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Can brain training games help improve thinking skills in children and teens with autism?

Submission date
24/08/2025

Recruitment status
No longer recruiting

Registration date
26/08/2025

Overall study status
Completed

Last Edited
26/08/2025

Condition category
Mental and Behavioural Disorders

[ ] Prospectively registered
[X] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
This study is looking at whether a type of brain training called “dual n-back” can help improve thinking and memory skills in children and teenagers with autism. People with autism often find it harder to plan, focus, and remember things. The training involves a computer game that challenges memory and attention. Researchers want to find out if doing this training can lead to improvements not just in memory, but also in other areas like problem-solving and emotional control.

Who can participate?
Children and teenagers aged 10 to 15 years who have been diagnosed with autism (including Asperger’s syndrome) can take part. People cannot join if they have serious mental health conditions, intellectual disabilities, sensory impairments, serious medical illnesses, or recent substance misuse.

What does the study involve?
Participants will be randomly placed into one of two groups. One group will do the dual n-back brain training, and the other group will do a simpler version of the task. Both groups will use a computer program for 2 weeks, doing short daily sessions. Researchers will measure thinking and memory skills before and after the training, and again 3 months later. Parents will help monitor how often their child uses the program.

What are the possible benefits and risks of participating?
The training may help improve memory and thinking skills, which could make everyday tasks easier. There are no known risks from doing the computer-based training, but it may be tiring or frustrating for some children. All data will be kept private and secure.

Where is the study run from?
The study is being run from the child and adolescent psychiatric outpatient clinic at Queen Mary Hospital in Hong Kong.

When is the study starting and how long is it expected to run for?
August 2024 to September 2025.

Who is funding the study?
No external funding has been received. The training program is provided by the Institute of Psychology at the Chinese Academy of Science.

Who is the main contact?
Dr Novia Mozart Kong , noviamozartkong@gmail.com

Contact information

Type(s)
Public, Scientific, Principal investigator

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Study information

Scientific Title
Transfer effects of dual N-back training in children and adolescents with autism spectrum disorder: a randomized controlled trial

Acronym
TEDNB

Study objectives
Primary objective:
To examine the impact of dual n-back training on the near transfer effect on WM performance in children and adolescents with ASD.

Secondary objectives:
1. To assess the far transfer effects of dual n-back training on cognitive functioning in children and adolescents with ASD.
2. To investigate the long-term maintenance of any observed training effects in the follow-up period after the completion of the dual n-back intervention.
3. To explore potential moderators and mediators of the training effects in children and adolescents with ASD.

Null hypothesis in this study:
There will be no significant impact of dual n-back training on the near transfer effect on WM performance in children and adolescents with ASD.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 01/08/2024, HKU/ HA HKW Institutional Review Board (Room 901, 9/F, Administrative Block, Queen Mary Hospital, 102 Pokfulam Road, -, Hong Kong; +852 22553923; hkwirb@ha.org.hk), ref: UW 24-422

Primary study design
Interventional

Study design
Single-center interventional double-blinded randomized controlled trial

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Working memory improvement in children with autism spectrum disorder

Interventions
Dual n-back training is a cognitive training task designed to target and improve working memory abilities specifically. It has been utilised in research studies and has shown promising results in enhancing working memory performance in children and adolescents.

During the dual n-back training, participants will engage in a computer-based task that requires them to simultaneously remember and recall two different types of stimuli, including spatial and auditory stimuli. The training sessions will be conducted daily for 2 consecutive weeks. Each training session would involve five blocks with a 10+n trial in each block. The 2-back task would be utilised as the experimental intervention, while the 0-back task would be the control group.

Participants were randomly assigned to either the intervention group (dual 2-back training) or the active control group (0-back task) using a computer-generated randomisation sequence. A block randomisation method (with varying block sizes of 6) was used to ensure balanced group sizes. The randomisation sequence was generated using computerised random number generation. The sequence was prepared by an independent statistician not involved in recruitment, assessment, or intervention delivery. To prevent selection bias, allocation concealment was maintained using digital folders. The folder contains the group assignment (intervention or control) corresponding to the pre-generated randomisation sequence. Folders were only opened after baseline assessments were completed and the participant was formally enrolled in the trial. After obtaining informed consent and confirming eligibility, participants underwent baseline assessments. The following digital folder was opened in sequence to reveal the group assignment. The person handling randomisation did not participate in post-intervention evaluations.

Intervention Type
Behavioural

Primary outcome(s)

Working Memory improvement by dual n-back task, digit span, Corsi Block Tapping Test and Sternberg Test at baseline, immediately post-intervention (i.e. 2 weeks) and 3 months

Key secondary outcome(s)
Executive Function and behavioral improvement by Operation Span Task, Go No-Go Test, Tower of London, BRIEF and CBCL at baseline, immediately post-intervention (i.e. 2 weeks) and 3 months

Completion date
30/09/2025

Eligibility

Key inclusion criteria
1. Age range of 10-15 years
2. Diagnosis of DSM-5 ASD, or DSM-4 Asperger’s syndrome or ICD-10 Childhood autism, atypical autism or Asperger syndrome

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Child

Lower age limit
10 Years

Upper age limit
15 Years

Sex
All

Total final enrolment
69

Key exclusion criteria
1. Diagnosed with comorbid active mood or psychotic disorder
2. Diagnosed with mental retardation
3. Visual or hearing impairment
4. Serious medical illness
5. Substance misuse in the past 6 months

Date of first enrolment
01/08/2024

Date of final enrolment
30/09/2025

Locations

Countries of recruitment
Hong Kong

Study participating centre
Child and Adolescent Psychiatric Outpatient Clinic, Department of Psychiatry, Queen Mary Hospital
5/F, Block J, Queen Mary Hospital, 102 Pok Fu Lam Road
Hong Kong
Hong Kong
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Sponsor information

Organisation
Hospital Authority

ROR
https://ror.org/05sn8t512

Funder(s)

Funder type
Other

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study will be available upon request form. (Contact name: Novia Kong, Email address: noviamozartkong@gmail.com)

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	version 4	26/07/2024	26/08/2025	No	Yes
Protocol file			26/08/2025	No	No