ORIGINAL ARTICLE

Development, Validity, and Reliability of Challenges and Attitudes to Practice Primary Eye Care (CAPEC) Questionnaire Among Malaysian Private Sector Optometrists

Nurul Ain Yahaya[1,2,*], Noor Azlina A. Rahman[3]

[1]Department of Optometry and Visual Sience, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Pahang, Malaysia
[2]Integrated Omics Research Group (IORG), Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Pahang, Malaysia
[3]Department of Physical Rehabilitation Sciences, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Pahang, Malaysia

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ABSTRACT

Background: Primary Eye Care (PEC) is vital in preventing visual impairment, yet private sector optometrists in Malaysia face barriers that hinder its implementation. This study aimed to develop and validate the Challenges and Attitudes to Practice Primary Eye Care (CAPEC) questionnaire to assess the barriers and attitudes of optometrists in the Malaysian private sector toward implementing PEC services. **Methods*:*** The CAPEC questionnaire was developed based on qualitative insights and thematic analysis from initial interviews with optometrists. The instrument underwent rigorous content validation by experts using the Content Validity Index (CVI) and exploratory factor analysis (EFA) for construct validity. A pilot study tested reliability and readability, and the finalized questionnaire was distributed to a sample of private sector optometrists. **Results*:*** The validated CAPEC questionnaire consists of 34 items within four domains addressing challenges (working environment, support and recognition, self-sufficiency, and customer influence) and two domains on attitudes (motivation and sense of responsibility). Results from the pilot study confirmed the questionnaire's reliability, with high internal consistency (Cronbach's alpha scores above 0.7 for all domains). **Conclusion*:*** The CAPEC questionnaire is a valid and reliable tool for assessing challenges and attitudes in PEC practice among optometrists. Its use may support further research and efforts to enhance PEC implementation in private optometry settings in Malaysia.

INTRODUCTION

PEC plays a crucial role in preventing visual impairment and blindness, providing essential services such as refraction, early detection of eye diseases, and patient education. The World Health Organization (WHO) has emphasised the importance of integrating PEC into primary health systems to address the global rise in preventable visual impairment and blindness (WHO, 2019). In Malaysia, while PEC services are accessible in public healthcare facilities, the role of private-sector optometrists in delivering PEC remains underutilised, despite evidence suggesting that these professionals are well-positioned to contribute significantly to PEC (Abd Aziz et al., 2020; Chew et al., 2018).

Despite the demand for comprehensive eye care services, private optometrists in Malaysia often face constraints, including limited resources, lack of formal recognition, and the influence of customer expectations. These challenges can impact their ability and willingness to expand their role beyond refractive services to include PEC (George et al., 2019). Understanding these barriers and optometrists' attitudes toward PEC may provide valuable insights for strengthening eye care services in Malaysia.

This study developed and validated the *Challenges and Attitudes to Practice Primary Eye Care (CAPEC)* questionnaire, designed to evaluate the specific challenges private-sector optometrists face in implementing PEC services and to assess their attitudes toward adopting these practices. The CAPEC questionnaire's development aimed to produce a reliable tool to inform efforts that could enhance PEC adoption in Malaysia's private optometry sector.

MATERIALS AND METHODS

This study followed a structured, multi-phase approach to develop and validate the CAPEC questionnaire. The process included initial qualitative research to inform item development, expert content validation, pre-testing for clarity, and a pilot study to assess construct validity and reliability. The main steps and results involved in the development, validation, and reliability of the questionnaire are summarized in Figure 1.

* *Corresponding author.*
E-mail address: nurulainyahaya@iium.edu.my

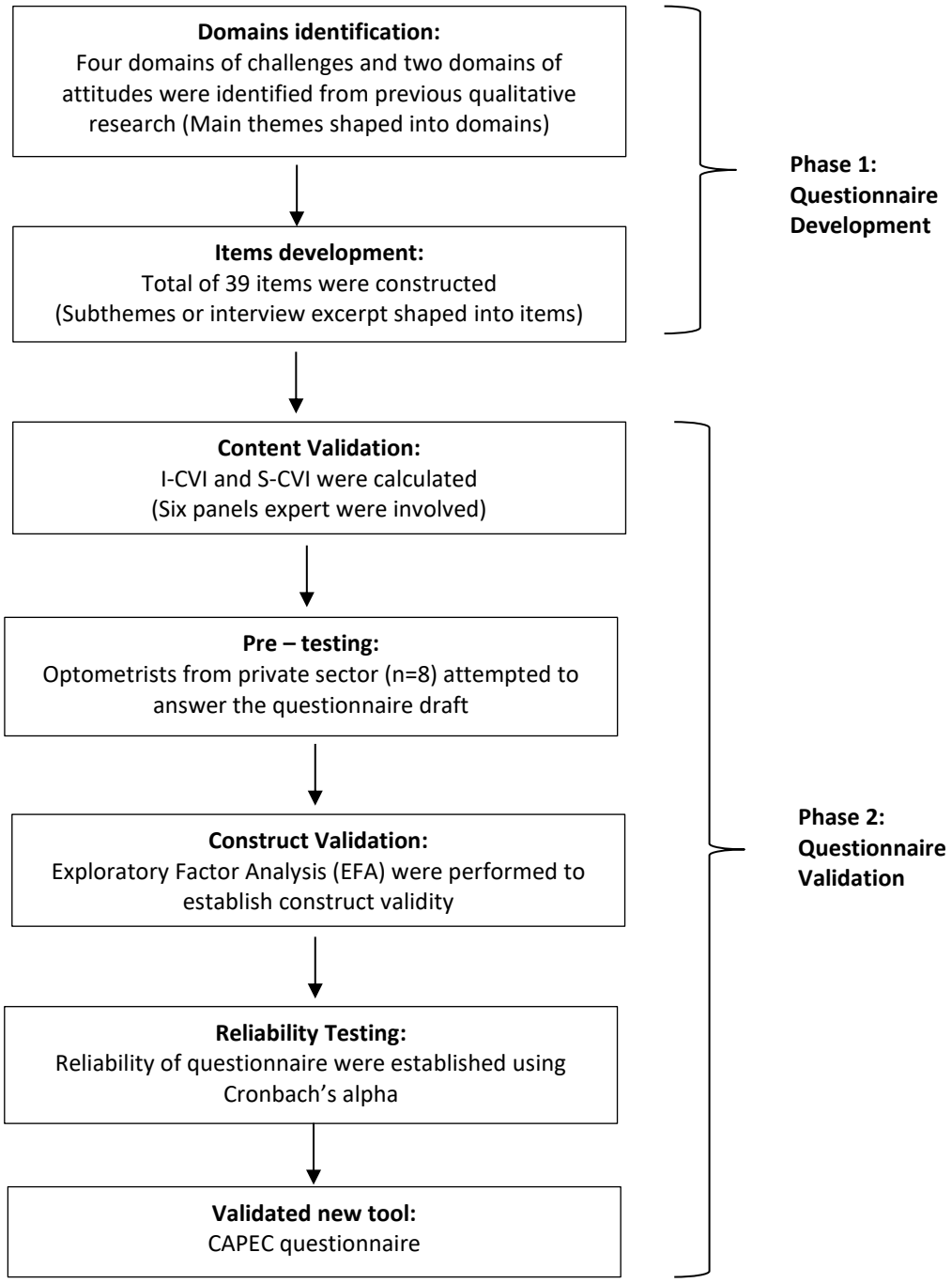

Figure 1: Flowchart of construction, validation, and reliability of the questionnaire.
CAPEC: Challenges and Attitudes to Practice Primary Eye Care; I-CVI: item-level content validity index; S-CVI: scale content validity *index*

Phase 1: Questionnaire Development

The development phase consists of two stages; domains identification and items development. Prior to the development, the CAPEC questionnaire was structured into three sections: demographics, challenges, and attitudes. The demographic section gathered essential participant information, including age, gender, race, location of practice, type of practice, ownership status, years of experience, and graduating university. These demographic factors aimed to identify potential associations with the respondents' perspectives on the challenges and attitudes toward PEC. Meanwhile , the challenges and attitudes sections comprised of items relevant to the areas being studied.

Domains identification

This study is a part of exploratory sequential mixed-methods design, whereby the development of the

questionnaire was based on the result of previous qualitative findings (Yahaya et al., 2023). These findings informed the construction of the challenges and attitudes domains, resulting in four challenge domains (working environment, lack of support and recognition, self-sufficiency, and customer influence) and two attitude domains (motivation and sense of responsibility). This framework guided the questionnaire's structure, ensuring alignment with the specific challenges and attitudes relevant to private-sector optometrists in Malaysia.

Items development

After identifying the domains, item development began using qualitative findings (Yahaya et al., 2023; Boateng et al., 2018). Key themes from the qualitative analysis shaped the domains, while subthemes or interview extracts informed specific items, ensuring relevance to the target population—optometrists in Malaysia's private sector (Creswell & Clark, 2018). Throughout this process, literature-based guidelines were applied, with frequent reviews of the research questions to maintain relevance (Rattray & Jones, 2007). Items were carefully drafted to avoid complex terminology, double negatives, and leading questions, thereby reducing potential response bias (Boateng et al., 2018; Robinson, 2018).

A five-point Likert scale was selected for responses, providing simplicity and high data quality (Rattray & Jones, 2007; Boateng et al., 2018). Responses ranged from 'strongly disagree' to 'strongly agree,' coded from 1 to 5. To allow flexibility in later stages, a preliminary item pool larger than the final required survey was initially constructed, comprising 39 items across domains: five for working environment, eight for support and recognition, seven for self-sufficiency, seven for customer influence, and twelve for attitudes (seven for motivation and five for sense of responsibility) (Artino et al., 2014; Robinson, 2018).

Phase 2: Questionnaire Validation

The questionnaire underwent multiple testing phases to ensure its validity and reliability. Developing a quantitative tool with strong psychometric properties is essential to support the validity of study findings (Devon et al., 2007; McKenzie et al., 1999). In this study, validity is defined as the instrument's ability to accurately measure the attributes of the construct under investigation (Devon et al., 2007). While validity encompasses several types—face, content, construct, and criterion validity (Cook & Beckman, 2006; McKenzie et al., 1999)—we focused specifically on assessing content and construct validity to ensure the precision and relevance of the instrument for this research.

Content validation

During content validation, a panel of six experts specializing in optometry and PEC reviewed the item pool. This panel included two academicians, two experienced public-sector optometrists serving as board members of the Association of Malaysian Optometrists (AMO), and two board members from the Malaysian Optical Council (MOC). The experts assessed each item for relevance, clarity, and simplicity of the constructs. Items were rated using a 4-point Likert scale, and the Content Validity Index (CVI) was calculated to quantify agreement among the experts (Polit & Beck, 2006). The recommended minimum values are 0.78 for I-CVI, 0.90 for S-CVI/Ave, and 0.75 for modified kappa statistic (Lynn, 1986; Polit & Beck, 2006; Polit et al., 2007).

Pre-Testing

A pre-test was conducted with eight optometrists to assess the questionnaire's readability, feasibility, and clarity from the respondents' perspective. Participants completed the draft questionnaire and were encouraged to give feedback on any ambiguous or confusing items. This process resulted in minor wording adjustments to enhance clarity, ensuring that all items were clearly understood as intended for the target audience (Lynn, 1986).

Construct Validation and Reliability

To assess the questionnaire's construct validity and reliability, a pilot study was conducted with a sample of 38 optometrists from the private sector. The pilot data were analysed using exploratory factor analysis (EFA) to determine the underlying factor structure and confirm the thematic domains identified in the qualitative phase. The extraction method was principal component analysis with an oblique (Varimax with Kaiser Normalization) rotation. Factors were retained based on eigenvalues greater than 1.0 and factor loadings above 0.40 (Fabrigar & Wegener, 2012).

The internal consistency reliability of the CAPEC questionnaire was measured using Cronbach's alpha. All domains achieved alpha values above 0.70, which is generally considered acceptable for psychological and educational assessments (George & Mallery, 2003).

Ethical Considerations

Ethical approval for this study was obtained from the International Islamic University Malaysia Research Ethics Committee (IREC), approval number (IREC 2020-153). All participants provided written informed consent, and their confidentiality was maintained throughout the study.

RESULTS

This section presents the findings from each phase of the CAPEC questionnaire's development and validation, including content validity, pre-test feedback, exploratory factor analysis, and reliability assessment.

Content Validity

Content validation involved six expert reviewers who rated each item for relevance, clarity, and simplicity. Items with an item-level I-CVI below 0.78 and scales with S-CVI below 0.90, were revised per Lynn's (1986) guidelines.

As shown in Tables 1, the I-CVI scores for each item and overall items were excellent (Polit & Beck, 2006; Yusoff, 2019). This result was further supported by high S-CVI scores at the scale level, with S-CVI/Ave values ranging from 0.93 to 1 (Davis, 1992; Polit & Beck, 2006). Additionally, the modified kappa statistic for each item was satisfactory, with a minimum value of 0.81.

Table 1: Content validity index (CVI) of CAPEC questionnaire items

Items No.	S-CVI/Ave	I-CVI/ Ave	I-CVI Interpretation	Modified kappa	Interpretation
Working environment	0.93				Excellent
Item 1		1	Appropriate	1	Excellent
Item 2		0.83	Appropriate	0.81	Good
Item 3		0.83	Appropriate	0.81	Good
Item 4		1	Appropriate	1	Excellent
Item 5		1	Appropriate	1	Excellent
Support and Recognition	0.98				Excellent
Item 6		1	Appropriate	1	Excellent
Item 7		1	Appropriate	1	Excellent
Item 8		0.83	Appropriate	0.81	Good
Item 9		1	Appropriate	1	Excellent
Item 10		1	Appropriate	1	Excellent
Item 11		1	Appropriate	1	Excellent
Item 12		1	Appropriate	1	Excellent
Item 13		1	Appropriate	1	Excellent
Self-sufficiency	0.93				Excellent
Item 14		1	Appropriate	1	Excellent
Item 15		1	Appropriate	1	Excellent
Item 16		0.83	Appropriate	0.81	Good
Item 17		0.83	Appropriate	0.81	Good
Item 18		0.83	Appropriate	0.81	Good
Item 19		1	Appropriate	1	Excellent
Item 20		1	Appropriate	1	Excellent
Customer Influence	0.93				Excellent
Item 21		0.83	Appropriate	0.81	Good
Item 22		0.83	Appropriate	0.81	Good
Item 23		1	Appropriate	1	Excellent
Item 24		1	Appropriate	1	Excellent
Item 25		0.83	Appropriate	0.81	Good
Item 26		1	Appropriate	1	Excellent
Item 27		1	Appropriate	1	Excellent
Motivation	0.95				Excellent
Item 1		0.83	Appropriate	0.81	Good
Item 2		0.83	Appropriate	0.81	Good
Item 3		1	Appropriate	1	Excellent
Item 4		1	Appropriate	1	Excellent
Item 5		1	Appropriate	1	Excellent
Item 6		1	Appropriate	1	Excellent
Item 7		1	Appropriate	1	Excellent

Sense of Responsibility	1				Excellent
Item 8		1	Appropriate	1	?
Item 9		1	Appropriate	1	Excellent
Item 10		1	Appropriate	1	Excellent
Item 11		1	Appropriate	1	Excellent
Item 12		1	Appropriate	1	Excellent

Pre-Test Feedback

A pre-test with eight optometrists assessed the CAPEC questionnaire's clarity and readability. Using a Yes/No scale (Ventkitachalam, 2015), participants rated items on readability, feasibility, and word clarity, with scores over 90% considered acceptable. High scores were achieved; 99.7% for readability, 99.0% for feasibility, and 99.4% for word clarity. Participants completed the questionnaire in 15 to 25 minutes, finding all items clear, though minor adjustments were made for clarity. The pre-test confirmed the questionnaire's relevance and ease of interpretation for the target audience.

Construct Validation

The pilot study involved a sample of 38 optometrists and was used to perform exploratory factor analysis (EFA) to confirm the questionnaire's structure. Six factors were identified, aligning with the thematic domains from the qualitative phase. Table 2 and 3 presents the factor loadings for each domain, supporting the construct validity of the CAPEC questionnaire.

Table 2: Factor loading of challenges items in the CAPEC Questionnaire

CAPEC item	**Factor loading**			
	1	**2**	**3**	**4**
Factor 1: Working Environment				
Item 1	0.66			
Item 2	0.70		0.29	
Item 3	0.83			0.21
Item 4	0.60			0.21
Item 5	0.65			
Factor 2: Support and Recognition				
Item 6	0.22	0.37	0.23	
Item 7		0.41		
Item 8		0.65	0.26	0.24
Item 9		0.66	0.39	
Item 10		0.77		
Item 11		0.69		
Item 12		0.72		
Item 13		0.66		0.34
Factor 3: Self-sufficiency				
Item 14			0.72	
Item 15			0.69	
Item 16			0.31	
Item 17			0.61	
Item 18			0.67	
Item 19			0.71	
Item 20			0.61	
Factor 4: Customer Influence				
Item 21				0.51
Item 22				0.51
Item 23				0.50
Item 24				0.76
Item 25				0.76
Item 26				0.47
Item 27				0.30

Table 3: Factor loading of attitudes items in the CAPEC questionnaire

CAPEC item	Factor loading	
	1	2
Factor 1: Motivation		
Item 1	0.77	0.39
Item 2	0.74	0.36
Item 3	0.71	0.36
Item 4	0.69	
Item 5	0.56	0.44
Item 6	0.53	
Item 7	0.51	
Factor 2: Sense of Responsibility		
Item 8		0.83
Item 9	0.37	0.72
Item 10		0.71
Item 11		0.67
Item 12	0.46	0.55

Reliability Assessment

The internal consistency reliability of each domain was evaluated using Cronbach's alpha. All domains exceeded the commonly accepted threshold of 0.70, indicating good reliability (George & Mallery, 2003). Specifically, the domains of 'support and recognition' and 'sense of responsibility' demonstrated the highest reliability, with Cronbach's alpha values of 0.803 and 0.816, respectively. Table 4 summarises the Cronbach's alpha values for each domain.

Table 4: The internal consistency reliability (ICR) of the challenges and attitudes domains

Domain	No. of items	ICR[a]	
		Corrected ITC[b]	Cronbach's Alpha
Challenges			
Working environment	5	0.507 - 0.714	0.798
Support and recognition	8	0.369 - 0.766	0.803
Self-sufficiency	5	0.308 - 0.716	0.727
Customer Influence	4	0.285 - 0.763	0.713
Attitudes			
Motivation	7	0.505 - 0.767	0.746
Sense of Responsibility	5	0.671 - 0.829	0.816

Note. ITC[b]= Item total correlation

Five items were removed either due to low EFA or low Cronbach's alpha value. The final validated questionnaire consists of 34 items with four domains of challenges ('working environment,' 'support and recognition,' 'self-sufficiency,' and 'customer influence') and two domains of attitudes ('motivation' and 'sense of responsibility').

Summary of Findings

The CAPEC questionnaire demonstrated high content validity, construct validity, and internal consistency reliability across all domains. These results indicate that the CAPEC questionnaire is a robust tool for assessing challenges and attitudes toward PEC among private-sector optometrists in Malaysia.

DISCUSSION

This study developed and validated the CAPEC questionnaire, specifically designed to assess the challenges and attitudes of optometrists in the Malaysian private sector toward implementing PEC. The CAPEC questionnaire exhibited high validity through thorough psychometric evaluations, demonstrating that it is a valid and reliable tool with strong content and construct validity and high internal consistency across all domains.

The content validity of the CAPEC questionnaire was assessed using the Index I-CVI and S-CVI/Ave, both confirming the validity of the items and overall scale. Content validation typically involves three to ten experts (Davis, 1992; Lynn, 1986; Yusoff, 2019), and this study employed a panel of six professionals: two academics, two board members AMO, and two from the MOC. An I-CVI score of 0.78 or above is considered excellent, and all CAPEC items achieved I-CVIs ranging from 0.83 to 1.00. The S-CVI values, measuring the questionnaire's overall relevance, were between 0.93 and 1.00, indicating strong content validity. Additionally, all modified kappa values exceeded 0.75, showing high expert agreement beyond chance. These results confirmed the relevance of all items,

so none were removed during content validation. However, some minimal revisions to the items' structure and grammar were made in response to expert comments.

These were followed with pre-testing of the questionnaire. Pre-testing is essential in questionnaire development to assess face validity and identify potential issues before broader distribution (Boateng et al., 2018). In this study, the questionnaire was pre-tested with a convenience sample of eight private-sector optometrists to gauge its effectiveness and minimize misunderstandings and measurement errors (Boateng et al., 2018; Reynolds et al., 2017). For this study, the pre-testing results were excellent and all participants also indicated that all items were clear and understandable, hence further revision was not needed.

The construct validity of the CAPEC questionnaire was assessed using exploratory factor analysis (EFA). Most items in the challenges domain demonstrated satisfactory factor loadings, aligning well within their respective domains. These acceptable factor loadings provide strong evidence of the CAPEC questionnaire's construct validity, supporting the conclusion that its individual items are both important and relevant for measuring the challenges and attitudes of private-sector optometrists in implementing PEC.

Reliability analysis of the CAPEC questionnaire, conducted using corrected Item-Total Correlations (ITC) and Cronbach's Alpha, confirmed its robustness. Five items with low corrected ITC were removed from the challenges section, leaving 22 items with strong reliability scores. As these removed items were not essential to the domain content, their exclusion did not impact the integrity of the domains. The attitudes section displayed corrected ITC values above 0.3 and Cronbach's Alpha values exceeding 0.7, affirming the questionnaire's reliability for assessing private-sector optometrists' challenges and attitudes toward implementing PEC.

The CAPEC questionnaire distinguishes itself from existing tools such as the Perceptions of Primary Eye Care Questionnaire (Thite et al., 2014) and the Optometric Practice Attitudes Scale (Smith et al., 2017), which also measure perceptions and attitudes in PEC settings. Unlike these tools, CAPEC has been specifically tailored to address the unique challenges faced by Malaysian private-sector optometrists, including cultural and systemic barriers. Its structure and design allow for contextualized assessment, making it highly adaptable for use in other cultural or healthcare settings with appropriate modifications. For instance, CAPEC could be validated and adapted for other Southeast Asian countries where optometrists face similar underutilisation of PEC due to resource constraints and role ambiguity (World Health Organization, 2019). Additionally, in developed healthcare systems, the tool could help uncover residual attitudinal barriers to PEC implementation, providing valuable insights for policy and professional development. Future research should consider cross-cultural validation of the CAPEC questionnaire to enhance its applicability and impact globally.

Study Limitation

This study offers important insights into the development and validation of the CAPEC questionnaire but also identified a few limitations to be addressed in future research. While the sample size was adequate for content and face validation, it may not entirely represent the diversity of the population. Future studies should include more varied geographic locations and account for differences in cultural and socioeconomic backgrounds. Expanding the sample size in subsequent validations would also enhance the generalisability of the findings.

CONCLUSION

This study developed and validated the CAPEC questionnaire as a reliable tool for assessing the challenges and attitudes of Malaysian private-sector optometrists toward implementing PEC. Extensive psychometric testing confirmed high content and construct validity, as well as internal consistency across all domains. The final CAPEC questionnaire, consisting of 22 items in four challenge domains and 12 items in two attitude domains, was reviewed by expert panels, pre-tested for clarity, and analysed through factor analysis to confirm its relevance and accuracy. Although the CAPEC is culturally specific to Malaysia, future research could enhance its applicability by expanding the sample size and incorporating more diverse geographic, cultural, and socioeconomic perspectives.

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