REVIEW ARTICLE

Vision-related Questionnaires Developed for the Paediatric Population From Birth to 18 Years Old: A Scoping Review of the Characteristics

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ABSTRACT

A questionnaire is fast becoming a key instrument in screening, diagnosis, treatment, and rehabilitation in health care and eye health care. Scholars have long debated the characteristics of questionnaires. What is less clear is the characteristics of vision-related questionnaires developed for the paediatric population. We used PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) approach to compile 386 items for the review. Questionnaires developed for the paediatric population can be as short as eight items up to as long as 47 items. The question approach was found to be twofold higher than the statement approach. The application of positive and negative phrasing is relatively balanced. Both patient-reported outcomes measures and patient-reported experience measures styles are employed. Nearly two-thirds of the questionnaires are intended for self-reporting. Proxy-reporting is predominantly for younger age groups. A recommendation for future design characteristics in paediatric eye care questionnaires has been provided.
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INTRODUCTION

The popularity of questionnaires has increased exponentially over the years. Questionnaires were initially invented for studies of social phenomena (1). They are now commonly used in marketing and social research (2). Questionnaires are a popular option to collect large-scale data and allow inexpensive and rapid information gathering (3,4). Well-designed questionnaires are valuable tools to assess the quality of life due to their psychometric properties and good construct validity (5–9). They are usually designed according to the intended purpose to achieve the desired outcome by conveying the meaning of inquiries accurately to gain the most precise responses possible (5–8). However, poor questionnaire design can lead to poor data quality due to methodological errors, resulting in misleading interpretations and vague conclusions (5–8). The acceptance of questionnaires into health care generally and eye health care is explicitly evident (10–17). It has been engaged for different purposes such as screening, diagnosis, assessment of treatments and rehabilitation outcomes (10–16,18). The existing questionnaires used in eye care were designed for specific conditions that make the questionnaires diverse according to the purpose, target conditions and target population (15). Therefore, utilising existing questionnaires for the paediatric eye screening approach might need to be reviewed. In the eye care, questionnaires were included in home-based vision screening batteries in Japan and South Korea. It may not involve high cost and could assist parents in perceiving symptoms and risk factors of vision problems (19,20). Although scholars have long debated the characteristics of questionnaires, what is less clear is the characteristics of vision-related questionnaires developed for the paediatric population. It is imperative to examine the item construct designs used in current paediatric eye care questionnaires that consist of different layouts for

different purposes. We used a scoping review approach to initiate a rapid gathering of literature and to capture the breadth of the literature about characteristics. We aimed to provide an overview of the clusters and the scopes of questionnaire items available.

REVIEW METHOD

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed to search for vision-related questionnaires developed for the paediatric population. The scoping review approach involved identification, screening, eligibility and data analytic strategy (21,22). Publications in medical and healthcare are widely reachable in Scopus, PubMed, and EBSCO host MEDLINE Complete database. A range of keywords (pediatr*, child*, eye, questionnaire, survey*, checklist, quality of life) was used individually or in combination to identify articles. The process to determine the main keywords was based on the review objective and searching synonyms or related terms or variations to the main keywords using thesaurus or keywords used by past studies. The search techniques incorporated Boolean operators, truncation, wildcard, phrase search encompassing subject headings and filters. Specific author names known to conduct work in paediatric eye care were also included in the search. Additional relevant studies that might have been missed from the databases search were also identified by reference tracking from articles captured through the initial search strategy. A total of 5398 articles were retrieved initially (PubMed=1985; Scopus=94; EBSCO host =3319). Two authors (CAH and NFAB) screened for the inclusion and exclusion criteria. Both had more than ten years of experience in the paediatric optometry research to screen all titles and abstracts to identify relevant articles. A Critical Appraisal Skills Programme (CASP) Diagnostic Checklist was completed for each study to identify eligible articles (23). Any discrepancies were resolved through consensus among the authors. Reasons for articles not being selected were recorded. After the screening and eligibility assessment processes according to pre-determined criteria, a final set of 30 articles describing 26 different types of questionnaires was included for qualitative synthesis (19–48). Subsequent analysis of the 587 items extracted from the 26 questionnaires led to the exclusion of 201 items due to redundancy, a limit to specific treatment or rehabilitation, or general health. The total number of items that remained for final profiling was 386 items. The flow diagram of the literature search and selection process is summarised in Fig. 1. Description of terminologies used in this review and the significance of analysis plan concerning review objective were summarised in Table I. List of the 26 vision-related questionnaires with citation can be obtained from Table II. Characteristics analysis of 386 items used in vision-related questionnaires developed for the paediatric population are summarised in Table III.

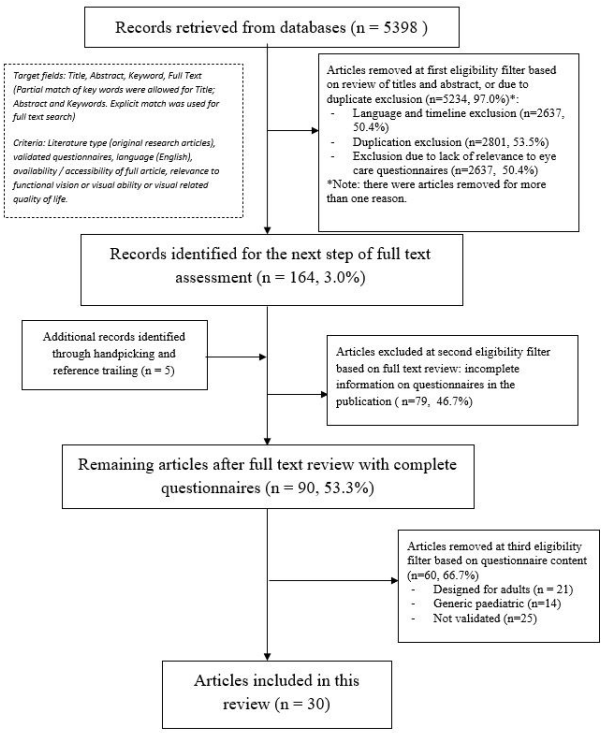

Fig. 1: Flow diagram of the literature search and selection process

Table I: Analysis framework of vision-related questionnaires developed for the paediatric population

	Clusters / Scopes	Description / Terminology	Plan
Clusters	Physical vision	About the optical visual system when light enters the eye, not limited to aided / unaided visual acuity, contrast sensitivity and visual field; covering wide scopes of spatial, temporal and spectral acuities. Including visual detection, visual resolution, visual recognition, visual discrimination for different viewing distances.	To examine if the distribution pattern of items construct in vision-related questionnaires developed for the paediatric population is equal or unequal among the five clusters.
	Physiological vision	About the ocular alignments, ocular comfort and coordination of the two eyes including focusing system, vergence system and eye movements	
	Perceptual vision	About the visual information process of extracting and organizing information from the surroundings. Not limited to eye-hand coordination, figure ground, visual discrimination, position in space, visual memory, visual motor integration, visual closure and form constancy.	
	Ocular health	About ocular diseases from anterior to posterior segments of the eyes.	
	Psychosocial	About psychosocial impact related to vision	

CONTINUE

Table I: Analysis framework of vision-related questionnaires developed for the paediatric population (CONT.)

Clusters / Scopes			Description / Terminology	Plan
Scopes	Domain	Sign	Signs refer to any objective observations.	To inspect the equality in allocation of the five domains in each cluster of vision.
		Symptoms	Symptoms refer to subjective individual experience.	
		Visual-related task	Visual-related tasks refer to any activity requiring visual functions such as reading, writing, drawing, computer working etc.	
		General perception	General perception includes internal and external perception that translate sensory impressions into a coherent and unified view.	
		Interaction with others	About communication or any action in such a way as to have effect on each other.	
	Sentence structure	Statement	Statement refers to a presentation of opinion in sentence.	To probe the preference of sentence structure.
		Question	Question refers to a sentence, phrase or word which asked for information, reply or response.	
	Phrasing	Positive phrasing	Positive phrasing focuses on what can be done and the positive outcome.	To scrutinize the phrasing pattern and usage.
		Negative phrasing	Negative phrasing focuses on what should not happen, and the negative consequences if it does.	
	Word counts		Total words used in each item construction.	To relate the word counts with standard age-match word range in sentence.

CHARACTERISTICS OF VISION-RELATED QUESTIONNAIRES DEVELOPED FOR THE PAEDIATRIC POPULATION

Mode of Administration: Self-Reporting versus Proxy Reporting

The questionnaires can generally be sorted into four different target groups: (1) Infants and toddlers: birth to 2 years and 11 months old; (2) preschools: 3 years 0 months to 6 years 11 months old; and (3) school-aged: 7 years to 18 years 11 months old; (4) special paediatric population: children of any age who require special assistance for disabilities comprising physical, developmental, behavioural/emotional or sensory impaired. Approximately 42% of the questionnaires are designed for school children alone, followed by 19% for preschool children alone, 15% for both preschool and school children, 12 % for infants/toddlers and 12% for the special paediatric population. Vision-related questionnaires developed for the paediatric population can either be self-reporting or proxy-reporting depending on age groups. Nearly two-thirds of the 26 questionnaires (65%) are intended for self-reporting. This finding is understandable because most of the questionnaires are designed for school-age children who are capable of self-reporting. Only 35% are devised for proxy reporting. Proxy-reporting is predominantly for younger age groups like infants, toddlers and preschool children.

Undoubtedly, challenges persist in developing and applying self-reporting questionnaires for children (18). The mode of administration has been reported to affect the quality of data obtained through questionnaires (54). Detailed questionnaire design in self-reporting option is essential to address cognitive requirements. Based on cognitive psychology theory, there are four heuristics in obtaining information from a questionnaire (55–57). The four heuristics are: middle means typical or central; left and top mean first; near means related; and similarity in appearance means close in meaning. The visual midpoint of a scale plays an important role in establishing the meaning of the scale points. In a bipolar scale, the conceptual midpoint is the neutral point of the scale. In unipolar scale, visual midpoint represents the population median or mode. When the response options are displayed horizontally or vertically, respondents expect the leftmost or top option to represent one extreme and the rightmost or bottom option the other extreme. When the items were placed in a close together, respondents appeared to envisage them to be similar in meaning. Respondents tend to infer conceptual similarity between two response options based on their similarity in appearance."

An individual needs to achieve item comprehension before retrieving relevant information. Then the individual opts to make a judgment and select an answer before reporting the answer. Primary school children in the concrete operational stage might be able to think logically about factual occurrences. Still, they might have difficulties understanding theoretical concepts compared with subsequent stages of operations (55,56). Children have been reported to self-report reliably using standardised patient-reported outcome measures questionnaires from 7 years old (58,59). Sometimes self-reporting cannot be performed due to requirement for special assistance associated with physical, developmental, behavioural/emotional or sensory impaired disabilities (60). The proxy-reporting option is a feasible alternative with careful modification. It can be explored further to strengthen its item construction to target younger age groups. Younger children or children with cognitive limitations might not be able to provide a reliable response. Even when children can self-report, parent proxy-report has been recommended as a secondary outcome measure (18,60). Both self-reporting or proxy-reporting can measure the same constructs

Table II: List of vision-related questionnaires developed for the paediatric population from birth to 18 years old included in this review

Target population	Titles of questionnaire	Main Objective or Purpose of the respective questionnaire	Total Items in the questionnaire	Approach I= Self-reporting II= Proxy-reporting	References
Infant/ toddler	Preverbal Visual Assessment (PreViAs)	Assess visual behaviour among infants	29	II	(24,25)
	Children's Visual Function Questionnaire-1 (CVFQ-1)	Vision-specific quality of life to monitor treatment outcome	34	II	(26,27)
	Nasolacrimal Duct Obstruction (NLDO) Questionnaire	Monitor treatment of NLDO	30	II	(28)
	Children's Vision for Living Scale (CVLS)	Assess the effect of amblyopia and monitor the treatment	21	I	(29)
Preschool	Child Amblyopia Treatment Questionnaire (CAT-QOL)	Monitor amblyopia treatment	8	I	(30)
	Children's Visual Function Questionnaire-2 (CVFQ-2)	Vision-specific quality of life to monitor treatment outcome	39	II	(26,27)
	Amblyopia Treatment Index (ATI)	Monitor amblyopia treatment	20	II	(31,32)
	Emotional impact of Amblyopia Questionnaire (EIAQ)	Monitor amblyopia treatment	15	II	(33)
Preschool & school-age	Cardiff Visual Ability Questionnaire for Children (CVAQC)	Monitor rehabilitation of the patient with visual impairment	25	I	(34)
	Pediatric Rhino-conjunctivitis Quality of Life Questionnaire (PRQL)	Monitor treatment of rhino-conjunctivitis	23	I	(35)
	Quality of Life in Children with Vernal Kerato-conjunctivitis Questionnaire (QUICK)	Monitor treatment of Vernal Kerato-conjunctivitis	30	I	(36)
	Intermittent Exotropia Questionnaire – Child version (IXTQ-C)	Monitor treatment of intermittent exotropia	12	I	(37)
	LV Prasad-Functional Vision Questionnaire (LVP-FVQ)	Monitor rehabilitation of the patient with visual impairment	19	I	(38)
	College of Vision Development- Quality of Life Questionnaire-19 (COVD-QoL)	Screen vision-related learning problem	19	1	(39)
	Student Refractive Error and Eyeglass Questionnaire (SREEQ)	Monitor treatment of refractive error	20	I	(40)
	Functional Vision Questionnaire for Children and Young People (FVQ_CYP)	Monitor rehabilitation of the patient with visual impairment	36	I	(41)
	Convergence Insufficiency Symptom Survey (CISS-15)	Monitor treatment of convergence insufficiency	15	1	(42)
School-age	Psychological Impact Questionnaire (PIQ)	Monitor rehabilitation of the patient with visual impairment	8	I	(43)
	Effects of Youngsters' Eyesight on Quality of Life (EYE-Q)	Monitor treatment of juvenile idiopathic arthritis-associated uveitis	13	I	(44)
	Impact of Visual Impairment for Children Questionnaire (IVI_C)	Monitor rehabilitation of the patient with visual impairment	24	I	(45,46)
	LV Prasad-Functional Vision Questionnaire Second version (LVP-FVQ II)	Monitor rehabilitation of the patient with visual impairment	27	I	(47)
	Vision-related quality of life (VQoL)	Monitor rehabilitation of the patient with visual impairment	47	I	(48,49)
	Convergence Insufficiency Reading Study (CIRS)	Monitor treatment of convergence insufficiency	15	II	(50)
	Visual Skill Inventory (VSI)	Assess functional vision among patients with neurological impairment	22	II	(51)
Special population	College of Vision Development- Quality of Life Questionnaire-14 (COVD-QoL-14)	Screen vision-related learning problem	14	II	(52)
	Cognitive vision problems in children with hydrocephalus (CVP)	Assess functional vision among children with hydrocephalus	22	II	(53)

Table III: Characteristics analysis of 386 items used in vision-related questionnaires developed for the paediatric population

Clusters analysis based on 386 items Sign		Domain being used for the investigation of eye conditions					Sentence structure		Phrasing		Total word counts per sentence	
		Symptom	Visual-related task	General perception	Interaction with others	Question	Statement	Positive	Negative	Minimum	Maximum	
Physical vision (n=200) 52%	Distance visual acuity (n=78) 39%	(n=0) 0%	(n=2) 3%	(n=76) 97%	(n=0) 0%	(n=0) 0%	(n=64) 82%	(n=14) 18%	(n=37) 47%	(n=41) 53%	4	24
	Near visual acuity (n=80) 40%	(n=0) 0%	(n=0) 0%	(n=80) 100%	(n=0) 0%	(n=0) 0%	(n=68) 85%	(n=12) 15%	(n=48) 60%	(n=32) 40%	4	34
	Non-specific distance visual acuity (n=34) 17%	(n=2) 6%	(n=11) 32%	(n=15) 44%	(n=6) 18%	(n=0) 0%	(n=18) 53%	(n=16) 46%	(n=16) 47%	(n=18) 53%	5	6
	Glare & night vision (n=8) 4%	(n=2) 25%	(n=2) 25%	(n=4) 50%	(n=0) 0%	(n=0) 0%	(n=6) 75%	(n=2) 25%	(n=4) 50%	(n=4) 50%	11	18
	Total	(n=4) 2%	(n=15) 7.5%	(n=175) 87.5%	(n=6) 3%	(n=0) 0%	(n=156) 78%	(n=44) 22%	(n=105) 52.5%	(n=95) 47.5%	4	34
Physiological vision (n=56) 14.5%	Ocular misalignment (n=20) 36%	(n=1) 5%	(n=0) 0%	(n=19) 95%	(n=0) 0%	(n=0) 0%	(n=13) 65%	(n=7) 35%	(n=5) 25%	(n=15) 75%	3	21
	Ocular discomfort (n=36) 64%	(n=3) 8%	(n=8) 22%	(n=25) 70%	(n=0) 0%	(n=0) 0%	(n=23) 64%	(n=13) 36%	(n=0) 0%	(n=36) 100%	3	18
	Total	(n=4) 7%	(n=8) 14%	(n=44) 79%	(n=0) 0%	(n=0) 0%	(n=36) 64%	(n=20) 36%	(n=5) 9%	(n=51) 91%	3	21
Perceptual vision (n=91) 23.5%	Visual-motor integration (n=42) 46%	(n=0) 0%	(n=0) 0%	(n=42) 100%	(n=0) 0%	(n=0) 0%	(n=21) 50%	(n=21) 50%	(n=27) 64%	(n=15) 36%	3	23
	Learning (n=49) 54%	(n=0) 0%	(n=0) 0%	(n=49) 100%	(n=0) 0%	(n=0) 0%	(n=38) 78%	(n=11) 22%	(n=28) 57%	(n=21) 43%	3	19
	Total	(n=0) 0%	(n=0) 0%	(n=91) 100%	(n=0) 0%	(n=0) 0%	(n=59) 65%	(n=32) 35%	(n=55) 60.5%	(n=36) 39.5%	3	23
Ocular health (n=17) 4.5%		(n=17) 100%	(n=0) 0%	(n=0) 0%	(n=0) 0%	(n=0) 0%	(n=2) 12%	(n=15) 88%	(n=0) 0%	(N=17) 100%	4	17
Psychosocial (n=22) 5.5%		(n=0) 0%	(n=0) 0%	(n=0) 0%	(n=8) 36%	(n=14) 64%	(n=2) 9%	(n=20) 91%	(n=4) 18%	(n=18) 82%	6	22
Grand total		(n=25) 6.5%	(n=23) 6%	(n=310) 80.5%	(n=14) 3.5%	(n=14) 3.5%	(n=255) 66%	(n=131) 34%	(n=170) 44%	(n=216) 56%	3	34

with parallel items to make comparisons between self-reporting and proxy-reporting more meaningful (18).

Item Compositions: Symptoms, Signs, Visual Related Activities

Visual function studied the mechanism of visual system that comprising ocular health, physical, physiological, and perceptual vision components. The distribution of items among five clusters of vision in the vision-related questionnaires developed for the paediatric population is not proportional and balance. Current vision-related questionnaires developed for the paediatric population seem to have a preference for blurred vision survey, a tendency to probe visual-related activities, and mostly in self-reporting mode. More than half of the vision-related questionnaires developed for the paediatric population focus on the physical aspect of vision which encompasses spatial, temporal and spectral acuities. Most items (52%) are targeting blur vision at distance and near. About a quarter relates to a visual information processing system that involves extracting and organising information from the surroundings. Less than 20% of the items are related to physiological vision and ocular health. The use of the visual related activities in item construction is highly preferred in perceptual vision cluster (100%) and followed by physical vision (87.5%) and physiological vision (79%) inquiries. Signs dominate item constructs in ocular health (100%); but less in physiological vision (7%) and least in physical vision (2%) probes. Usage of symptoms in item construction is less common but can be found in 14% of physiological vision and 7.5% physical vision inquests. Item construction in physiological vision is mostly huddled into ocular misalignment and ocular discomfort. Perceptual assessment comprises visual-motor integration and learning. Ocular health evaluation mainly covers ocular inflammation and infection. The psychosocial study employs a different question approach, in which 64% is about interaction with others, and 36% is about general perception. Future design may consider having an equal proportion of items in all vision components to enhance vision-related quality of life. An imbalance questionnaire with bias emphasis on certain types of vision clusters may not be able to provide all-inclusive vision screening for paediatric population.

The item composition in the vision-related questionnaires developed for the paediatric population contains both

patient-reported outcomes measures (PROM) and patient-reported experience measures (PREM) styles (61). PREM is used to capture the specific experiences during eye health care. PROM is used to apprehend the outcomes of eye health care. Most of the items in vision-related questionnaires developed for the paediatric population are designed using PROM style rather than PREM style. PROM style is commonly used to measure treatment and rehabilitation outcomes. Construct measures in eye health care questionnaires usually focusses on two main categories: visual ability or vision-related quality of life (18). Most items (94%) built to collect information are based on observation. The visual ability approach focuses on signs and symptoms of the visual system from the perspectives of ocular health, physical, physiological and perceptual vision. Items on vision-related quality of life measure the ability to cope with visual-related activities. Visual related activities domain is the most preferred approach to construct items in existing vision-related questionnaires developed for the paediatric population.

Parent's observation dominates the item construction in proxy-reporting. Parent's proxy-reporting assessment is reliable and valid among children (60). The highest agreement of child-parent responses was found in observable signs (60,62). Visible physical health condition shows a more heightened level of agreement between child and parent than emotional and social components that is difficult for a parent to observe (60,62). Suppose observation plays such an essential role in the current vision-related questionnaires developed for the paediatric population. In that case, there might be a great potential to explore pictorial options to substitute wordings in future development of vision-related questionnaires for the paediatric population, especially in ocular health investigations. It is widely known that 'a picture paints a thousand words' in which an image may be an advantage to express a complex idea in the same way a large amount of descriptive text can do. Parents' observation of their child's actual eye conditions can be enhanced by re-examining the suitability of diverse domains in designing future vision-related questionnaires developed for the paediatric population. Additional research into proper theoretical explanation underlying each item construct is required before adopting a questionnaire instrument for screening purposes in preventive paediatric eye care.

Investigation Tactic: Question versus Statement; Closed-ended versus Open-ended; Response Options

The majority of the current vision-related questionnaires developed for the paediatric population items adopt the question (66%) approach rather than the statement (34%) approach. "Do you notice the words blurring when reading?" and "Words run together during reading." are respective examples of question approach and statement approach used. Close-ended question formats are preferred (about 99.7%) based on our 386-item analysis. The question approach was found to be twofold higher than the statement approach in our analysis. The question approach has been claimed to engage better with the mind than the statement approach (63)The influence of statement and question has been suggested to be more favourable under high arousal and low arousal state, respectively (63,64). A simple statement has the advantage of conveying more clarity than the uncertainty indicated by the question mark (63,64). The question approach is more persuasive if the content is relevant (63,64). Question style is more suitable for calm conditions such as online questionnaires (63,64). Question style is less effective for a questionnaire using face-to-face interview approach due to nervousness (63,64).

Close-ended questions are more favoured than open-ended questions in current vision-related questionnaires developed for the paediatric population. Parents report more signs and symptoms of eye problems among their children through close-ended questions than open-ended questions (65). On the other hand, open-ended question allows many possible responses that can be expressed using own words together with feelings (65–68). However, transcribing the responses from open-ended questions are time-consuming (65–68). A closed-ended question can be equally effective if its answer choices are comprehensive (65–68). The guessing factor is unavoidable in closed-ended questions with pre-coded responses (65–68). The use of scales can be a practical alternative to minimise guessing (54,69–71). The use of scales requires more interpretative efforts (72). Approximately 88% of current vision-related questionnaires developed for the paediatric population employ a scale approach. The response to closed-ended questions can be swayed by order of the choices offered (69–71). When options are presented visually in self-reporting format, respondents tend to select answer choices provided early in the list (primacy effect) (6,69–71). Nonetheless, when choices are read aloud, respondents are inclined to select the options offered last (recency effect) (71). Response bias has also been associated with difficult questions or fatigue due to answering too many preceding questions (69,73). Response bias can be scrutinised by including item reversals (74). However, it is impractical due to the drawback of longer duration to complete questionnaire. Increasing the length of questionnaires can affect the accuracy of outcomes. These effects are most noticeable in more cognitively demanding questions among those with low cognitive skills (69,75,76).

The response options also play an essential role in questionnaire outcome. Our item analysis exhibits only 12% applied dichotomous ("yes" or "no") response. The remaining items are accompanied by response options ranging from 3 to 7 Likert scales. About 65% of response options are arranged according to negative to positive sequence such as "strongly disagree" to "strongly agree";

or "never" to "always"; or "not hard" to "very hard". Meanwhile, 23% of the response options are positive to negative sequences such as "very easy" to "very difficult". Only 1% of the 368 items in this review contains no opinion or neutral filter in the response options. It is imperative to explore 'no opinion' filter options (77–79) (71–73). By explicitly offering an "I don't know" or "I am not sure" option, no opinion filters reassure respondents that it is alright to be unsure (71–73). No opinion response can also indicate uncertainty of decision and question ambiguity rather than lack of opinion (71–73). Therefore, follow-up questions should be included after no opinion filter for re-confirmation.

Completion Time: Length of Questionnaire

The total items vary from as low as eight items up to as high as 47 items. Only two questionnaires have less than ten items, while four questionnaires have more than 30 items. The rest falls between 10 and 30 items. There was no evidence that the target group influences the total number of items in a questionnaire. Keeping the questionnaire short is crucial because fatigue leads to data inaccuracy (80,81). Short questionnaires upraise concentration that results in more accurate responses (80,81). For most questionnaire designs, a general rule of thumb is best to keep the completion time below 10 minutes (80,81). This 10-minute completion time can be achieved with about ten questions or less. Based on the length of the questionnaire alone, current vision-related questionnaires developed for the paediatric population are relatively challenging and tedious to engage because the majority falls between 10 and 30 items. Future design can aim to limit to 10 questions or below.

Memory Capacity: Length of sentence

Total words used to construct sentences in vision-related questionnaires developed for the paediatric population vary from 3 words up to 34 words. Shorter sentences are easier to understand than longer ones (82–85). It has been reported that sentences with eight words or less are easy to read, while 21 words are relatively difficult to read and more than 25 words are challenging (82–85). Approximately 97% of the items in vision-related questionnaires developed for the paediatric population are below 21 words. Those questionnaires with sentences exceeded 25 words should be revised carefully in any future modification or adaptation. The outcome of any questionnaire can be affected if the design does not take thoughtful deliberation in word counts per sentence. The cognitive load reversal effect appears in text comprehension with a sentence length of 15–17 words (82–85). Sentences shorter than 15 words can be processed in the working memory at the first reading, while sentences longer than 15 words exceed the operational memory capacity and reduce the level of text comprehension (82). Approximately 81% of the items in vision-related questionnaires developed for the paediatric population are below 15 words. The effect of sentence length varies with age—preferably short sentence length for the younger age group (82–85). Therefore, questionnaires designed for different age groups should pay careful attention to the effect of word counts per sentence.

Language Impact: Adjectives; Positive versus Negative Phrases

Adjectives are commonly found in items construction to describe emotions and feelings. Approximately 50% (196 out of 386 items) used adjectives to describe emotions and feelings. Fifteen most common descriptive words used in 386 items comprise of 'difficult' (16%), 'easy' (11%), 'hard' (5%), 'problem' (5%), 'bother' (4.5%), 'well' (1.8%), 'trouble' (1.5%), 'worry' (1.5%), 'confident' (1.3%), 'enjoy' (1%), 'uncomfortable' (0.5%), 'fine' (0.5%), 'interfere' (0.5%), 'different' (0.25%) and 'good' (0.25%). Adjectives sometimes can be ambiguous in relational, structural and functional measures (86). Interpretation of adjectives is complex (87). Interpretation of adjectives varies with age (87,88). The use of an adjective to describe emotion among children may increase ambiguity in response due to their cognitive limitation (87,88). Interpretation of adjectives in children is better with visual input (88,89).

Application of positive and negative phrasing is about 44% and 56%, respectively. "My child's enjoys watching television, videos or playing video games" and "My child's eyesight makes it difficult for him/her to learn to walk, run, skip, or jump" are respective examples of positive and negative phrasings. Positive and negative phrasings play an essential role in both self-reporting and proxy-reporting questionnaires. The psychological influence of positive and negative phrasing is apparent among those with lower social status, less formal education, lower intelligence, or less social concern (59,90–93). It is believed that respondent tends to disagree with a negative phrasing than agree with a positive phrasing (90,94,95). Negative phrasing can have negative impacts on the emotion (90). Younger children and those with poor verbal skills were more likely to respond to negatively worded items (94). The question and answer options are reread more frequently for negative questions than positive ones (95).

Limitation

The limitation of this review is that it does not cover unpublished questionnaires. The questionnaires limited to English version, therefore we may miss visual questionnaire in other languages. Still, the review gives a glimpse into general characteristics in those published vision-related questionnaires developed for the paediatric population.

CONCLUSION

This review provides important information about the key characteristics of vision-related questionnaires developed for the paediatric population. Questionnaires

developed for the paediatric population can be as short as eight items up to as long as 47 items. The question approach was found to be twofold higher than the statement approach. The application of positive and negative phrasing is relatively balanced. Both patient-reported outcomes measures and patient-reported experience measures styles are employed. Nearly two-thirds of the questionnaires are intended for self-reporting. Proxy-reporting is predominantly for younger age groups.

Future design can harness the strength of both mode of administration (self-reporting & proxy-reporting) to optimize diverse situations. Scope of questionnaire can be expanded to include all vision clusters. The potential to integrate signs, symptoms and pictorial options is irrefutable and may be explored to unravel the item constructs limitation using visual-related activities. A closed-ended question with a balance of positive and negative phrasings of less than 15 words and a neutral filter are recommended for the future design. Information from this review can guide the new design of vision-related questionnaire developed for the paediatric population.

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