Clinical Trial Protocol
Iranian Registry of Clinical Trials

07 Nov 2026

Comparison of the effectiveness of brain-based learning instruction and Fernald multisensory instruction versus usual school instruction on love of learning, cognitive load, working memory, information processing speed, and mathematics achievement in sixth-grade primary school students with specific learning disorder with impairment in mathematics

Protocol summary

Study aim
To determine the difference in effectiveness between brain based learning instruction and Fernald multisensory instruction on love of learning, cognitive load, working memory, information processing speed, and mathematics achievement in sixth grade students with specific learning disorder with impairment in mathematics

Design
This is a non-randomized, non-blinded, quasi-experimental study with three parallel control groups, involving 45 students divided into groups of 15; it employs purposive sampling and includes pre-test, post-test, and two-month follow-up assessments

Settings and conduct
Students are identified from schools and learning disorder centers in Yazd, and following screening and a pre-test, they are assigned to groups

Participants/Inclusion and exclusion criteria
Sixth grade students in Yazd with specific learning disorder with impairment in mathematics; Shalev score below the fifth percentile; adequate instruction; normal cognitive ability; parental consent and student assent; exclusion for uncorrected visual or hearing impairment

Intervention groups
Brain based or Fernald multisensory instruction, each comprising eight group sessions of 60 minutes, plus two introductory and two concluding sessions; control receiving usual school instruction

Main outcome variables
Love of learning; cognitive load; working memory; information processing speed; mathematics achievement

General information

Reason for update
Acronym
IRCT registration information
IRCT registration number: **IRCT20261030071609N1**
Registration date: **2026-11-03, 1405/08/12**
Registration timing: **prospective**

Last update: **2026-11-03, 1405/08/12**
Update count: **0**
Registration date
2026-11-03, 1405/08/12

Registrant information
Name
Soad Shahabizadeh
Name of organization / entity
Country
Iran (Islamic Republic of)
Phone
+98 939 627 4198
Email address
soad.shahabizadeh@gmail.com

Recruitment status
Not yet recruiting
Funding source

Expected recruitment start date
2026-11-15, 1405/08/24
Expected recruitment end date
2026-12-05, 1405/09/14
Actual recruitment start date
empty
Actual recruitment end date

empty

Trial completion date

empty

Scientific title

Comparison of the effectiveness of brain-based learning instruction and Fernald multisensory instruction versus usual school instruction on love of learning, cognitive load, working memory, information processing speed, and mathematics achievement in sixth-grade primary school students with specific learning disorder with impairment in mathematics

Public title

Comparing the Effects of Two Teaching Methods, Brain-Based Learning and Fernald Multisensory Instruction, on Love of Learning, Cognitive Load, Working Memory, Information Processing Speed, and Mathematics Achievement in Sixth-Grade Primary School Students with Mathematics Learning Disorder

Purpose

Education/Guidance

Inclusion/Exclusion criteria

Inclusion criteria:

Enrollment in the sixth grade of primary school and residence and school attendance in Yazd Persistent mathematics difficulties and a score below the fifth percentile on the Shalev diagnostic mathematics test Adequate prior instruction and cognitive ability within the normal range Written parental consent and student assent to participate in the study

Exclusion criteria:

An uncorrected visual or hearing impairment Failure to complete the baseline assessment before group allocation

Age

From **11 years** old to **12 years** old

Gender

Both

Phase

N/A

Groups that have been masked

- Outcome assessor
- Data analyser

Sample size

Target sample size: **45**

Randomization (investigator's opinion)

Not randomized

Randomization description

Blinding (investigator's opinion)

Single blinded

Blinding description

Due to the educational nature of the intervention, blinding of participants, the intervention provider, and the principal investigator is not feasible, because students are aware of the training they receive and the trainer knows the group allocation. To reduce the risk of bias, the outcome assessor will be blinded to group allocation and will not be involved in the assignment of students to groups. Each participant will be identified by a unique identification code, and the allocation list will be held by the thesis supervisor and will not be accessible to the assessor. The data analyst will analyse the data using neutral labels such as Group A, Group B, and Group C and will remain unaware of the meaning of these labels until the primary analysis is completed. Participants will also be asked not to reveal their group assignment to the assessor during assessment sessions.

Placebo

Not used

Assignment

Parallel

Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee

Ethics Committee of Islamic Azad University Ahvaz Branch

Street address

No. 7, Shahid Parnian Alley 9, Enghelab Alley 56, Amirabad

City

Yazd

Province

Yazd

Postal code

۸۹۱۸۶۶۸۷۱۹

Approval date

2026-10-26, 1405/08/04

Ethics committee reference number

IR.IAU.AHVAZ.REC.1405.576

Health conditions studied

1

Description of health condition studied

Specific learning disorder with impairment in mathematics

ICD-10 code

F81.2

ICD-10 code description

Mathematics disorder

Primary outcomes

1

Description

Total love of learning score measured using the McFarlane Love of Learning Scale

Timepoint

Before the instructional sessions, during the first two sessions of the intervention (pretest), and after the eight instructional sessions, during the last two sessions of the

intervention (posttest)

Method of measurement

The nine item McFarlane Love of Learning Scale, with responses scored from 1 to 5 and total scores ranging from 9 to 45; higher scores indicate greater love of learning

Secondary outcomes

1

Description

Mean scores for intrinsic, extraneous, and germane cognitive load on the questionnaire by Klepsch and colleagues

Timepoint

Before the instructional sessions, during the first two sessions of the intervention (pretest), and after the eight instructional sessions, during the last two sessions of the intervention (posttest)

Method of measurement

The eight item Cognitive Load Questionnaire by Klepsch and colleagues, with seven response options per item; the mean score is calculated separately for each dimension

2

Description

Working memory score on the Wechsler subtests and number of correct responses on the computerized n back task

Timepoint

Before the instructional sessions, during the first two sessions of the intervention (pretest), and after the eight instructional sessions, during the last two sessions of the intervention (posttest)

Method of measurement

The Digit Span and Letter Number Sequencing subtests of the Wechsler Intelligence Scale for Children and the computerized n back task at the one back and two back levels

3

Description

Mean reaction time in milliseconds in the congruent, incongruent, and neutral conditions of the computerized Stroop Color Word Test

Timepoint

Before the instructional sessions, during the first two sessions of the intervention (pretest), and after the eight instructional sessions, during the last two sessions of the intervention (posttest)

Method of measurement

The computerized Stroop Color Word Test, recording reaction times and numbers of correct and incorrect responses

4

Description

Total mathematics achievement score on the Shalev diagnostic arithmetic test

Timepoint

Before the instructional sessions, during the first two sessions of the intervention (pretest), and after the eight instructional sessions, during the last two sessions of the intervention (posttest)

Method of measurement

The Shalev standardized diagnostic arithmetic test, assessing number comprehension, number production, and arithmetic calculations

Intervention groups

1

Description

Intervention group: Participants will receive brain-based learning training in eight 60-minute sessions. The sessions will cover creating a safe learning environment and reducing mathematics anxiety; connecting new material to prior knowledge; meaningful learning; movement-based and visual activities using concrete materials; attention and processing speed exercises; providing challenges appropriate to each student's abilities; working memory and active retrieval exercises; promoting positive emotions and interest in learning; and reviewing and transferring acquired skills to mathematics tasks. In addition to the eight instructional sessions, two sessions will be held before training for pretest assessment, student preparation, and familiarizing parents with the training process. Two further sessions will be held after training for review, practice, posttest assessment, and providing feedback to parents.

Category

Rehabilitation

2

Description

Intervention group: Participants will receive Fernald's multisensory training in eight 60-minute sessions. This approach teaches mathematical concepts and skills through the simultaneous engagement of visual, auditory, tactile, and kinesthetic modalities. Activities will include observing numbers or concepts, hearing and verbalizing them, tracing them with a finger on sand or sandpaper, writing from memory, using concrete objects to understand quantities, practicing arithmetic operations, learning fractions, decimals, and ratios, solving mathematical word problems, participating in movement-based number games, and reviewing acquired skills. In addition to the eight instructional sessions, two sessions will be held before training for pretest assessment, student preparation, and familiarizing parents with the training process. Two further sessions will be held after training for review, practice, posttest assessment, and providing feedback to parents.

Category

Rehabilitation

3

Description
Control group: Control group: Participants will continue to receive routine school instruction throughout the study and will receive neither the brain-based learning program nor Fernald’s multisensory training. Pretest and posttest assessments will be conducted at time points corresponding to those of the intervention groups.

Category
Rehabilitation

Recruitment centers

1

Recruitment center

Name of recruitment center
Yazd County Department of Education Learning Disorders Center

Full name of responsible person
Soad Shahabizadeh

Street address
Zeytun Neighborhood, Lokizadeh Street, Salavati Alley

City
Yazd

Province
Yazd

Postal code
8916966443

Phone
+98 35 3314 4301

Fax
+98 35 3724 2146

Email
notices@yazdedu.ir

Web page address

Sponsors / Funding sources

1

Sponsor

Name of organization / entity
Islamic Azad University

Full name of responsible person
Aslan Egdernejad

Street address
Golestan Highway, Farhang Shahr

City
Ahvaz

Province
Khouzestan

Postal code
37333 61349

Phone
+98 61 3334 8336

Fax
+98 61 3332 9200

Email
Info@iauahvaz.ac.ir

Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?
Yes

Title of funding source
Islamic Azad University

Proportion provided by this source
100

Public or private sector
Public

Domestic or foreign origin
Domestic

Category of foreign source of funding
empty

Country of origin

Type of organization providing the funding
Academic

Person responsible for general inquiries

Contact

Name of organization / entity
Islamic Azad University

Full name of responsible person
Soad Shahabizadeh

Position
Student

Latest degree
Master

Other areas of specialty/work
Psychology

Street address
No. 7, Shahid Parnian Alley 9, Enghelab Alley 56, Amirabad

City
Yazd

Province
Yazd

Postal code
۸۹۱۸۶۶۸۷۱۹

Phone
+98 35 3726 4084

Email
1820012433@iau.ir

Person responsible for scientific inquiries

Contact

Name of organization / entity
Islamic Azad University

Full name of responsible person
Sahar Safarzadeh

Position
Assistant Professor

Latest degree
Ph.D.

Other areas of specialty/work
Psychology

Street address
Gharbi Kargar, Farhang-e Shahr Campus, Islamic Azad

University, Ahvaz Branch
City
Ahvaz
Province
Khouzestan
Postal code
37333 61349
Phone
+98 61 3334 8336
Email
s.safarzadeh1152@iau.ac.ir

Person responsible for updating data

Contact
Name of organization / entity
Islamic Azad University
Full name of responsible person
Soad Shahabizadeh
Position
Student
Latest degree
Master
Other areas of specialty/work
Psychology
Street address
No. 7, Shahid Parnian Alley 9, Enghelab Alley 56, Amirabad
City
Yazd
Province
Yazd
Postal code
۸۹۱۸۶۶۸۷۱۹
Phone
+98 35 3726 4084
Email
1820012433@iau.ir

Sharing plan

Deidentified Individual Participant Data Set (IPD)
No - There is not a plan to make this available
Justification/reason for indecision/not sharing IPD
There is no further information.
Study Protocol
No - There is not a plan to make this available
Statistical Analysis Plan
No - There is not a plan to make this available
Informed Consent Form
No - There is not a plan to make this available
Clinical Study Report
No - There is not a plan to make this available
Analytic Code
No - There is not a plan to make this available
Data Dictionary
No - There is not a plan to make this available