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DEVELOPMENT AND VALIDATION OF AN ONLINE HEARING AID MANAGEMENT MODULE FOR PARENTS OF HEARING-IMPAIRED CHILDREN

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Abstract

Consistent and early hearing aid use is important for hearing-impaired children to develop speech and language skills. However, parents often face challenges in retaining information from hearing aid orientation sessions and effectively managing their children's hearing aids. To achieve this, parents need to acquire the necessary information and skills to ensure their children receive consistent daily auditory stimulation through well-functioning hearing aids. This study aimed to develop and validate an online hearing aid management (HAM) module designed to empower parents of hearing-impaired children. A two-phase approach was employed. Phase one involved developing the module's content based on published literature, while Phase II focused on assessing the module's face and content validity through expert reviews and parent evaluations. Six topics were established during the development process of the module. The development phase resulted in the inclusion of six hearing aid management topics in the 19-minute module. Content validity, measured using the Suitability Assessment of Materials scale, yielded a high mean score of 0.98 (range: 0.86-1.00) from seven experts. Face validation by seven parents using the Patient Education Materials Assessment Tool for Audio-visual Materials indicated good understandability (96.4%) and actionability (100%). These results demonstrate that the module has strong content validity and is suitable for enhancing parents' ability to manage their children's hearing aids.

Keywords: Hearing aid orientation, Parental empowerment, Hearing-impaired children, Online education module, Content validity

INTRODUCTION

Recent technological advances through newborn hearing screening have made early diagnosis possible, and hearing aids (HA) are often the primary intervention for children diagnosed with hearing loss. This

early detection and intervention provide opportunities for these children to develop spoken language comparable to their typical hearing peers. For spoken language development, parents play a crucial role in ensuring children receive consistent auditory stimulation through well-functioning HA.

Hearing aid orientation (HAO), typically carried out after HA fitting, involves an information and demonstration sharing session between audiologists and parents about the device components, function, and their use and care (Phelan & Lee, 2022). The HAO session is usually delivered verbally for at least 15-20 minutes, and parents are recommended to refer to HA user manuals for managing the devices at home (Gomez & Ferguson, 2019).

Previous studies have revealed challenges faced by parents in retaining information from HAO sessions due to factors such as anxiety and emotion (Watermeyer et al., 2017), health literacy (Penn et al., 2010), and maternal education (Walker et al., 2014). Unsatisfactory design, layout, typography, graphics, and terminologies in HA manuals are additional factors that challenge parents in managing and integrating HA use into daily routines. For example, Munoz et al. (2014) observed mothers struggling to keep HA on their children's ears. Additionally, some parents have reported a lack of training in checking devices (Muñoz et al., 2015), while Caballero et al. (2017) discovered that 59% of parents were uncomfortable sharing HA management information and skills with other families. Negative feedback regarding diagram quality and language in HA user manuals was reported by 35% of participants in a study by Brooke et al. (2012).

Supplemental remote support via an online HAO module could enhance parent engagement and success with home routines. Muñoz et al. (2016) found that families facing challenges with HA use responded positively to remote support. In another study, Locaputo-Donnellon and Clark (2011) demonstrated that a HA instructional DVD improved information retention among first-time HA adult users. Therefore, an online HAO video module has the potential to empower parents with better understanding and skills for effective device management.

PROBLEM STATEMENTS

Parents who are independent and confident in managing their children's HA are more likely to ensure consistent device usage, which is crucial for optimal speech and language development. However, many often struggle with information retention and overload during HAO sessions. Studies have shown that individuals can forget up to 80% of the information given during medical consultations (Kessels, 2003), and parents often struggle to complete basic HA maintenance tasks even when following user manuals (Brooke et al., 2012).

To address these challenges, visual imagery and multimedia interventions have been shown to enhance patient engagement, satisfaction, confidence, and behaviour change (Sawesi et al., 2016). An online video module can provide parents with flexible access to HA education and support, mitigating the challenges associated with in-person appointments. The video also allows for demonstrating the target behaviours multiple times with minimal effort (Buggey, 2012).

The proposed video-guided educational intervention is based on the proposition of social learning theory in which desirable behaviors are learned or acquired by an individual through direct experience or by observation of others (Bandura, 1977). By guiding parents through step-by-step demonstrations and explanations, the video module aims to foster the knowledge, skills, and confidence necessary for effective HA management. This approach has proven beneficial in various contexts, such as caregiver training for autism (Besler & Kurt, 2016), parent-based interventions for developmental language delay (van Balkom et al., 2010), and patient education for children with fractures (Golden-Plotnik et al., 2017). For instance, van Balkom et al. (2010) demonstrated that a video-based home training program for parents led to long-lasting improvements in language development for children with developmental language delays. Thus, incorporating multimedia features such as photos, animations, audio, and video into the proposed online module will foster parent engagement, facilitate knowledge acquisition, and promote the retention of crucial information related to HAM.

OBJECTIVE

The study had two specific objectives:

1. To develop an online HAM video module for parents of hearing-impaired children.
2. To evaluate the content and face validity of the HAM video module.

METHODOLOGY

The present study was conducted in two phases: Phase I involved the development of the HAM module, while Phase II focused on validation. Ethics approval was obtained from the Research Ethics Committee of Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2023-101) and only participants who provided informed consent were recruited.

Phase I: Development of the HAM Module

The development of the HAM module followed the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, with a focus on the analysis, design, and development stages. In the analysis stage, a development committee (R.M; W.N.H.M.Y; M.F.L; and N.M.Y reviewed and adapted relevant topics and contents from published literature and adapted relevant materials from the eHealth Program available at www.heartolearn.org.

During the design stage, a storyboarding technique was used to draft content and narration scripts for each module topic in the Malay language. The modules were designed to be user-friendly, easy to understand, concise, and time-efficient, facilitating convenient learning for parents.

In the development stage, the drafted modules were reviewed by independent panels comprising experts in special education. Their feedback was incorporated, and the modules underwent a recording and editing process by a professional recording team. An iterative design and review cycle was employed, involving virtual meetings between the development committee, independent review panels, and the recording team to refine the modules.

Phase II: Validation of the HAM Module

The validation phase involved two groups: experts and parents.

Expert validation:

A convenient sample of seven audiologists, four from university hospitals and three from private practices, with at least two years of clinical experience was selected as the experts. The mean age of the experts was 37 ± 9.3 years, with an age range of 27 to 52 years.

The adapted Suitability Assessment of Material (SAM) scale (Mohd Yusoff et al., 2019) was used to assess the content and face validity of the module. This tool evaluates five domains: content, literacy demand, graphics, layout and typography, and learning stimulation and motivation. It uses a 4-point Likert scale, ranging from 1 (not relevant) to 4 (highly relevant). The experts were given links to access the adapted SAM and the modules for a two-week evaluation period.

To quantify the experts' agreement on item relevancy, the Content Validity Index (CVI) was calculated. With seven experts involved, an item level CVI (I-CVI) of at least 0.83 was required for the module to be considered valid (Lynn 1986). The I-CVI was computed as the number of experts rating an item as 3 or 4, divided by the total number of experts. The scale level CVI (S-CVI) was calculated as the sum of I-CVI scores, divided by the number of items.

Parent Validation:

Seven parents of hearing-impaired children under the age of 11, each with at least one year of experience using a hearing aid, participated in the face validation process. The mean age of the parents was 39.7 ± 2.3 years, with an age range of 36 to 45 years. The Patient Education Materials Assessment Tool for

Audio Visual materials (PEMAT-A/V) (Shoemaker et al., 2014) was utilised to assess understandability and actionability of the HAM module. This tool consists of 12 items assessing understandability and three items measuring actionability, with parents rating each item as “agree”, “disagree”, or “not applicable”. Responses are then scored as follows: “agree” receives a score of 1, “disagree” receives a score of 0, and “not applicable” is noted without a score. The HAM module were scored separately for understandability and actionability by summing the total points for each scale and dividing by the total possible points. The resulting score was then multiplied by 100 to obtain a percentage for each subscale. Higher percentages (above 70%) indicated understandability or actionability (Shoemaker et al., 2014).

RESULTS

Findings for Research Objective 1: Development of an Online HAM Video Module for Parents of Hearing-Impaired Children.

The HAM module consists of six core topics designed to cover all aspects of HA use and care: (1) Introduction to the module, (2) About HA, (3) A Guide for HA Use, (4) A Guide to HA Care, (5) The Don'ts of HA, (6) A Guide for Troubleshooting HA. Each topic includes a main page, title, contents, and acknowledgements. Additionally, English subtitles are also available for all topics. The total duration of the module is 19 minutes and 12 seconds. Table 1 summarized the topics, contents, and duration of the module.

Table 1: Topics, contents, and duration of the HAO module

Topics	Titles	Content	Duration	Learning Objectives
1	Introduction to the Module	<ul style="list-style-type: none"> • Purpose of the module. • Introduction to behind-the-ear HA. • Differences between analogue and digital HA. 	2:51 min	<ul style="list-style-type: none"> • Understand the purpose and basic types of HA.
2	About HA	<ul style="list-style-type: none"> • HA components and its function. • Estimated lifespan and warranty. • Importance of regular HA maintenance. 	3:00 min	<ul style="list-style-type: none"> • Identify the components of a HA and their functions. • Understand the importance of proper HA care.
3	A Guide for HA Use	<ul style="list-style-type: none"> • Differentiating right/left HA. • Turning HA on/off. • Checking battery status. • Inserting batteries. • Performing listening check. • Putting on/removing HA. 	5:10 min	<ul style="list-style-type: none"> • Gain practical skills for using a HA.
4	A Guide to HA Care	<ul style="list-style-type: none"> • Tools needed for cleaning. 	3:50	<ul style="list-style-type: none"> • Learn proper techniques for

continued

		<ul style="list-style-type: none"> • Proper cleaning techniques. • Ear mould replacement considerations. • Storage guidelines. 		cleaning and storing HA.
5	The Don'ts of HA	<ul style="list-style-type: none"> • Steps to prevent HA damage. 	1:24 min	<ul style="list-style-type: none"> • Identify actions to avoid damaging HA.
6	A Guide for Troubleshooting HA	<ul style="list-style-type: none"> • Common problems and troubleshooting steps 	2:47 min	<ul style="list-style-type: none"> • Gain basic troubleshooting skills for common HA issues.

Findings for Research Objective 2: Examining the Content and Face Validity of the HAM Video Module

2.1 Content Validation by the Experts

The content validity of the HAO video module was assessed by seven audiologists using the adapted SAM scale. As shown in Table 2, the I-CVI for all items ranged from 0.86 to 1.00. Sixteen of the 19 items achieved a perfect agreement (CVI = 1.00), while three items had a CVI of 0.86. Additionally, 100% agreement was observed for all items in the domains of content, literacy demand, and layout and typography. The S-CVI for the 19 items was calculated to be 0.98, indicating high overall content validity.

Table 2: Content Validity Index Scores according to the Experts

Domains & Items	Number of Experts (N=7)				Experts in Agreement (3 or 4)	I-CVI
	NR (1)	SR (2)	QR (3)	HR (4)		
1. Content						
1.1 Purpose is explicitly stated in the title, cover illustration or introduction.	0	0	2	5	7	1.00
1.2 Thrust of material is the application of knowledge or skills aimed at desirable viewer behaviour rather than facts.	0	0	2	5	7	1.00
1.3 Scope is limited to essential information directly related to the purpose.	0	0	1	6	7	1.00
2. Literacy Demand						
2.1 The writing is in conversational style, active voice.	0	0	2	5	7	1.00
2.2 Common words are used nearly all the time.	0	0	3	4	7	1.00
2.3 There is little or no technical jargon.	0	0	1	6	7	1.00
2.4 The material consistently provides context before presenting new information.	0	0	2	5	7	1.00
3. Graphics						
3.1 Cover graphic clearly portrays the purpose of the material.	0	0	2	5	7	1.00
3.2 Graphics used are friendly.	0	0	2	5	7	1.00

continued

3.3 Graphics used attract attention.	0	1	2	4	6	0.86
3.4 Step-by-step directions are provided.	0	0	2	5	7	1.00
3.5 Explanatory captions are provided for all or nearly all graphics.	0	1	1	5	6	0.86
4. Layout & Typography						
4.1 Layout and sequence of information are consistent, making it easy for the viewer to predict the flow of information.	0	0	3	4	7	1.00
4.2 The font size is easy to read.	0	0	2	5	7	1.00
4.3 The video module is grouped under descriptive subheadings or chunks.	0	0	1	6	7	1.00
4.4 Complex topics are subdivided into small parts.	0	0	2	5	7	1.00
5. Learning Stimulation & Motivation						
5.1 Instruction models specific behaviours or skills.	0	0	2	5	7	1.00
5.2 Interaction is used.	0	1	3	3	6	0.86
5.3 The module motivates learning & increase self-efficacy.	0	0	0	7	7	1.00

NR = Not Relevant; SR = Somewhat Relevant; QR = Quite Relevant; HR = Highly Relevant

2.2 Face Validation by the Parents of Hearing-impaired Children

Table 3 presents the descriptive statistics for the ratings of individual items from the PEMAT-A/V. All items in the questionnaire received high levels of agreement, varying from 85.7% to 100%. Notably, three items in the understandability domain had the lowest agreement at 85.7%. The actionability domain obtained 100% agreement from all parents. Additionally, there was unanimous agreement on items assessing content and the use of visual aids in the understandability domain.

Table 3: Descriptive statistics of the Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V) items

PEMAT-A/V Domains & Items	Frequency, n (%)		
	DA	A	NA
A. Understandability			
1.0. Content			
i. The material makes its purpose completely evident.	0	7 (100)	0
1.2 Word Choice & Style			
i. The material uses common, everyday language.	0	7 (100)	0
ii. Medical terms are used only to familiarize audience with terms. When used, medical terms are defined.	1 (14.3)	6 (85.7)	0
iii. The material uses the active voice.	0	7 (100)	0
1.3 Organization			
i. The material breaks or “chunks” information into short sections.	0	7 (100)	0
ii. The material’s sections have informative headers.	0	7 (100)	0
iii. The material presents information in a logical sequence.	0	7 (100)	0
iv. The material provides a summary.	1 (14.3)	6 (85.7)	0
1.4 Layout & Design			
i. The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	1 (14.3)	6 (85.7)	0
ii. Text on the screen is easy to read.	0	7 (100)	0

continued

iii. The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	0	7 (100)	0
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1.5 Use of Visual Aids

i. The material uses illustrations and photographs that are clear and uncluttered.	0	7 (100)	0
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B. Actionability

i. The material clearly identifies at least one action the user can take.	0	7 (100)	0
ii. The material addresses the user directly when describing actions.	0	7 (100)	0
iii. The material breaks down any action into manageable, explicit steps.	0	7 (100)	0

DA = Disagree; A = Agree; NA = Not Applicable

DISCUSSION

Research Objective 1: To Develop an Online HAM Video Module for Parents of Hearing-Impaired Children.

The HAM module was developed to enhance parents’ knowledge, skills, and confidence in managing their children’s HA effectively. To achieve this, the research team designed the module using health literacy principles, ensuring that information was accessible and easily understandable through narrations and captions, and presented in short segments to facilitate re-watching (Brega et al., 2015; Kaper et al., 2018). Adopting health literacy principles is crucial in developing educational materials, as it helps to overcome potential barriers to comprehension and promotes better understanding and adherence to the recommended practices (Foster et al., 2016).

The development of the HAM module followed a structured three-step process: pre-production, production, and post-production. The pre-production stage, which included adapting content, writing the storyboard, and scouting for a location, actors, and a recording company, spanned seven months. During this stage, the research team carefully reviewed and adapted relevant content from the evidence-based eHealth Program (www.heartolearn.org), ensuring that the information was up-to-date and aligned with best practices in hearing aid management. The storyboarding process involved meticulous planning and organization of the module’s content, ensuring a logical flow and coherence across the different topics (Wan Husain et al., 2020).

During the production stage, a professional recording company filmed and directed the module in one day. The involvement of a professional production team ensured high-quality audiovisual content and adherence to industry standards (Morain & Swarts, 2012).

The final post-production stage, also taking seven months, involved comprehensive video editing, adding music, graphics, animated text, voice-over, and captions. This stage required close collaboration between the research team and the video editors to ensure that the final product accurately represented the intended message and was visually appealing and engaging (Moreno & Mayer, 2007).

The resulting HAM module comprises six separate videos with viewing time ranging from 1 to 5 minutes. Breaking the content into shorter segments aligns with best practices in multimedia learning, as it allows for better information processing and retention (Mayer & Fiorella, 2021).

The module includes step-by-step explanations to boost parents' confidence in routinely performing tasks. By integrating camera footage, animations, graphics, text, and audio, the HAM module aims to enhance knowledge acquisition, practical skills, communication, and confidence in managing HA (Ferguson et al. 2016). This multimedia approach leverages the principles of multimedia learning, which suggest that combining different modalities (e.g., visual, and auditory) can enhance learning and understanding, especially for complex topics (Mayer & Fiorella, 2021). This approach is particularly crucial as studies have shown that parents often lack confidence in managing their children’s HAs, leading to less than the recommended 10 hours of daily HA usage (Muñoz et al., 2015; Walker et al., 2013; Jones et al., 2013). This is concerning as consistent HA usage is crucial for better language outcomes in hearing-impaired children (Tomblin et al., 2015). By providing comprehensive and

accessible information through a multimedia format, the HAM module aims to support parent learning, knowledge retention, and confidence in managing HAs, ultimately contributing to improved language development in children with hearing loss.

Research Objective 2: To Examine the Content and Face Validity of the HAM Video Module

This study validated the Malay version of the HAM module through assessments by experts and parents of hearing-impaired children. The expert validation process involved a panel of seven audiologists with diverse clinical backgrounds, including representation from both university hospitals and private practices. This multidisciplinary expert panel helped ensure a comprehensive evaluation of the module's content validity from various perspectives (Yusoff., 2019). The module achieved an excellent CVI of more than 0.83 based on expert ratings. This CVI value exceeds the recommended threshold of 0.83 for a panel of seven experts, as proposed by Lynn (1986), indicating a high level of agreement among experts regarding the relevance and appropriateness of the module's content.

Additionally, the module's understandability and actionability were rated as adequate, with all items receiving above 70% from parents, which is considered adequate according to the PEMAT-A/V guidelines. This finding suggests that the module is well-designed and accessible, enabling parents to comprehend the information and apply the recommended practices effectively.

These positive validation results demonstrate that the HAM module contains valid and relevant content that aligns with the objectives of developing comprehensive and effective educational resources for parents of children with hearing loss. This finding supports claims by Kim et al. (2014) and Prieto (2017) that educational modules must possess clear, relevant concepts to achieve validity and acceptability among the target audience.

Notably, all items assessing the module's content received high agreement from both experts and parents, indicating that the information was well-planned, precise, and relevant. The use of simple language, coherent vocabulary, and attractive visuals facilitated comprehension and reduced communication barriers, aligning with best practices in health communication (Nietsche et al., 2014).

The multimedia elements of the HAM module, including camera footage, graphics, and illustrations created by professional graphic designers, were highly rated by experts and parents. They found these elements to be relevant, easy to understand, and quantitatively appropriate. The effective integration of multimedia elements enhances the delivery and comprehension of information, contributing to the module's validity and acceptability (Mayer & Fiorella, 2021).

While this study has demonstrated the rigorous process of development and validation, one limitation is the lack of implementation and evaluation with the target audience in real-world settings. Applying the HAM module to parents of children with hearing loss and assessing its impact on their knowledge, skills, and confidence in hearing aid management would provide valuable insights into the module's real-world effectiveness. Such an evaluation would facilitate a comprehensive understanding of the module's impact and potentially inform further refinements or adaptations to optimize its effectiveness.

IMPLICATION OF FINDINGS

Evaluating the quality and validity of research materials is crucial to ensure rigor and facilitate the translation of findings into practice. Involving experts and parents from the target audience in the validation process enhances the credibility and acceptability of the HAM module, increasing its likelihood of successful implementation and adoption. This study's strength lies in its meticulous validation process for educational materials in the local language. The rigorous validation process employed in this study can serve as a model for future research in developing and evaluating culturally and linguistically appropriate educational materials.

Furthermore, the positive outcomes of this study highlight the potential of multimedia interventions in improving knowledge, skills, and confidence related to hearing aid management among parents of children with hearing loss. By empowering parents with the necessary competencies, the HAM module can facilitate consistent HA use, ultimately supporting optimal speech and language development in children with hearing loss.

These findings have significant implications for clinical practice, emphasizing the importance of incorporating multimedia educational resources into HA orientation and follow-up sessions. Healthcare professionals can leverage the HAM module as a supplementary tool to reinforce information and ensure better retention and application of hearing aid management techniques by parents.

However, a limitation of this study is that the module has not yet been applied to the target audience, preventing a full evaluation of the understanding and effectiveness of the information presented. Therefore, future steps should focus on assessing the module's applicability and effectiveness within the target population.

CONCLUSION

This study successfully developed and validated an online HAM video module for parents of children with hearing loss. The module achieved excellent content validity among experts and demonstrated good understandability and actionability among parents, suggesting its potential to enhance knowledge, understanding, and confidence in managing hearing aids effectively.

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REFERENCES

- Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.
- Besler, F., & Kurt, O. (2016). Effectiveness of video modelling provided by mothers in teaching play skills to children with Autism. *Educational Sciences: Theory and Practice*, 16(1), 209-230.
- Brega, A.G., Barnard, J., Mabachi, N.M., Weiss, B.D., DeWalt, D.A., Brach, C., et al. (2015). *AHRQ Health Literacy Universal Precautions Toolkit*, 3rd Edition. Rockville: AHRQ Publication.
- Brooke, R.E. Isherwood, S., Herbert, N.C., Raynor, D. K., & Knapp, P. (2012). Hearing aid instruction booklets: Employing usability testing to determine effectiveness. *American Journal of Audiology*, 21(2), 206–214.
- Buggey, T. (2012). Effectiveness of video self-modeling to promote social initiations by 3-year-olds with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 27, 102–110.
- Caballero, A., Muñoz, K., White, K., Nelson, L., Domenech-Rodriguez, M., & Twohig, M. (2017). Pediatric hearing aid management: Challenges among Hispanic families. *Journal of the American Academy of Audiology*, 28(8), 718–730.
- Ferguson, M., Brandreth, M., Brassington, W., P. & Wharrad, H. (2016). A Randomized Controlled Trial to Evaluate the Benefits of a Multimedia Educational Program for First-Time Hearing Aid Users. *Ear and Hearing*, 37(2), 123–136.
- Foster, J., Idossa, L., Mau, L., & Murphy, E. (2016). Applying health literacy principles: Strategies and tools to develop easy -to-read- patient education resources. *Clinical Journal of Oncology Nursing*, 20(4), 433-436.
- Golden-Plotnik, S., Ali, S., Drendel, A.L., Wong, T., Ferlisi, F., Todorovich, S., et al. (2017). A Web-based module and online video for pain management education for caregivers of children with fractures: A randomized controlled trial. *Canadian Journal of Emergency Medicine*, 20(6), 1-10.
- Gomez, R. & Ferguson, M. (2019). Improving self-efficacy for hearing aid self-management: the early delivery of a multimedia-based education programme in first-time hearing aid users. *International Journal of Audiology*, 59(4), 272–281.
- Jones, C. (2013). What do we know about the fitting and daily life usage of hearing instruments in pediatrics? In *A Sound Foundation through Early Amplification: Proceedings of the 2013 International Conference*.
- Kaper, M.S., Reijneveld, S.A., van Es, F.D., de Zeeuw, E L., Almansa, J., Koopmans, A.J., & Severijnen, S.E. (2019). Effectiveness of a comprehensive health literacy consultation skills training for undergraduate medical students: a randomized controlled trial. *International Journal of Environmental Research and Public Health*, 17(1), 81.

- Kessels, R.P.C. (2003). Patients' memory for medical information. *Journal of the Royal Society of Medicine*, 96(5): 219-222.
- Kim, J., Guo, P.J., Seaton, D. T., Mitros, P., Gajos, K.Z., & Miller, R.C. (2014). Understanding in-video dropouts and interaction peaks online lecture videos. *Proceedings of the First ACM conference on Learning@scale conference*.
- Locaputo-Donnellon, A.E. & Clark, J.G. (2011). Hearing aid orientation supplement through DVD instruction. *Hearing Journal*, 64(3), 44-50.
- Lynn, M. R. (1986). Determination and Quantification of Content Validity. *Nursing Research*, 35(6), 382-385.
- Mayer, R., & Fiorella, L. (2014). Principles for managing essential processing in multimedia learning: segmenting, pre-training, and modality principles. Cambridge: Cambridge University Press.
- Mohd Yusoff, W.N.H., Quar, T. K., Chong, F. Y., & Mazlan, R. 2019. Development and evaluation of a hearing aid manual in the Malay language. *International Journal of Audiology*, 58(5), 278-286.
- Morain, M., & Swarts, J. (2012). YouTutorial: a framework for assessing instructional online video. *Technical Communication Quarterly*, 21(1), 6-24.
- Moreno, R., & Mayer, R. E. (2007). Interactive multimodal learning environments. *Educational Psychology Review*, 19(3), 309-326.
- Muñoz, K., Preston, E., & Hicken, S. (2014). Pediatric hearing aid use: How can audiologists support parents to increase consistency? *Journal of the American Academy of Audiology*, 25(4), 380-387.
- Muñoz, K., Oslan, W. A., Twohig, M. P., Preston, E., Blaiser, K. & White, K.R. (2015). Pediatric hearing aid use: Parent-reported challenges. *Ear and Hearing*, 36(2), 279-287.
- Muñoz, K., Rusk, S. E. P., Nelson, L., Preston, E., White, K. R., Barrett, T. S. & Twohig, M.P. (2016). Pediatric Hearing Aid Management: Parent-Reported Needs for Learning Support. *Ear and Hearing*, 37(6), 703-709.
- Nietsche, E.A., Teixeira, E., Medeiros, H.P. (2014). Assistive educational technologies: a possibility for the empowerment of the nurse. *Porto Alegre: Moriá. Rev Rene*. 15,185-186.
- Penn, C., Watermeyer, J., Koole, T., de Picciotto, J., Ogilvy, D., Fisch, M. (2010). Cultural brokerage in mediated health consultations: An analysis of interactional features and participant perceptions in an audiology context. *Journal of Interactional Research in Communication Disorders*, 1(1), 135-156.
- Phelan, P., & Lee, J.J. (2022). Hearing aid fitting orientation and the APSO Standard. *Seminar in Hearing*, 43(2), 94-98.
- Prieto, N., Naval, V., Carey, T. (2017). *Practical Research for Senior High School*. Lorimar Publishing Inc., Quezon City, Metro Manila.
- Sawesi, S., Rashrash, M., Phalakornkule, K., Carpenter, J.S., & Jones, J.F. (2016). The impact of information technology on patient engagement and health behavior change: A systematic review of the literature. *JMIR Medical Informatics*, 4(1), e1.
- Shoemaker, S.J., Wolf, M.S., & Brach, C. (2014). Development of the Patient Education Materials Assessment Tool (PEMAT): a new measure of understandability and actionability for print and audiovisual patient information. *Patient Education and Counseling*, 96(3), 395-403.
- Tomblin, J.B., Harrison, M., Ambrose, S.E., Walker, E.A., Oleson, J.J., & Moeller, M.P. (2015). Language outcomes in young children with mild to severe hearing loss. *Ear and Hearing*, 36(1), 76s-91s.
- van Balkom, H, Verhoeven, L, van Weerdenburg, M, & Stoep, J. (2010). Effects of parent-based video home training in children with developmental language delay. *Child Language Teaching and Therapy*, 26(3), 221-237.
- Walker, E.A., Spratford, M., Moeller, M. P., Oleson, J., Ou, H., Roush, P. & Jacobs, S. (2013). Predictors of hearing aid use time in children with mild-to-severe hearing loss. *Language, Speech, and Hearing Services in Schools*, 44(1), 73-88.
- Wan Husain, W.S., Che Hassan, S.H., Nik Kamaruzaman, N.N., Wan Aziz, W.A.H., & Wan Abdul Rahman, W.F. (2020). From scratch to storyboard: incorporating techniques for novice users. *Journal of Mathematics and Computing Science*, 6(2), 9-19.
- Watermeyer, J., Kanji, A., & Sarvan, S. (2017). The first step to early intervention following diagnosis: Communication in pediatric hearing aid orientation sessions. *American Journal of Audiology*, 26(4), 473-584.
- Yusoff, M.S.B. (2019). ABC of content validation and content validity index calculation. *Education in Medicine Journal*, 11(2), 49-54.