# Screening for visual impairment in children ages 1-5 years: systematic review to update the 2004 U.S. preventive services task force recommendation

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## CRD summary

This review concluded that evidence on effectiveness of preschool vision screening for improving visual acuity or other clinical outcomes was limited and did not adequately evaluate screening versus no screening. However, some evidence suggested that preschool screening could lead to increased detection of impairment and improvement in visual outcomes than no screening. These cautious conclusions are likely to be reliable.

## Authors' objectives

To assess the effects of screening for impaired visual acuity in preschool (one to five years old) children. This abstract summarises the reviews of the accuracy, benefits and harms of vision screening and benefits and harms of treatment for vision impairment in preschool children.

## Searching

MEDLINE (to July 2009), Cochrane Central Register of Controlled Trials (CENTRAL) and Cochrane Database of Systematic Reviews (to third quarter 2009) were searched for relevant publications. Additional publications were sought by contacting experts and reviewing reference lists.

## Study selection

Studies were eligible for inclusion if they focused on children aged one to five years of age in primary care, community care or school-based settings. Eligible screening tests were those used or available in primary care settings (such as visual acuity tests, tests of stereopsis, tests for strabismus, photoscreeners, autorefractors). Eligible treatments were correction of refractive error (eyeglasses) and penalisation of the non-amblyogenic eye (patching and atropine).

Eligible measures of benefit were improved visual acuity, reduced long-term amblyopia, school performance, function, and quality of life. Eligible measures of harm were psychological distress, labelling, anxiety, other psychological effects, false-positives, and adverse events on vision in the non-impaired eye.

Eligible measures of diagnostic accuracy were sensitivity, specificity, negative predictive values, likelihood ratios and diagnostic odds ratios or sufficient available data to calculate these measures.

Studies that compared a screening question or diagnostic test against a credible reference standard (such as cycloplegic refraction) were included to assess diagnostic accuracy. Randomised trials (RCTs) were eligible for evaluations of effectiveness and harm; these were supplemented by data from controlled observational studies for questions relating to screening outcomes and harms of treatment.

Two reviewers each evaluated studies for inclusion.

## Assessment of study quality

Included studies were rated as good, fair or poor according to US Preventative Services Task Force Quality Rating Criteria for Randomised Controlled Trials and Observational Studies.

Two reviewers independently assessed quality. Disagreements were resolved by discussion.

## Data extraction

Data were extracted on study population, study design, data analysis, length of follow-up, results and quality.

One author extracted data and a second checked the assessment for accuracy; disagreements were resolved by discussion.

## Methods of synthesis

Studies were combined in a narrative synthesis. The synthesis was structured around six key issues: effectiveness of preschool screening, accuracy/reliability of risk factor assessment, accuracy of screening tests, harms of vision screening, effectiveness of treatment for vision impairment and harms of treatment.

## Results of the review

Effectiveness of preschool vision screening: Four studies reported on the effectiveness of preschool visual screening. No RCTs were found that compared screening against no screening. One large (3,490 participants) fair quality nested RCT found that repeated orthoptist screening from ages eight to 37 months was associated with a statistically significant reduction in likelihood of amblyopia at age 7.5 years compared with one-time orthoptist screening at age 37 months on one of two definitions of amblyopia. One large, prospective cohort study from the same population found that one-time orthoptist screening at 37 months was associated with no significant difference in risk for amblyopia at age 7.5 years compared with no screening or school entry screening. Three retrospective cohort studies found that preschool screening was associated with improved school-age vision outcomes compared with no screening but each study had methodological limitations and none evaluated school performance or other functional outcomes.

Impact of age of assessment on effectiveness of preschool vision screening: No RCTs compared outcomes of preschool vision screening in different age groups. Evidence from other studies was poor quality, subject to confounding or did not address relevant clinical outcomes.

Accuracy of screening tests for vision impairment in preschool children: Thirty-one studies evaluated the diagnostic accuracy of preschool visual screening tests. None was consistently associated with both high (>90%) sensitivity and specificity. In the largest comparative study, differences in likelihood ratio estimates and diagnostic odds ratios for 10 different screening tests were generally small except for the Random Dot E stereoacuity test, which was associated with a lower diagnostic odds ratio. Combinations of clinical tests generally showed stronger likelihood ratios than individual tests.

Impact of age of assessment on accuracy of screening tests: Diagnostic accuracy of preschool vision tests did not clearly differ in children stratified by age. Testability was generally slightly lower in children aged one to three years with the possible exception of the MTI Photoscreener, for which one large study reported testability as being 94% at age one year.

Harms of preschool vision screening: One large cohort study reported a 50% reduction in the odds of being bullied at age 7.5 years among children offered screening compared with those not offered screening. Six of seven studies reported false-positive rates greater than 70% but none evaluated the effects of unnecessary corrective lenses or treatment for amblyopia on long-term vision or functional outcomes.

Effectiveness of treatment for vision impairment in children aged one to five years: Three fair or good quality trials reported that treatment resulted in small (<1 line on the Snellen eye chart) improvements in visual acuity in the amblyopic or worse eye compared with no treatment after five weeks to one year of follow-up in older children (four to five years). One trial found larger benefits in the subgroup of children with worse baseline visual impairment. No trials reported school performance or other measures of function. Evidence on the impact of age on effectiveness of treatment was inconsistent.

Harms of treatment for vision impairment in children aged one to five years: Evidence from five good-quality trials suggested that amblyopia treatments were associated with reversible visual acuity loss in the non-amblyogenic eye. Evidence on adverse psychosocial effects and effects of suboptimal compliance with amblyopia treatments was limited.

## Authors' conclusions

Direct evidence on effectiveness of preschool vision screening for improving visual acuity or other clinical outcomes was very limited and did not adequately address the question of whether screening was more effective than no screening. However, good evidence on diagnostic accuracy and treatments suggested that preschool vision screening could lead to increased detection of visual impairment and greater improvement in visual outcomes than if children were never screened.

## CRD commentary

This review addressed a series of clearly defined questions related to diagnostic accuracy, effectiveness and potential

harms of screening for visual impairment in preschool aged children. Studies were selected using appropriate inclusion criteria and study quality was assessed using an established method. Attempts were made to minimise error and bias during these processes.

Given the clear heterogeneity of the included studies, the authors' decision to combine findings in a narrative rather than statistical summary appeared appropriate. The authors acknowledged limitations of the review such as exclusion of studies not in English and that several diagnostic accuracy studies were conducted in settings other than primary care. The authors' cautious conclusions account for these limitations and reflect the limitations and diversity of the available evidence and are likely to be reliable.

### Implications of the review for practice and research

The authors did not state any implications for practice.

Research: The authors stated that additional studies were needed to better understand effects of screening compared with no screening, clarify the risk for potential unintended harms from screening (such as use of unnecessary treatments) and define the optimal time at which to initiate screening during the preschool years.

### Bibliographic details

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### Original Paper URL

http://www.ncbi.nlm.nih.gov/books/NBK52708/

### Other publications of related interest

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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.