CONCEPTUAL DOMAINS AND KEY ITEMS IN QUESTION-BASED PAEDIATRIC VISION SCREENING: A SYSTEMATIC REVIEW PROTOCOL

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Abstract

Background: Vision plays a fundamental role in a child's development, yet paediatric vision disorders often go undetected due to the limitations of conventional screening methods. Question-based vision screening tools have emerged as an early identification of vision problems in children. Nevertheless, the conceptual domains and key items used in the existing tools vary, leading to inconsistent screening outcomes. Objectives: This systematic review aims to identify the core conceptual domains and key items essential in existing question-based paediatric vision screening tools. Methods: This systematic review protocol follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) 2015 guidelines and is registered with PROSPERO (ID: CRD420251006529). A comprehensive literature search will be conducted across four databases including Scopus, Web of Science, PubMed, and EBSCOhost MEDLINE Complete for peer-reviewed studies published between 2005 to 2024, restricted to publications in English and Malay. Eligibility criteria will be based on the Population, Interest, and Context (PICo) framework, focusing on studies examining the conceptual domains and key items in question-based vision screening tools for children aged 4 to 12 years. Two independent reviewers will screen and assess the studies for methodological quality using the Mixed Methods Appraisal Tool (MMAT). Data will be synthesised using thematic synthesis methods to identify the conceptual domains and key items. Anticipated outcomes: This systematic review will offer a comprehensive synthesis of the core conceptual domains and key items employed in question-based paediatric vision screening tools.

Keywords: **Conceptual Domains; Paediatric Vision Screening; Question-Based Screening; Systematic Review Protocol**

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Introduction

Vision plays a crucial role in a child's early development, academic performance, and overall quality of life (Magakwe *et al*., 2024). Paediatric vision disorders, including refractive errors, amblyopia, and strabismus, are among the most prevalent childhood conditions, affecting up to 5% of preschool-aged children and 25% of school-aged children worldwide (Wu & Wang, 2024). If left undetected and untreated, these conditions can lead to irreversible visual impairment, which may adversely impact learning outcomes, psychosocial development, and future career prospects (Wettstein *et al*., 2021). Early detection and timely intervention are essential to mitigate these risks, highlighting the importance of effective paediatric vision screening programmes (Marsh-Tootle *et al*., 2008).

Conventional paediatric vision screening methods primarily rely on professional-administered tools, such as visual acuity tests, automated screening devices, and school-based screenings (Chaplin *et al*., 2015). However, these methods often face significant limitations, including restricted accessibility, high operational costs, and inconsistent implementation across healthcare settings (Killeen *et al*., 2023; Ambrosino & Collins, 2024). As a result, there is growing interest in question-based vision screening approaches, particularly parent-reported and self-administered questionnaires, which function as a complementary tool to professional assessments (Sii *et al*., 2023). These tools leverage parental observations of visual behaviours, functional impairments, and complaints expressed by children, enabling for early detection of potential vision issues (Moon *et al*., 2021). Despite the growing use of question-based vision screening, significant variability exists in the conceptual domains assessed by different tools. Some tools primarily focus on visual acuity-related concerns, while others incorporate broader cognitive and behavioural indicators associated with vision impairment (Margolis *et al*., 2002; Ambrosino *et al*., 2023). Additionally, while some questionnaires have undergone rigorous psychometric validation, others lack standardised criteria for assessing reliability and validity (Hatt *et al*., 2019). Standardising question-based tools could improve early detection rates and ensure consistency across diverse settings, including schools and low-resource clinics, thereby enhancing equitable access to paediatric vision care. There is a need for a systematic synthesis of the conceptual domains and key items included in existing question-based screening tools to guide best practices in paediatric vision assessment. Therefore, this systematic review seeks to identify the core conceptual domains and key items incorporated within existing question-based paediatric vision screening tools. The findings will contribute to the development of an effective screening tool that can facilitate early detection and intervention for childhood vision disorders.

Materials and Methods

This systematic review protocol adheres to the adapted guidelines of the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 (Moher *et al*., 2015). The adapted sections of the PRISMA-P checklist utilised in this review are detailed in Supplementary Table 1. Additionally, the protocol has been registered with PROSPERO (ID NO: CRD420251006529).

The research question guiding this review is structured using the PICo framework, where 'P' represents the Population or Problem, 'I' denotes the Phenomenon of Interest, and 'Co' refers to the Context. Accordingly, this review focuses on three key aspects: What are the conceptual domains and key items (Phenomenon of Interest) of a question-based vision screening approach (Context) in children (Population)?.

Eligibility Criteria for Studies

Studies will be selected according to predefined inclusion and exclusion criteria.

Population

Eligible studies must involve children aged 4 to 12 years, with or without underlying health conditions, who have undergone vision screening.

Phenomenon of Interest and Study Design

This review will include qualitative, mixed-methods, and observational studies, such as cross-sectional, cohort, and case-control studies, that report on the development and validation of paediatric vision screening questionnaires, as well as studies that employ any form of question-based screening method (i.e., structured questions or validated questionnaires) to assess vision problems in children.

Studies focusing exclusively on device-based or clinical screening methods will be excluded. Additionally, review articles, study protocols, conference abstracts, editorial letters, case reports, case series, non-peer-reviewed publications, and studies published in languages other than English or

Table 1. Shows PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review
Update	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments
Support:		
Sources	5a	Indicate sources of financial or other support for the review
Sponsor	5b	Provide name for the review funder and/or sponsor
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)

Malay will not be considered. If the full text of an article is not accessible, the corresponding author will be contacted to request access.

Context

This review focuses on question-based vision screening tools used to detect vision problems in children.

Systematic Searching Strategies

This systematic review will be conducted in accordance to the PRISMA 2020 guidelines (Page *et al*., 2021). The systematic searching procedures included three processes: identification, screening, and eligibility, as outlined in the PRISMA flow diagram.

The identification phase will involve enriching the keywords used in the search procedure. The search will be conducted using the Scopus, Web of Science, PubMed, and EBSCOhost MEDLINE Complete databases, with restrictions applied to English or Malay language publications from 2005 to 2024. A combination of primary keywords-*"vision problems," "screening," "questionnaire," and "children"-along with related terms such as "vision," "visual function," "visual impairment," "visual behaviour," "amblyopia," "refractive error," "myopia," "binocular anomalies," "strabismus," "detection," "assessment," "survey," "index," "scale," "tool," "paediatric," "schoolchildren," and "preschool children"* will be used. To enhance search accuracy, Boolean

Table 2. Shows search strings for each database

Database	String
Scopus	TITLE-ABS-KEY((“vision problems” OR “visual impairment” OR “vision” OR “eye” OR “visual function” OR “amblyopia” OR “refractive error” OR “myopia” OR “binocular vision anomalies” OR “strabismus”) AND (“screening” OR “detection” OR “assessment”) AND (“questionnaire” OR “survey” OR “index” OR “scale”) AND (“child*” OR “paediatric*” OR “schoolchildren” OR “preschool children”))
Web of Science	TS=((“vision problems” OR “visual impairment” OR “vision” OR “eye” OR “visual function” OR “amblyopia” OR “refractive error” OR “myopia” OR “binocular vision anomalies” OR “strabismus”) AND (“screening” OR “detection” OR “assessment”) AND (“questionnaire” OR “survey” OR “index” OR “scale”) AND (“child*” OR “paediatric*” OR “schoolchildren” OR “preschool children”))
PubMed	(("vision problems"[Title/Abstract] OR "visual impairment"[Title/Abstract] OR "vision"[Title/Abstract] OR "eye"[Title/Abstract] OR "visual function"[Title/Abstract] OR "amblyopia"[Title/Abstract] OR "refractive error"[Title/Abstract] OR "myopia"[Title/Abstract] OR "binocular vision anomalies"[Title/Abstract] OR "strabismus"[Title/Abstract]) AND ("screening"[Title/Abstract] OR "detection"[Title/Abstract] OR "assessment"[Title/Abstract]) AND ("questionnaire"[Title/Abstract] OR "survey"[Title/Abstract] OR "index"[Title/Abstract] OR "scale"[Title/Abstract]) AND ("child*"[Title/Abstract] OR "paediatric*"[Title/Abstract] OR "schoolchildren"[Title/Abstract] OR "preschool children"[Title/Abstract]))
EBSCOhost MEDLINE Complete	(("vision problems" OR "visual impairment" OR "vision" OR "eye" OR "visual function" OR "amblyopia" OR "refractive error" OR "myopia" OR "binocular vision anomalies" OR "strabismus") AND ("screening" OR "detection" OR "assessment") AND ("questionnaire" OR "survey" OR "index" OR "scale") AND ("child*" OR "paediatric*" OR "schoolchildren" OR "preschool children"))

operators (“OR” and “AND”), phrase searching, wildcards, truncation, and field code functions will be applied across all four databases. The detailed sample search strings for each database are provided in Supplementary Table 2.

An initial screening of studies retrieved through the search process will be conducted to identify and remove duplicate records using Mendeley reference management software. Following the removal of duplicates, the remaining records will undergo title and abstract screening based on the predefined inclusion and exclusion criteria. Two independent reviewers (BSAR and TS) will assess each record, and studies deemed potentially relevant will be selected for full-text retrieval. Full-text copies will be stored in a designated cloud-based folder within Mendeley to ensure shared access among the review authors.

Following title and abstract screening, full-text articles of selected studies will be reviewed in detail to determine their eligibility based on the established criteria. Two independent reviewers (BSAR and TS) will assess each full text article, and any disagreements will be resolved through discussion. If consensus cannot be reached, a third reviewer (MMMMS) will be consulted to make the final decision. The study selection process will be systematically documented and illustrated using a PRISMA flow diagram (Figure 1) to ensure transparency and reproducibility. In addition, a table outlining the reasons for exclusion will be prepared to document the rationale for excluding studies at the full-text screening stage.

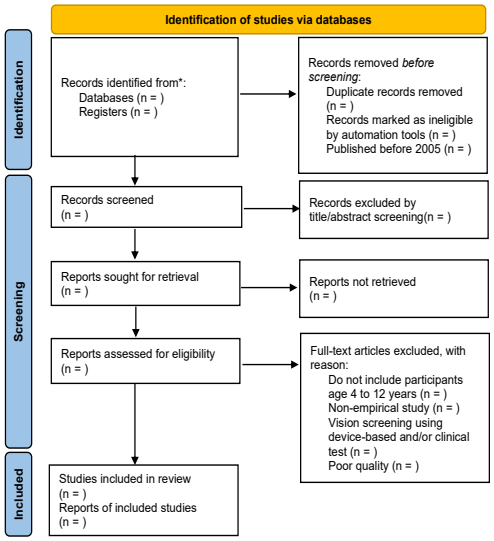

Figure 1. Shows PRISMA flow diagram

Quality Assessment

The methodological quality of the selected studies will be evaluated using the Mixed Methods Appraisal Tool (MMAT), version 2018 (Hong *et al*., 2018). Each study will be assessed according to five methodological criteria, examining key aspects such as research design, data collection methods, data analysis, and interpretation. A structured checklist will be employed, with each criterion rated as ‘Yes,’ ‘No,’ or ‘Can’t tell.’ Justifications will be provided where necessary to support the assigned ratings.

Two independent reviewers (BSAR and TS) will conduct the quality assessment. The process will begin with an initial screening based on two fundamental criteria: (i) whether the research questions are clearly defined and (ii) whether the collected data adequately address these questions. Studies that fail to meet these initial criteria will be excluded from full appraisal. For studies that pass the initial screening, the review authors will conduct a detailed evaluation, assessing each methodological component in accordance with the respective study design. To be included in the qualitative synthesis, a study must receive at least three 'Yes' ratings (≥3/5) as agreed upon by both reviewers. In cases of disagreement regarding study inclusion or exclusion, a third reviewer (MMMMS) will be consulted to resolve discrepancies. Inter-reviewer reliability will be assessed using Cohen's kappa coefficient, consistent with the approach used in the study selection process. The level of agreement will be reported as κ = (value) (95% CI: (lower–upper)), with an interpretation of the agreement level (e.g., substantial agreement).

Data Extraction and Analysis

One reviewer (BSAR) will initially extract data from each included study using a structured table in Microsoft Word, presenting key study characteristics. The extracted data will include: (1) General information (e.g., first author, year of publication, funding sources, and any reported conflicts of interest); (2) Study setting, detailing (research design, location, and country); (3) Population characteristics (age range and number of participants); (4) Method of administration according to age range category; (5) Study objectives; and (6) Outcomes relevant to the review question. Another review author (TS) will independently verify the extracted data to ensure completeness and accuracy prior to analysis.

A qualitative synthesis will be conducted to identify emerging themes from the selected literature, focusing on the conceptual domains and key items within question-based paediatric vision screening methods. This systematic review process will be guided by Braun and Clarke's (2006) thematic analysis framework, following six structured phases. First, an in-depth familiarisation with the included studies will be conducted to recognise patterns pertinent to the review objectives. Second, initial inductive coding will be performed manually by two independent reviewers (BSAR and TS), involving the extraction of relevant statements that address the review questions. Third, codes will be organised into preliminary themes by clustering conceptually related content, such as issues pertaining to reduced distance visual acuity and impaired binocular coordination. The development of these preliminary themes will be achieved through consensus discussions among three reviewers (BSAR, TS, and NMN). Any disagreements arising during this process will be resolved by consulting a fourth reviewer (MMMMS), who will serve as the arbiter. Fourth, themes will be reviewed and refined to ensure internal coherence and alignment with the overall analytical framework. Fifth, each theme will be clearly defined and appropriately labelled to ensure conceptual clarity and consistency. Lastly, the findings will be reported with supporting evidence and direct quotations. This structured approach ensures a rigorous and transparent qualitative synthesis of question-based paediatric vision screening methods.

Ethics and Dissemination

Since this review does not involve patient data or any confidential information, ethical approval is not required. All data utilised in this study is obtained from publicly available sources and will be handled in accordance with established academic standard to ensure integrity and transparency. The findings will be disseminated through publication in a peer-reviewed specialist journal and may also be presented at relevant academic conferences to contribute to the ongoing discourse in the field.

Anticipated Outcomes

This systematic review will provide a comprehensive synthesis of the core conceptual domains and key items employed in existing question-based paediatric vision screening tools.

Findings will be presented using a series of tables and figures to ensure clear, structured, and transparent reporting. The methodological quality of each study will be summarised in a table using the criteria outline in the Mixed Methods Appraisal Tool (MMAT). Additionally, a table documenting the reasons for excluding full-text articles will be prepared to enhance transparency. The overall study selection process will be illustrated using a PRISMA 2020 flow diagram.

A comprehensive table will summarise the characteristics of the included studies, providing details such as author, year of publication, country, sample size, study design, and the specific screening tool employed. Furthermore, an additional table will outline the extracted conceptual domains and key items identified in each study.

Discussion

The growing acknowledgement of question-based paediatric vision screening as a viable alternative to conventional methods underscores the need for a comprehensive evaluation of its conceptual domains and key items these tools incorporate (Selvan *et al*., 2022). Conventional vision screening approaches, which rely on device-based assessments and clinical measurement techniques present notable drawbacks, including accessibility challenges, high costs, and inconsistent implementation (Chen *et al*., 2019). In contrast, question-based screening tools offer a non-invasive, cost-effective, and scalable solution that facilitates the early detection of vision issues through structured parental or self-reported assessments (Sii *et al*., 2023).

Despite their increasing adoption, existing question-based screening tools exhibit significant variability in their conceptual domains and key items incorporated. Some tools focus primarily on detecting visual acuity deficits and refractive errors, while others encompass broader cognitive, behavioural, and functional indicators associated of visual impairment (Mozdbar *et al*., 2022). Moreover, although several questionnaires have undergone rigorous psychometric validation, many rely on unvalidated questions lacking standardised criteria for reliability and diagnostic accuracy (Gorrie *et al*., 2019). This absence of standardisation contributes to inconsistent application across various healthcare and educational settings, thereby limiting the overall effectiveness of these tools (Wahl *et al*., 2021).

In light of these challenges, this systematic review aims to synthesise and categorise the conceptual domains assessed in existing question-based paediatric vision screening tools. Through qualitative thematic analysis, recurring patterns and key assessment components will be identified to inform the development of an evidence-based, standardised framework. Such standardisation is crucial for ensuring all children's equitable access to reliable vision screening, regardless of their geographic or socioeconomic status. The common conceptual domains and key items identified may ultimately inform design of a universally applicable screening instrument to support consistent and accurate early detection of vision problems in children.

Furthermore, the synthesis of conceptual domains identified in this review will serve as a foundational framework for the cross-cultural adaptation of paediatric vision screening tools. By understanding the core components of effective question-based screening, researchers and healthcare providers will be better equipped to adapt existing instruments or develop new tools that are linguistically and culturally appropriate for diverse populations, thereby enhancing their relevance and acceptance. This review will also evaluate how these screening tools align with best practices in paediatric optometry and ophthalmology, ensuring their clinical relevance. The insights generated are also expected to inform national policy recommendations by providing an evidence-based framework as guidance to policymakers in supporting the selection or development of effective screening strategies. Such evidence could facilitate the integration of validated question-based tools into national vision screening programs, improving the reach, efficiency, and timeliness of early interventions, and ultimately promoting better visual outcomes for children.

Making this protocol publicly available promotes transparency, supports reproducibility, and encourages constructive expert feedback. However, certain limitations must be acknowledged. These include the restriction to four electronic databases for the literature search, which may introduce selection bias, as well as the anticipated heterogeneity across study populations, settings, and outcome reporting, which may present challenges for synthesis of findings.

Looking ahead, the findings from this systematic review will lay the groundwork for future research. The future studies could aim to validate the identified conceptual domains and key assessment components in prospective clinical settings to confirm their diagnostic accuracy and practical utility. Further research could also explore the implementation strategies for integrating these standardised tools into real-world healthcare and educational environments.

Conclusions

This review protocol aims to serve as a foundational reference for researchers conducting systematic reviews focused on evaluating the conceptual domains and key items of question-based paediatric vision screening tools. By synthesising the latest evidence, this study will provide insights into the most effective questionnaires for vision screening and their applicability in routine paediatric healthcare settings. Ultimately, the findings may help identify the most practical and clinically relevant screening tools to support early diagnosis and intervention for vision problems in children through the use of structured questionnaires.

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