

# Virtual Reality Perimetry in Children: A Systematic Review of Feasibility and Diagnostic Performance

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## Background

- Visual Fields are critical for glaucoma and neuro-ophthalmology assessments.
- The Humphrey Visual Field (HVF) Analyzer is the gold standard for assessing visual fields. Unfortunately, HVF perimetry is difficult for children to complete and has poor reliability.
- Through completing a systematic review, our objective was to evaluate the accuracy, reliability, and feasibility of VR perimetry in pediatric populations.

## Methods

- This systematic review was completed using the PRISMA guidelines. Databases searched included Embase, Medline, Scopus, Web of Science, and PubMed.
- Inclusion criteria:
  - Evaluated virtual reality-based perimetry,
  - included pediatric participants (<18 years),
  - or mixed populations with pediatric representation

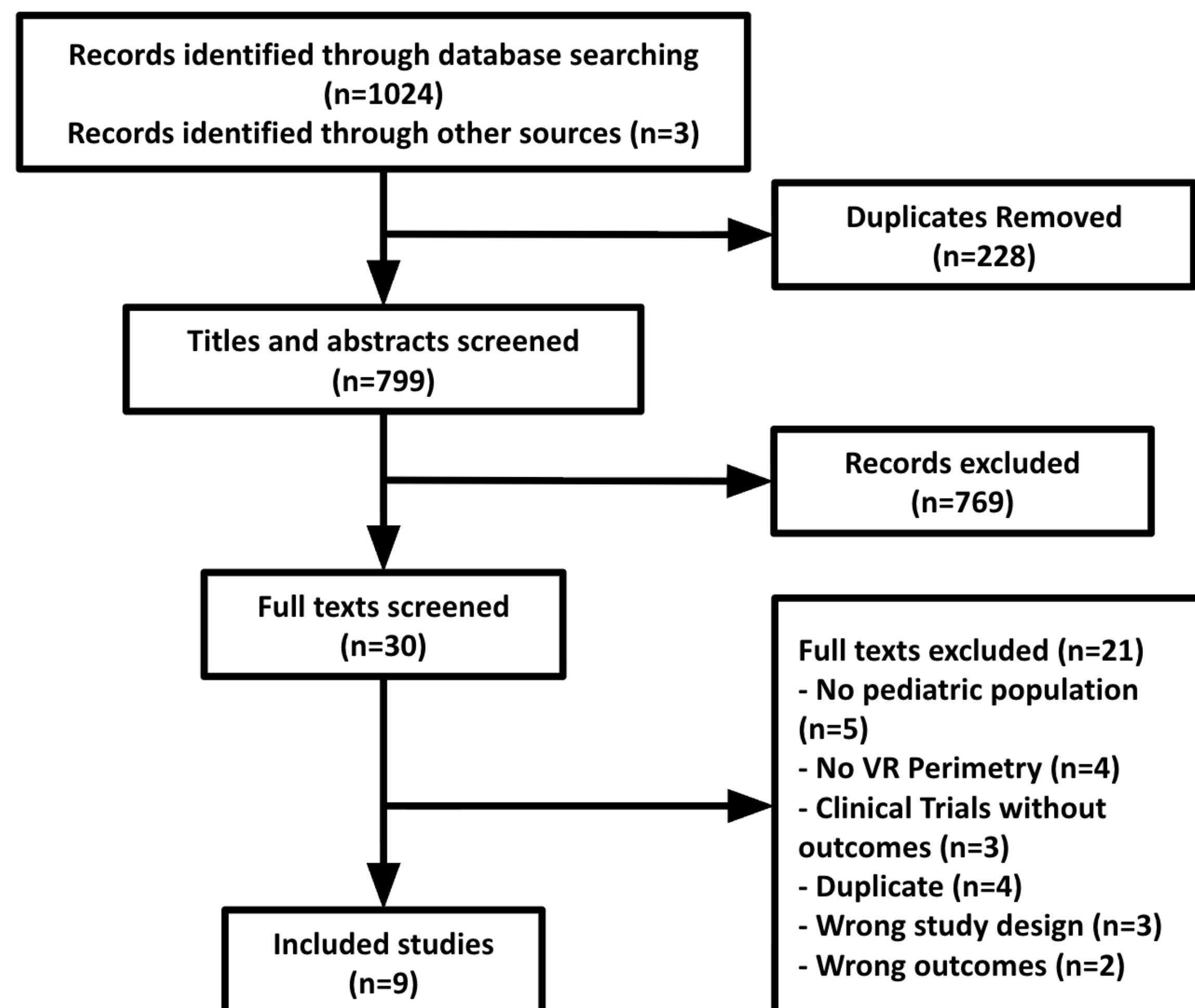


Figure 1. PRISMA Diagram

## Results

Table 1. Summary of Key Findings Across Included Studies

<b>Feasibility &amp; Patient Experience</b>	<ul style="list-style-type: none"> <li>• Completion rates: Up to 94.9% (VR) vs 75.5% (standard perimetry)</li> <li>• Multiple studies: VR completed when standard testing failed</li> <li>• Patient preference: Consistently favored VR</li> <li>• Reported benefits:                             <ul style="list-style-type: none"> <li>• Improved comfort</li> <li>• Increased engagement</li> </ul> </li> </ul>
<b>Agreement with Standard Perimetry</b>	<ul style="list-style-type: none"> <li>• Moderate-strong agreement in disease populations (<math>r = 0.68-0.78</math> (MD/PSD) and up to 88.5% defect concordance)</li> <li>• Longitudinal study: 76.9% agreement for progression detection</li> <li>• Normative populations: Weak correlation (<math>R^2 \approx 0.15</math>)</li> <li>• Mixed-population study: High agreement for large defects: Hemianopia (~90%), Bitemporal (~94%); but poor agreement for subtle defects (e.g., blind spot)</li> </ul>
<b>Diagnostic Accuracy</b>	<ul style="list-style-type: none"> <li>• Diagnostic accuracy evidence is sparse and inconsistent.</li> <li>• Only 1 study reported sensitivity/specificity, which were 88.6% and 33.5% respectively</li> </ul>
<b>Reliability</b>	<ul style="list-style-type: none"> <li>• Only 1 study assessed reproducibility (ICC <math>\approx 0.70</math>; Repeatability: <math>\pm 5</math> dB)</li> <li>• No standardized reliability metrics (FP/FN rates) in most studies</li> </ul>
<b>Test Duration and Algorithm Variability</b>	<ul style="list-style-type: none"> <li>• VR test duration: Similar or slightly longer than standard perimetry</li> <li>• Game-based VR: Longer duration and higher patient preference</li> <li>• Algorithm differences: Produce systematic variation in results</li> </ul>

Table 2. Summary of Evidence Across Key Outcome Domains in Included Studies

Study	Diagnostic Accuracy	Agreement with SAP	Reliability	Feasibility
Alvarez-Falcón 2024				
Badakere 2023				
Farag 2025				
Groth 2023				
Mesfin 2024				
Pruett 2024				
Saleem 2026				
Wang 2023				
Wang 2025				

Legend: Strong Moderate Weak Not reported

## Discussion

### 1. Interpretation:

1. VR = highly feasible
2. Moderate agreement with standard testing
3. Accuracy still uncertain

### 2. Clinical Implication: Best used as a screening or complementary tool, not a replacement

### 3. Strengths: First pediatric synthesis and consistent feasibility findings

### 4. Limitations: Small studies, heterogeneous devices, and limited accuracy data

### 5. Future Directions: larger pediatric studies, standardized protocols, and reliability metrics

## References.

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4. J AAPOS. 2025;29(6):104691
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