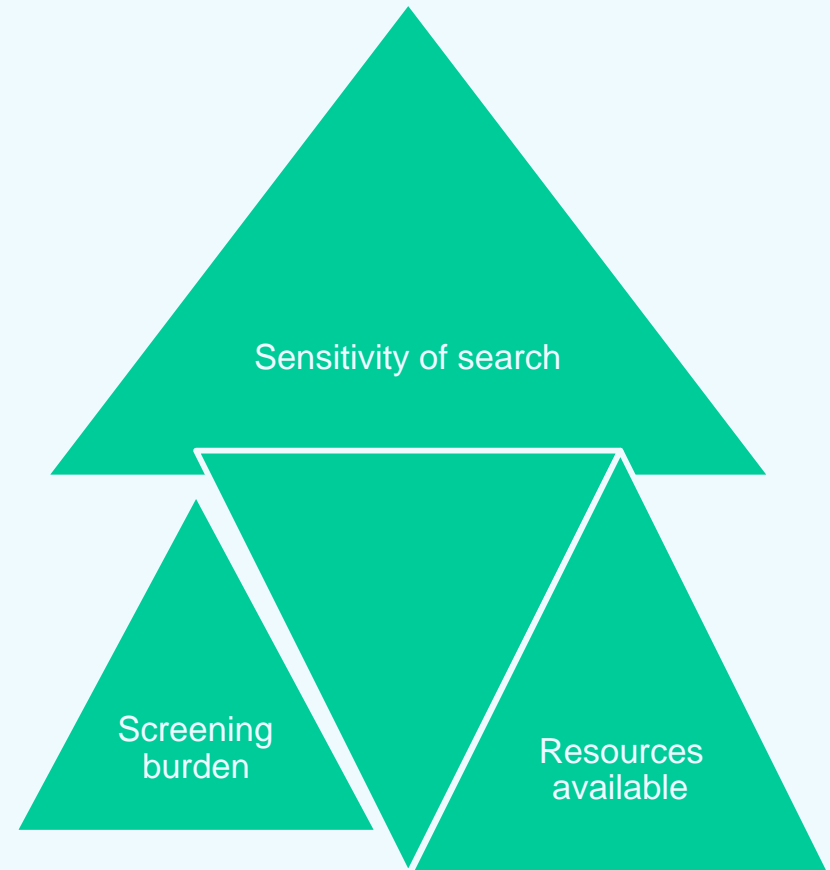
Search sensitivity and screening burden

- Systematic reviews are required to have extensive / exhaustive / sensitive, etc... searches
- Typically a trade-off between searching sensitively and retrieving a manageable number of references to screen
- The number of references missed through lack of sensitivity in the search is unknown.

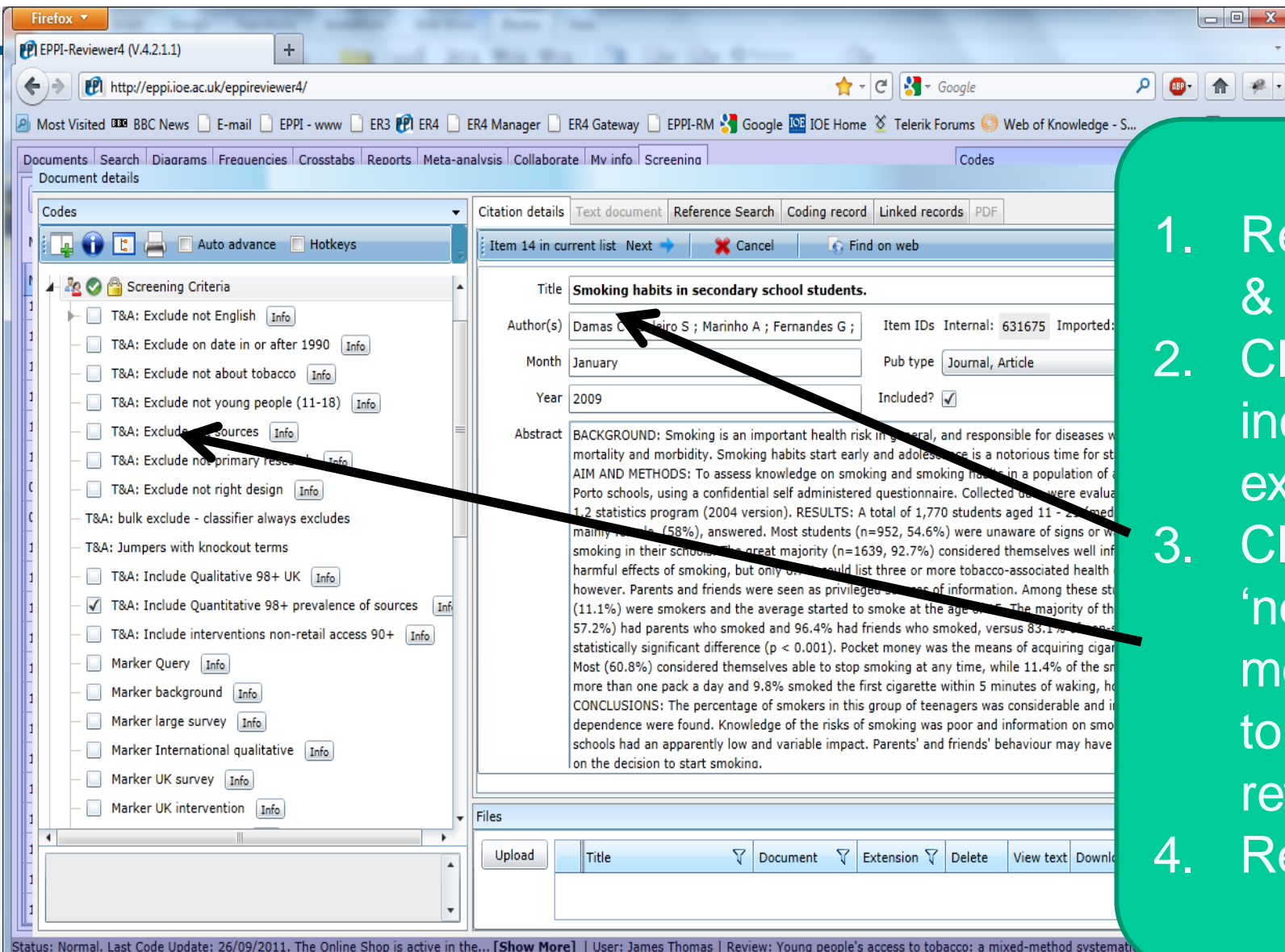


Aim of utilising text mining technologies for study identification

- To change the relative proportions in the triangle
- And make more sensitive searches possible without increasing the screening burden
- (Or to maintain sensitivity but with reduced resources)



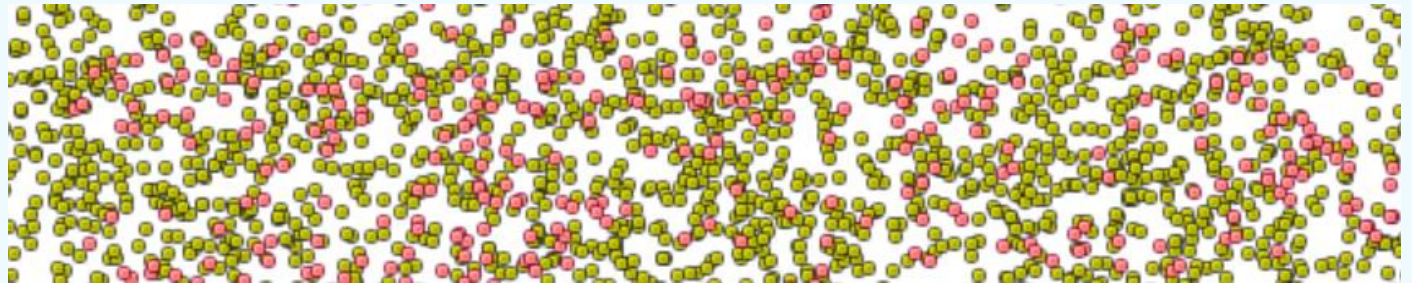
The screening process



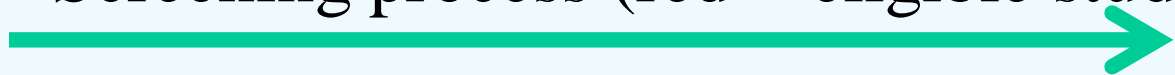
1. Read title & abstract
2. Click include / exclude
3. Click 'next' and move on to the next reference
4. Repeat...

Screening prioritisation: Changing the distribution of studies

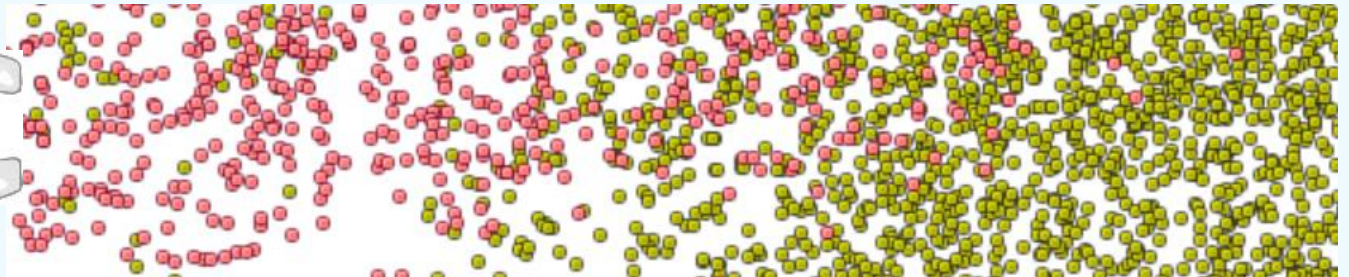
Traditional
screening



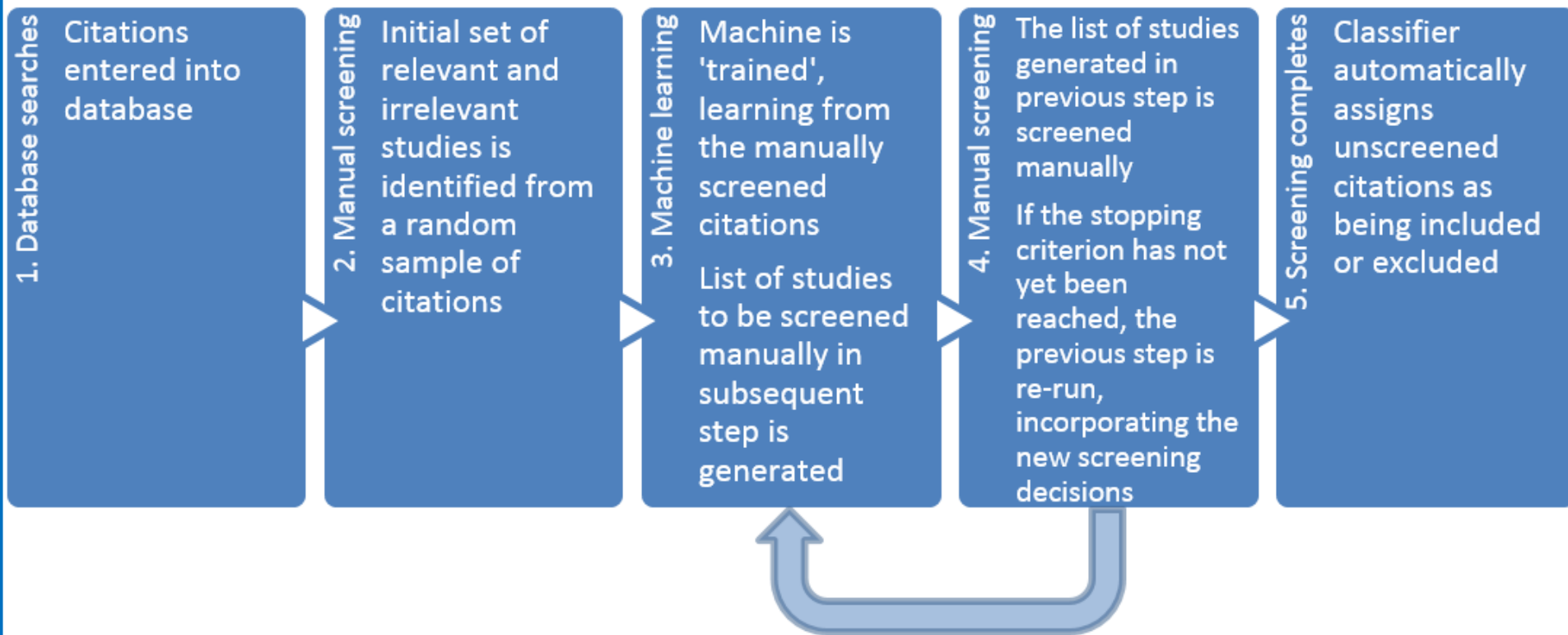
Screening process (red = eligible study)



Screening
aided by
text
mining



The active learning process



The result

- The result is an ordered list of titles and abstracts
 - With those that are *most similar* to the ones already marked as 'include' at the top
- The person screening continues to screen as usual, but behind the scenes the titles and abstracts remaining are re-ordered regularly (e.g. every 25 items)

A photograph of a park scene. In the foreground, there is a green lawn with several pigeons. A low hedge runs across the middle ground. Behind the hedge, there is a fountain with water spraying upwards. Several people are sitting on benches in the background. Large trees with green leaves are scattered throughout the park. A semi-transparent blue rectangle is overlaid on the left side of the image, containing the text "Does it work?".

Does it work?

Using text mining for study identification in systematic reviews: a systematic review of current approaches


- O'Mara-Eves A, Thomas J, McNaught J, Miwa M, Ananiadou S (2015) Using text mining for study identification in systematic reviews: a systematic review of current approaches. *Systematic Reviews* 4:5. doi:10.1186/2046-4053-4-5
- Five research questions:
 - what is the state of the evidence base;
 - how has workload reduction been evaluated;
 - what are the purposes of semi-automation and how effective are they;
 - how have key contextual problems of applying text mining to the systematic review field been addressed;
 - and what challenges to implementation have emerged?

Results of the O'Mara-Eves et al. (2015) review

- Most studies suggested that a saving in workload of between 30% and 70% might be possible (though sometimes at < 100% recall).
- But the field is very new, there are few genuinely comparable evaluations (different data / metrics / feature selection methods...)

Conclusions of the O'Mara-Eves et al. (2015) review

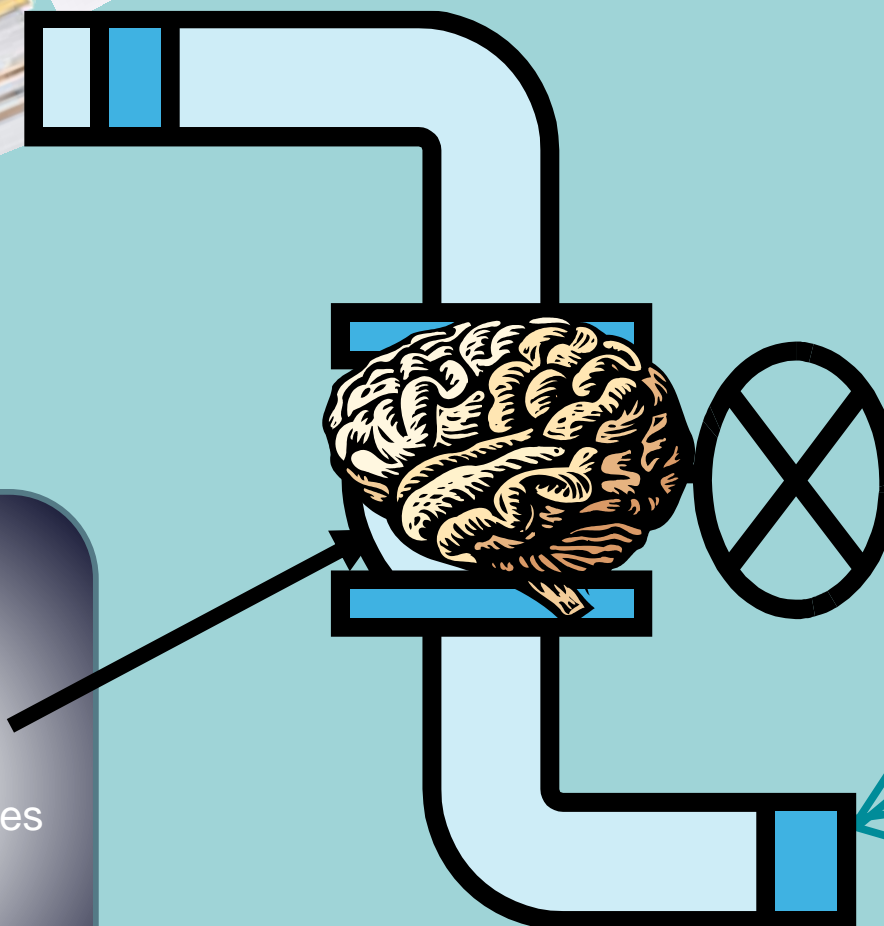
- Using text mining to prioritise the order in which items are screened should be considered safe and ready for use in 'live' reviews.
- The use of text mining as a 'second screener' may also be used cautiously.
- The use of text mining to eliminate studies automatically should be considered promising, but not yet fully proven. In highly technical/ clinical areas, it may be used with a high degree of confidence; but more developmental and evaluative work is needed in other disciplines.

A vibrant photograph of a park scene. In the foreground, a green lawn is dotted with several pigeons. A low, well-manicured hedge runs across the middle ground. Behind the hedge, a small, active fountain sprays water upwards. Several people are sitting on black park benches; some are looking towards the camera, while others are looking away. The background is filled with large, leafy green trees, and a few black lampposts are visible among the foliage. The overall atmosphere is peaceful and sunny.

Cochrane “Evidence pipeline”



- Completed reviews
- RG specialist registers
- Search strategies
- Citation networks...
- ...?



Part of the Cochrane 'Transform'
project:

<http://cochrane.org/transform>

SEARCH THE COCHRANE LIBRARY

Title, Abstract, Keywords

GO

or try an [Advanced Search](#)

COCHRANE DATABASE OF SYSTEMATIC
REVIEWS

Issue 9 of 12, September 2014

(Updated Daily) | [Contents](#)

BROWSE BY TOPICS

[Flood disorders](#) (152)

[Cancer](#) (512)

[Child health](#) (1737)

[Complementary & alternative medicine](#) (597)

[Consumer & communication strategies](#) (78)

[Dentistry & oral health](#) (160)

[Developmental, psychosocial & learning
problems](#) (119)

[Diagnosis](#) (27)

[Ear, nose & throat](#)



CRS Web

← → ↺ 🔍

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🔍

📁

Search

Classifier

Folders

Select a group from the dropdown to search for records identified by the classifier as of potential interest to that group.

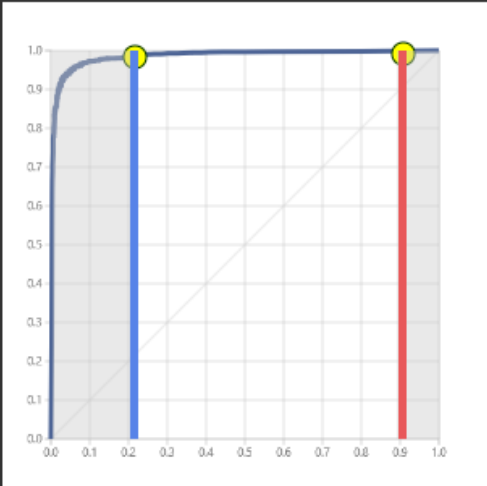
Dementia and Cognitive Improvement Group

▼

Search now

20

91



Interval contains about 142 records

Show all ▼

Page 1 of 3

⏪ < > ⏩ ...

✕

140 hits: "20 TO 91 DEMENTIA:ML"

1

☐

Adherence to an exercise intervention among older women post hip fracture
Resnick B, D'Adamo C, Shardell M, Orwig D, Hawkes W, Hebel JR, et al Journal of clinical sport psychology 2008 pp41-56
90 MUSKINJ C

2

☐

Mediterranean diet- and exercise-induced improvement in age-dependent vascular activity.
Klonizakis M, Alkhatib A, Middleton G, Smith MF Clinical science (London, England : 1979) 2013 May pp579-87
90 COMPMED C HTN LIVER

3

☐

Reliance on visual information after stroke. Part II: Effectiveness of a balance rehabilitation program with visual cue deprivation after stroke: a randomized controlled trial.
Bonan IV, Yelnik AP, Colle FM, Michaud C, Normand E, Panigot B, Roth P, Guichard JP, Vicaut E Archives of physical medicine and rehabilitation 2004 Feb pp274-8
90 COMPMED C HANDSRCH C REHAB C STROKE C

4

☐

Controlled trial of continuous positive airway pressure given by face mask for hyaline membrane disease
Allen LP, Reynolds EOR, Rivers RPA, Le Souef PN, Wimberley PD Archives of disease in childhood 1977 pp373-8
90 CHILD C NEONATAL C

Within the new CRS-Web interface, you can:

- Select the group that you're interested in
- Specify the range of scores you want to list
- View the list of citations, ordered by their likely relevance

Creating evidence-based methods...

- We need more evaluations using the same datasets
- We need more people to use text mining / machine learning tools in order to identify new ways of using them
- We need evaluations of the impact of losing 'tail' studies on reviews
- We need genuine comparisons of using automation vs search specificity

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