Whispered voice test for screening for hearing impairment in adults and children: systematic review
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CRD summary
This well conducted review assessed the accuracy of the whispered voice test in detecting hearing impairment in adults and children. The authors' concluded that it is a simple and accurate test for detecting hearing impairment, but that there is considerable room for improvement in standardising the testing procedure. The authors' recommend that further research be conducted in primary care settings.

Authors' objectives
To determine the accuracy of the whispered voice test in detecting hearing impairment in adults and children.

Searching
A range of electronic databases and other sources was searched. Further searches were made of indexes, unpublished theses, and bibliographies of known primary and review articles. Authors were also contacted. Full details of the search strategy are available. No language restrictions were applied.

Study selection
Study designs of evaluations included in the review
Studies were included if they had cross-sectional designs.

Specific interventions included in the review
At least one of the index tests evaluated needed to be the whispered voice test. Six different techniques were used in the studies found.

Reference standard test against which the new test was compared
The reference standard used was hearing impairment by audiometry. It needed to be performed on at least 80% of the participants. In studies of adults, the positivity threshold for hearing impairment by audiometry was 30 dB (3 studies) or 40 dB (1 study); in studies of children, the threshold for hearing impairment ranged from 20 to 35 dB.

Participants included in the review
Both adults (17 years or older) and children (under 17 years) were eligible for inclusion in the review, and were considered separately. Four studies were of children and four were of adults. The participants in the adult studies were generally elderly; only one study included participants younger than 55 years. The prevalence of hearing impairment in these studies ranged from 26 to 61%. The children in the child studies were aged from 3 to 12 years, and the prevalence of hearing impairment ranged from 9 to 31%.

Outcomes assessed in the review
The primary outcome measure was the accuracy of the whispered voice test, as reflected in its sensitivity and specificity. These needed to be reported or calculable from the study data provided. The positive and negative likelihood ratios were also calculated and presented in the review.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies for inclusion in the review.

Assessment of study quality
Studies were assessed on the method of sampling (consecutive or random); whether the comparisons between the index test and the reference test were independent, and whether they were blinded; whether the adequacy of the test
descriptions would allow replication; and whether there was at least 80% verification with the reference test. Two reviewers independently extracted data on the quality and accuracy of the studies.

**Data extraction**
Two reviewers independently extracted data on the study characteristics onto a specially designed data extraction form.

**Methods of synthesis**
How were the studies combined?
The studies were combined narratively. A summary receiver operating characteristic (ROC) curve was presented in the discussion, but no pooling was described.

How were differences between studies investigated?
Differences between the studies in terms of the assessment techniques, procedure and quality, were discussed within the report.

**Results of the review**
Eight studies with 1,006 participants (290 adults, 716 children) were accepted for inclusion in the review.

The overall methodological quality of the studies was modest with many important aspects not reported. Only one study met all five quality criteria. The studies conducted in children were of poorer quality than those conducted in adults.

The sensitivity in the four adult studies was 90% (specificity 70 to 80%) or 100% (specificity 84 to 87%). The sensitivity in the four childhood studies ranged from 80% (specificity 96%) to 96% (specificity 92%).

**Authors’ conclusions**
The whispered voice test is a simple and accurate test for detecting hearing impairment. One area of concern was the reproducibility of the test. It was also noteworthy that the test had a lower sensitivity in children.

**CRD commentary**
This review had defined inclusion criteria for the participants, index and reference tests, study design and outcomes. A range of sources was searched and attempts were made to locate unpublished material. The validity of the studies was assessed and issues concerning the reliability of the tests were discussed. More than one reviewer selected the studies, extracted the data and assessed validity, which helps to minimise bias. Although an ROC curve was presented, no explicit reason was given for not pooling the data statistically. However, differences between the studies were discussed and the implications for further research were highlighted.

**Implications of the review for practice and research**
Practice: The authors did not state any implications for practice.

Research: The authors stated that further research is needed in primary care settings to ascertain the influence of components of the testing procedure. This should allow the optimisation of test sensitivity and promote standardisation of the testing procedure. Research on the diagnostic accuracy of the whispered voice test should also be conducted, using different methods in younger and older children.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.