TEST

BAER - brainstem auditory evoked response

A BAER test records how the hearing nerve and brainstem respond to sounds.

WHAT IT MEASURES
Electrical responses from the hearing nerve and brainstem

SAMPLE
None; scalp electrodes and earphones

FASTING NEEDED?
Sometimes, when sedation is planned

HOW LONG IT TAKES
Usually 30 to 90 minutes

RESULTS IN
Same day to several days; varies by laboratory

USED FOR
Screening, diagnosis, and monitoring hearing pathways

MAIN LIMITATION
Movement and electrical noise can hide responses

Overview

A brainstem auditory evoked response, or BAER, test checks how sound signals travel from your inner ear through the hearing nerve and brainstem. The brainstem is the lower part of the brain that connects with the spinal cord.

The test is also commonly called an auditory brainstem response, or ABR, test. Small sensors called electrodes record electrical activity while clicks or other sounds play through earphones. The electrodes only record signals; they do not send electricity into you.

BAER can estimate hearing ability when a standard hearing test is not practical. It can also help assess the hearing nerve and brainstem. However, it does not provide a complete picture of how someone understands speech or manages sound in everyday life.

Why the test is ordered

BAER may be used as part of newborn hearing screening. An automated version reports whether the recorded response meets the screening criteria.

A diagnostic BAER provides more detailed information. It may be ordered to:

BAER is usually one part of an assessment. Other tests may be needed to examine the middle ear, inner ear, or ability to hear different pitches and speech.

- Estimate hearing levels in babies or people unable to complete a behavioural hearing test
- Investigate hearing test results that are unclear or inconsistent
- Check whether sound signals are travelling normally through the hearing nerve and brainstem
- Assess possible auditory neuropathy, where sound enters the inner ear but nerve signalling is disrupted
- Monitor hearing pathways during certain operations
- Follow a known hearing or neurological condition

Who should have the test

A healthcare professional may recommend BAER for a baby who did not pass newborn hearing screening. A screening result that says "refer" does not confirm hearing loss. Temporary fluid, debris in the ear canal, movement, or test conditions may affect the result.

The test may also be helpful for children or adults who cannot reliably respond during an ordinary hearing test. This can include people who are sleeping, sedated, critically ill, or unable to follow the test instructions.

Some people with unexplained one-sided hearing changes, unusual nerve-related hearing findings, or inconsistent hearing results may also be referred. BAER is not automatically needed for every hearing concern.

How to prepare

Follow the testing centre's instructions, especially if the test will be performed during natural sleep or with sedation.

For a test without sedation, you can usually eat and drink normally and take your usual medicines. Do not stop a medicine unless the healthcare professional responsible for it tells you to.

Wash your hair and avoid hair spray, gel, oils, or heavy skin products around your forehead and ears. These products can prevent the electrodes from making good contact.

Babies may be scheduled around their usual sleep time. You may be asked to keep your baby awake beforehand and feed them after the electrodes have been placed. Use only the sleep plan provided by the testing centre.

If sedation or anaesthesia is planned, fasting instructions are important. Tell the team about medicines, allergies, pregnancy, recent illness, breathing problems, and previous reactions to sedation.

What happens during the test

The audiologist or technician may first examine the ear canals. They clean small areas of skin and attach electrodes to the forehead, scalp, and near each ear. Insert earphones or headphones are then fitted.

You will hear repeated clicks, brief tones, or both. The electrodes record the timing and size of the resulting electrical waves. Each ear is usually tested separately at several sound levels.

You need to remain still and relaxed because muscle activity creates electrical signals that can cover the much smaller BAER response. Babies and young children are often tested while asleep. Sedation may be considered if natural sleep is not practical and the information is important.

The recording itself is painless. A routine appointment commonly lasts 30 to 90 minutes, although testing may take longer if a child needs time to settle or sleep.

Understanding your results

A diagnostic report may describe a series of waves. These waves represent activity at different points along the hearing pathway. The report may consider whether waves are present, how long they take to appear, and how their timing compares between the ears.

When BAER is used to estimate hearing, the lowest sound level that produces a repeatable response helps estimate hearing thresholds. These are not always identical to thresholds from a behavioural hearing test, where you respond whenever you hear a sound.

Automated newborn screening usually gives a "pass" or "refer" result. A pass means the expected response was recorded under the test conditions. It does not guarantee that hearing will remain normal or rule out every mild or frequency-specific hearing difference.

A delayed, weak, or absent response has several possible explanations. These include ear canal blockage, middle-ear fluid, hearing loss in the inner ear, or altered signalling along the

hearing nerve or brainstem. BAER alone may not identify the exact cause.

There is no single universal set of normal BAER values. Ranges and interpretation can vary by laboratory or testing centre, age, sex, pregnancy status, medicines, equipment, and clinical context. Age is particularly important in newborns because the hearing pathways continue to mature.

What affects the results

BAER records very small electrical signals, so testing conditions matter. A result can be unclear without anything being wrong with the equipment or laboratory.

Important influences include:

Ordinary sleep usually improves the recording because it reduces movement. Recent exercise, meals, and hydration do not usually change the hearing pathway itself, although vigorous exercise immediately beforehand may make it harder to lie still and relaxed.

- Movement, crying, jaw clenching, or tense facial and neck muscles
- Poor electrode contact or incorrect electrode placement
- Electrical interference from nearby equipment
- Earwax, debris, or fluid behind the eardrum
- Background sound or a poorly fitting earphone
- The type, pitch, speed, and loudness of the test sounds
- Young age and ongoing maturation of the hearing pathway
- Low body temperature or serious illness
- Some sedatives, anaesthetic medicines, and medicines that affect hearing or nerve function

Accuracy and limitations

BAER can reliably record hearing-pathway activity when the electrodes have good contact and the person remains still. It is especially useful when someone cannot take part in a conventional hearing test.

The test can miss mild hearing loss, loss limited to particular pitches, or hearing changes that develop after testing. A screening BAER may also say "refer" when hearing is normal because of movement, middle-ear fluid, ear canal debris, or recording noise.

BAER estimates whether sound reaches and activates the brainstem. It does not directly measure speech understanding, listening in background noise, or how the brain interprets complex sounds.

Other tests may answer different questions better. Tympanometry checks eardrum and middle-ear movement. Otoacoustic emissions measure responses produced by the inner ear. Behavioural audiometry is better for measuring conscious responses to different sounds when someone can participate. MRI is better for showing the physical structure of the hearing nerves and brain.

Risks and complications

A BAER recording without sedation is non-invasive and has few risks. Removing the electrodes may cause brief discomfort, and the adhesive or skin-cleaning gel can occasionally cause mild redness or irritation.

The test sounds are controlled and should not damage hearing.

If sedation is needed, it adds separate risks, such as changes in breathing, nausea, or a reaction to a medicine. The team should explain these risks, fasting requirements, monitoring, and recovery before the test.

What happens next

A normal result may complete the assessment, or it may be compared with other hearing tests. Babies and children may still need routine hearing and developmental follow-up because hearing can change over time.

An unclear result may need to be repeated, often when the person can sleep more deeply or remain still. Depending on the findings, the next step may include tympanometry, otoacoustic emissions, behavioural hearing tests, review by an ear, nose and throat specialist, or imaging.

Most BAER follow-up is routine. Arrange prompt medical assessment for a sudden loss of hearing developing over hours or a few days rather than waiting for a scheduled BAER appointment.

Call emergency services for hearing changes accompanied by signs such as new facial or limb weakness, difficulty speaking, loss of consciousness, or a sudden severe balance problem. These symptoms need emergency assessment for causes unrelated to the test itself.

Common questions

Can I drink coffee before a BAER test?

Usually, yes, if you are having the test while awake and without sedation. Too much caffeine may make it difficult to relax. Do not eat or drink if your sedation instructions say you must fast.

Does the time of day matter?

Not usually for an awake adult. For babies and young children, an appointment matching their normal sleep time can make the recording easier and more complete.

Can I exercise beforehand?

Light activity is generally acceptable. Avoid strenuous exercise immediately before the appointment if it leaves you restless, sweaty, or unable to lie quietly.

Does the test hurt?

No needles are used, and the electrodes only record activity. Cleaning the skin and removing adhesive may cause minor discomfort.

Will I or my child need sedation?

Many adults do not, and babies can often be tested during natural sleep. Sedation may be considered when staying still is not otherwise possible. It requires separate preparation and monitoring.

Can I drive home afterward?

You can usually drive after a BAER performed without sedation. If you receive sedation, you will need to follow the centre's discharge instructions and arrange for someone else to take you home.

Sources

- American Speech-Language-Hearing Association. Auditory Brainstem Response
- National Institute on Deafness and Other Communication Disorders. Your Baby's Hearing Screening and Next Steps
- Joint Committee on Infant Hearing. Year 2019 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs
- American Academy of Audiology. Clinical Guidance Document: Assessment of Hearing in Infants and Young Children

- StatPearls. Auditory Brainstem Response. NCBI Bookshelf