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Improving working memory

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Registration date 15/09/2016	**Overall study status** Completed	[ ] Statistical analysis plan [ ] Results
Last Edited 23/01/2018	**Condition category** Other	[ ] Individual participant data [ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Being numerate means having the confidence and skill to use numbers and mathematical approaches in all aspects of life - at work, in practical everyday activities at home and beyond, as consumers, in managing our finances, as parents helping our children learn, as patients making sense of health information, as citizens understanding the world about us. Being numerate means being able to reason with numbers and other mathematical concepts and to apply these in a range of contexts and to solve a variety of problems. Studies have shown that working memory (being able to hold onto information long enough to use it) can affect learning numeracy skills. The aim of this study is to find out whether a program designed to improve working memory in children has an effect on their numeracy skills.

Who can participate?
Year 3 pupils of English state primary schools with low numeracy skills.

What does the study involve?
Schools are randomly allocated to one of three groups. Children attending schools in the first group take part in a Working Memory training program taught by teaching assistant. This involves working memory skills being taught in structured sessions with support from computer games. Schools are directed to allocate 8-10 hours of teaching assistant time to the program over the course of a term. Children attending schools in the second group take part in the same Working Memory program as the first group but also play games from the mathematical reasoning curriculum. Children attending schools in the third group continue as normal for the duration of the study. Numeracy of children in all schools is tested at the end of year 3 and compared to their scores from their normal tests at the end of key stage 1 (year 2). At the start of the study and then at the end of year 3, children have their working memory assessed using a range of tests and teachers are asked to rate their attention and behaviour in class.

What are the possible benefits and risks of participating?
Children who take part in the working memory groups may benefit from improved maths academic attainment. There are no risks involved with participating in this study.

Where is the study run from?
The study is run from University of Oxford Department of Education and takes place in 115 schools from across England (UK)

When is the study starting and how long is it expected to run for?
January 2016 to December 2017

Who is funding the study?
Education Endowment Fund (UK)

Who is the main contact?
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Contact information

Type(s)
Public

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Additional identifiers

Protocol serial number
2015147

Study information

Scientific Title
The impact of working memory training on attainment in the BAS3 number skills test in Year 3 English children

Study objectives
The Working Memory (WM) intervention and the blended working memory and number skills (WM+) intervention will increase the numeracy scores of children who participate compared to children who receive no intervention.

Ethics approval required
Old ethics approval format

Ethics approval(s)
University of Oxford Department of Education Research Ethics Committee, 21/01/2016

Primary study design
Interventional

Study design
Three-arm cluster randomised controlled trial

Study type(s)
Other

Health condition(s) or problem(s) studied
Numeracy

Interventions
Schools are randomly allocated to one of three groups using block randomisation with a random number generator. There will be six blocks, defined on the basis of school size (one-form entry, two or more form entry) and most recent school KS1 performance (lower third, middle third, upper third). Both interventions will be delivered between January and May 2017.

Working Memory Group: Strategies for improving Working Memory are taught by Teaching Assistants. The intervention combines two aspects of working memory training: strategies and practice. The strategies (rehearsal, association, using fingers) are taught in structured sessions, with support from computer games. The WM and WM+ interventions will be of the same length. Some variation in the expected length of delivery is likely in practice. Schools will be directed to allocate a total of 8-10 hours TA time (with a 50/50 split between TA time and games) over the course of a term.

Working Memory + Group: Participants are taught the same strategies as in the Working Memory Group, with the addition of games from the mathematical reasoning curriculum will also be tested in this trial. The rationale is that pupils who are behind in their maths may require additional help with working memory, but also with maths-specific content. The WM and WM+ interventions will be of the same length. Some variation in the expected length of delivery is likely in practice. Schools will be directed to allocate a total of 8-10 hours TA time (with a 50/50 split between TA time and games) over the course of a term.

Control group: Participants allocated to the control group receive no intervention and proceed through the school year as normal. Control group schools will be given a financial incentive that they can then spend on the training, if they wish, after the post-test.

Follow up for all study arms involves the the British Ability Scales (BAS) number skills test (third edition), this will be assessed at the end of year 3. The tests will be administered by research assistants recruited by BIT, blinded to allocation status.There is no pre-test but relevant scores from Key Stage 1 will be used to track progress. Outcome measure data collection will take place between May and June 2017. The evaluation will consider two secondary outcomes: The first is working memory, which will be assessed prior to randomisation before the intervention and also at the end of year 3 using the three central executive subtests (counting recall, backward digit recall, listening recall) of a working memory scale for children (Pickering & Gathercole, 2001, or Alloway, 2007, which is the computerised version). It will be administered by Oxford's researchers, blinded to allocation status. RAs from BIT will audit a random sample of the assessments to ensure that they are completed as per the protocol and that assessors are blind to the allocation of the child. The second is attention and behaviour in class, as assessed by teachers at the end of year 3. When testers visit schools for data collection on the WM test, they

will approach teachers, who will be asked to complete 15 items for the “Attention Rating Scale for Teachers” (adapted from the original by James M. Swanson; Swanson et al., 2001). This is a 4-point rating scale which contains items relevant to children's sustained attention in the classroom. There is no specific training required of raters, beyond the instructions. The Oxford team will be responsible for data entry. Data will be shared with the evaluation team, once available. Only those eligible for the intervention will be tested.

Intervention Type

Primary outcome(s)
Number skills will be assessed at the end of year 3 using the BAS3 number skills test. There is no pre-test but instead KS1 scores will be used as a comparator.

Key secondary outcome(s)
1. Working memory will be assessed using the three central executive subtests (counting recall, backward digit recall, listening recall) of a working memory scale for children at baseline and at the end of year 3.
2. Attention and behaviour in class will be assessed by teachers using the Attention Rating Scale for Teachers at the end of year 3

Completion date
21/12/2017

Eligibility

Key inclusion criteria
Schools:
1. English state primary schools
2. Have at least 20 pupils in Year 3

Children:
1. Year three pupils
2. Low numeracy skills
3. Parents have not opted their child out of participating

Participant type(s)
Other

Healthy volunteers allowed
No

Age group
Child

Sex
All

Key exclusion criteria
Not meeting inclusion criteria

Date of first enrolment
01/09/2016

Date of final enrolment
01/11/2016

Locations

Countries of recruitment
United Kingdom

Study participating centre
University of Oxford Department of Education
15 Norham Gardens
Oxford
OX2 6PY

Sponsor information

Organisation
Education Endowment Fund

ROR
https://ror.org/03bhd6288

Funder(s)

Funder type
Charity

Funder Name
Education Endowment Fund

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are not expected to be made available as it is not anonymised. BIT will hold the data for two years following the trial, and EEF will also hold a copy.

IPD sharing plan summary

Not expected to be made available