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UTILISING NGT TO EVALUATE THE SUITABILITY AND USABILITY OF PARENT-IMPLEMENTED SOCIAL COMMUNICATION STRATEGIES IN AUTISM (PICA) MODEL AMONG SPEECH-LANGUAGE THERAPISTS (SLTs)

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Abstract: *Parent-implemented social communication interventions are increasingly recognised as effective for improving the social communicative development of children with Autism Spectrum Disorder (ASD). These approaches train parents to embed therapeutic strategies into daily routines, creating naturalistic learning opportunities. Speech-language therapists (SLTs) are critical in guiding parents, ensuring intervention fidelity, and monitoring outcomes. However, the usability and suitability of such interventions within clinical practice remain underexplored. This study evaluates the newly developed Parent-Implemented Social Communication Strategies in Autism (PICA) model among Malaysian SLTs, focusing on training objectives, social communication components, parents' communication knowledge, parent-child interaction skills, and generalisation strategies. The Nominal Group Technique (NGT) obtained consensus from 27 Malaysian SLTs. Findings revealed strong agreement (93.1%–99.5%) on the model's suitability and usability across all five components. Prioritised elements included interaction, communicative function, and fidelity support. Despite the overall endorsement, skill generalisation and cultural adaptation challenges were noted. The study empirically validates the PICA model as a practical framework for parent-led intervention in Malaysia. It further underscores the need for technology-driven enhancements, such as AI applications and culturally responsive training, to enhance access and effectiveness of early*

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intervention programs. These advancements are essential for supporting parents and consequently contribute to social communication outcomes in children with ASD.

Keywords: *Autism Spectrum Disorder, Nominal Group Technique, Parent-Implemented Intervention, Speech-Language Therapy, Social Communication Strategies, Usability Evaluation.*

Introduction

Evaluating the suitability and usability of parent-implemented social communication strategies within autism interventions is crucial for enhancing therapeutic outcomes. SLTs play a pivotal role in this process, ensuring that such strategies are practical and effective for families. The Nominal Group Technique (NGT), a structured method for consensus-building, has been effectively employed in related fields to assess and refine intervention strategies. For instance, Nelson et al. (2023) utilised NGT to explore the experiences of students with Autism in online education, highlighting its efficacy in gathering diverse perspectives to inform educational practices. Similarly, Meadan et al. (2023) investigated the maintenance and generalisation of parent-implemented telepractice interventions for children with Autism, underscoring the importance of evaluating usability to ensure sustained implementation.

Additionally, Shire et al. (2021) found that usability testing among SLTs indicated the developed a web-based adaptation of the Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER) intervention platform is user-friendly, with 85% reporting increased confidence in delivering parent-mediated programs. Moreover, 78% observed significant improvements in children's social communication skills following the intervention. These findings underscore the potential of technology-assisted platforms in enhancing SLTs' capacity to deliver effective parent-implemented interventions.

Ingersoll and Wainer (2013) on Project ImPACT, a parent-mediated social communication intervention, showed that SLTs could effectively train parents to implement strategies that resulted in significant gains in children's spontaneous language use. Further supporting these outcomes, a meta-analysis by Nevill et al. (2018) evaluated the effectiveness of parent-mediated interventions facilitated by SLTs. The analysis encompassed 19 studies and reported a moderate effect size ($g = 0.55$) in improving children's social communication skills. Notably, interventions that included SLT coaching sessions for parents yielded higher effect sizes ($g = 0.63$), suggesting that SLT involvement is pivotal in optimising intervention outcomes.

By adopting NGT, SLTs can systematically assess the practicality and acceptability of parent-implemented social communication strategies, leading to evidence-based and tailored interventions tailored to family needs.These findings underscore the critical role of SLTs in facilitating parent-implemented interventions and highlight the importance of providing accessible resources and training to support their efforts. As a result, SLTs are capable of offering optimum support to parents to implement social communication strategies effectively, thereby enhancing the developmental trajectories of children with ASD.

Recent studies have suggested several approaches to enhance the usability of parent-implemented social communication strategies in ASD models among SLTs. Firstly, integrating technology-based platforms can provide SLTs with accessible tools to coach parents effectively, such as seen in Shire et al. (2021).

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SLTs stated that the developed web-based adaptation of the JASPER intervention was beneficial for parent coaching, leading to improved social communication outcomes in children with ASD. Secondly, addressing barriers such as limited funding, time constraints, and lack of inter-professional collaboration is crucial for SLTs' implementing parent-implemented interventions. SLTs have identified these factors as significant challenges in service provision (Balabanovska et al., 2024; Barnett et al., 2023; Jurek et al., 2022). Implementing flexible scheduling, securing adequate resources, and fostering collaborative practices can mitigate these issues.

Thirdly, providing SLTs with specialised training in parent-implemented interventions enhances their confidence and competence. Nevill et al. (2018) reported that SLTs receiving targeted training significantly improve children's social communication skills. Finally, developing culturally adapted intervention programs ensures relevance and practicality across diverse populations. Gao and Drani (2024) demonstrated that culturally tailored parent-implemented interventions significantly improved children's social communication skills and family quality of life among Chinese families. By adopting these strategies, SLTs can effectively support parents in implementing social communication interventions, thereby improving outcomes for children with ASD.

The purpose of evaluating the PICA Model among SLTs is to determine the suitability and usability of this intervention model. Parent-implemented intervention approaches have been widely recognised as beneficial for improving social communication skills in children with ASD (Nevill et al., 2018). Recent research indicates that although parent-mediated interventions produce beneficial results, their success is highly influenced by the training and support available to SLTs (Shire et al., 2021). Nonetheless, the role of SLTs in guiding and supporting parents is critical to ensuring the success of these strategies. Through the NGT method, the researchers can evaluate how Malaysian SLTs perceive and their perspective towards the developed PICA Model, identify potential barriers or challenges, and explore ways to enhance usability and accessibility.

Research Aims

To evaluate the suitability and usability of the PICA Model using NGT among the Malaysian SLTs. Understanding the suitability and usability of this PICA model will contribute to the development of a more practical, adaptable, and scalable intervention framework.

Literature Review

Recent literature emphasises the efficacy of parent-implemented intervention approaches in empowering parents' roles in early intervention programs and, concurrently, enhancing the communicative abilities of children with ASD. These approaches allow parents to integrate therapeutic techniques into daily routines, fostering naturalistic learning environments for their children. A pilot study demonstrated that coaching parents in positive behaviour support strategies reduced children's disruptive behaviours (Sourander et al., 2024) and improved social communication skills (Hampton et al., 2022). Similarly, integrating developmental and behavioural interventions is effective when parents are actively involved (Barnett et al., 2023). Parent-implemented strategies, often guided by SLTs, include evidence-based interventions such as the Hanen Program, the Early Start Denver Model, and naturalistic developmental behavioural interventions (NDBIs) (Brian et al., 2022; Waddington et al., 2020). Research has highlighted that when parents receive structured training in these methods, they can effectively promote their child's communication development (Barnett et al., 2023; Erturk et al., 2020). A

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meta-analysis by Roberts and Kaiser (2011) supports the positive impact of parent-implemented language interventions, noting significant improvements in receptive and expressive language skills among children with developmental delays. Parents create consistent and meaningful learning opportunities beyond the clinical setting by embedding communication strategies into everyday interactions (Carruthers et al., 2022).

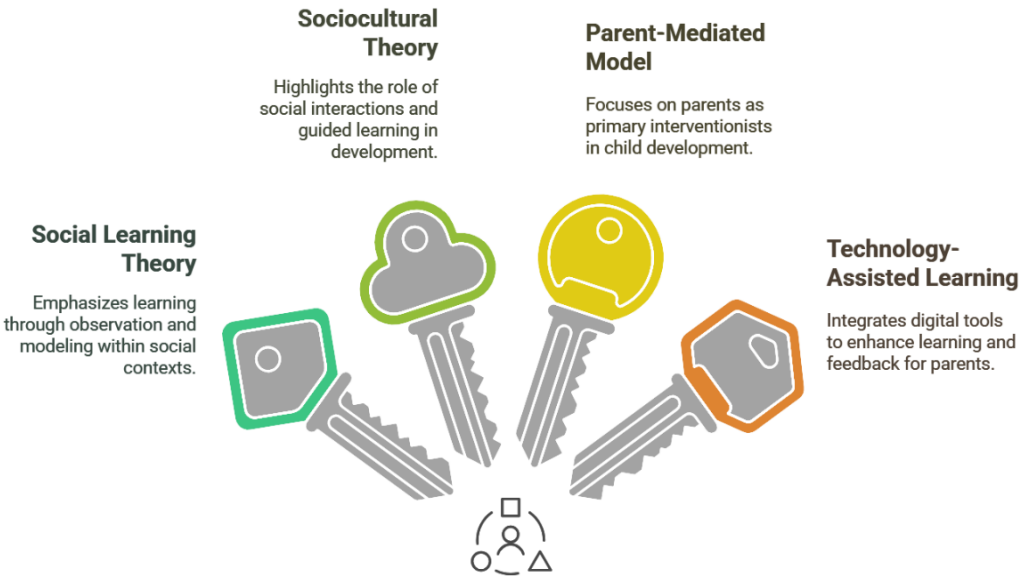

Figure 1: Theoretical Framework for PICA model

Several theories, approaches, and models have been used to ground the development of the PICA Model (refer to Figure 1). A combination of these evidence-based theories and approaches underpins the design and development of components and elements in the PICA Model. The Social Learning Theory underscores the importance of observational learning within social contexts, while the Sociocultural Theory highlights the significance of social interaction and guided learning. While it is undeniable that parents play crucial roles in their children's development, the Parent-Mediated Model positions parents as primary agents in early intervention, resulting in a new model that focuses on empowering parents and simultaneously has the potential to enhance children's development. Besides, technology-assisted learning, which involves integrating digital tools or resources to support parent learning and feedback mechanisms, ultimately improves the delivery of the PICA Model across settings and contexts. Collectively, these frameworks contribute to a holistic, evidence-based foundation for effective early intervention models.

Despite these benefits, the effectiveness of parent-implemented strategies varies based on parental engagement, the severity of the child's communication deficits, and the availability of professional support. These often occur due to the specialised training required for practitioners (Hickey et al., 2020; Rieth et al., 2018) to support parent training, which is notably lacking in low-resource settings (Lee et al., 2022). SLTs are crucial in coaching parents through structured training programs, typically involving modelling, role-playing, and feedback sessions. Schertz et al. (2020) emphasised that sustained professional support is necessary to ensure fidelity in implementing these strategies. Parents may struggle with consistency or misinterpret intervention techniques without proper guidance, impacting the child's progress.

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Additionally, cultural and socioeconomic factors influence the accessibility and implementation of these interventions. Research such as Brian et al. (2022) has suggested that families from diverse backgrounds may face barriers such as limited access to trained therapists, financial constraints, or differing beliefs about intervention approaches. SLTs must adopt a culturally responsive approach by tailoring strategies to meet the unique needs of each family (Gao & Drani, 2024). Besides, the parent coaching models incorporating telepractice and flexible training schedules improved accessibility and adherence among families in underserved areas (Kossyvaki et al., 2022; Meadan et al., 2023). These findings highlight the importance of adapting intervention models to diverse populations.

Parent-implemented interventions have the potential to enhance language and social communication skills in children with ASD. However, their success depends on SLTs' support, the availability of training resources, and the adaptability of intervention models to different family needs. Hence, the need for a model that bridges the gap between theory and practice is crucial for improving outcomes for children with Autism, ensuring that interventions are both practical and effective for their families.

Methodology

This study was conducted in response to the increasing demand for parent-implemented intervention training for children with ASD, particularly in Malaysia. The research employed the Nominal Group Technique (NGT), whereby the participants were selected through purposive sampling. Participants who met the inclusion criteria were identified. A total of 27 Malaysian SLTs participated as the expert panel, as illustrated in Figure 2 below. The primary researcher actively facilitated group discussions involving qualified SLTs with at least five years of professional experience.

An online NGT session via Google Meet lasted two hours and was conducted between the primary researcher and the participants. A structured brainstorming session was held among experts to gather insights and responses based on their professional perspectives. The NGT approach was used to systematically compile and analyse the collected data, ensuring the final results aligned with the study's objectives.

Approach to NGT

The Nominal Group Technique (NGT) is a structured approach designed to identify shared opinions within a group on a specific topic. Delbecq, Van de Ven, and Gustafson (1975) outlined its application in social planning scenarios, including exploratory research, citizen participation, transdisciplinary expert consultations, and proposal assessments. Initially described as a "participation technique for social planning situations." NGT has since been widely adopted in empirical social science research across various group settings. Although its application in education is somewhat limited, it has been highlighted in studies by O'Neil and Jackson (1983), Lomax and McLeman (1984), Lloyd-Jones et al. (1999), and MacPhail (2001). As a result, it is more frequently utilised in health-related social science research. The NGT follows a highly structured five-step process (Dung, 2015; Harvey & Holmes, 2012; Williams et al., 2006), and a 7-Likert-scale voting system was used.

Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
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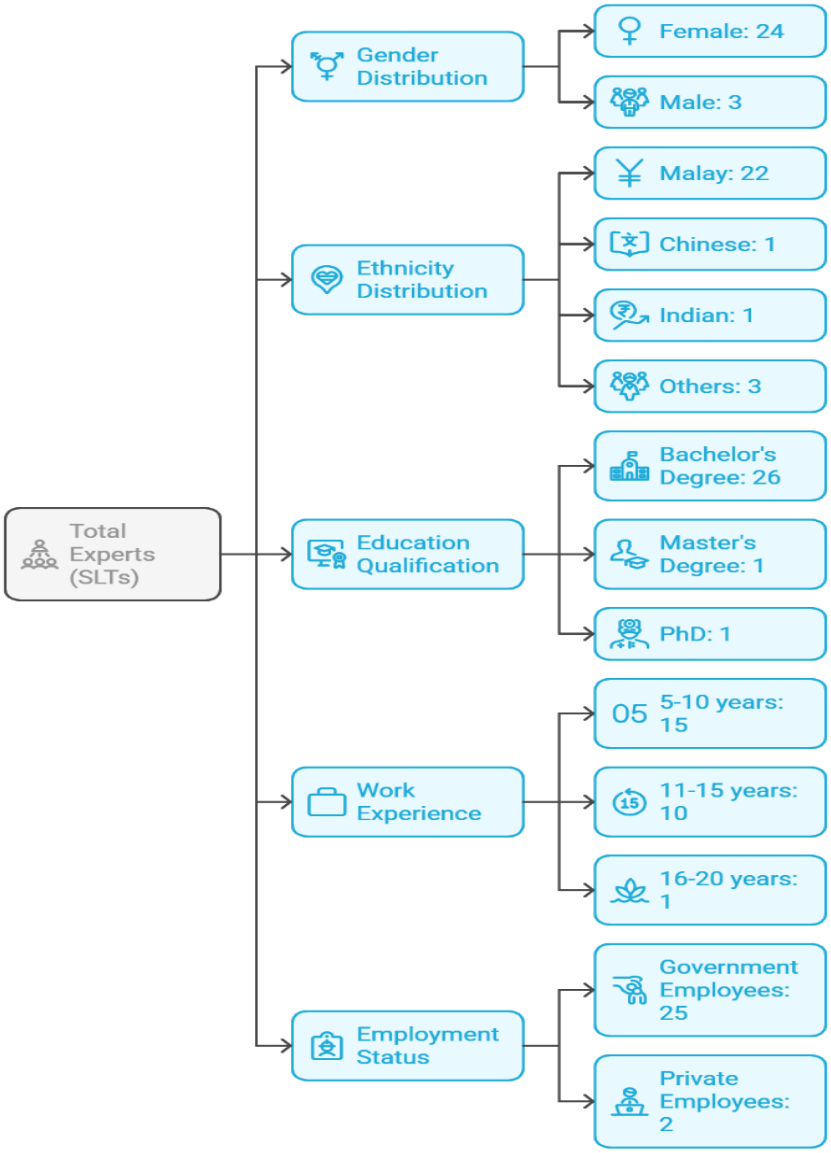

Figure 2: Background of the Designated SLTs Experts

1. Independent Idea Generation – Participants independently generate ideas by responding to stimulus questions.
2. Round-Robin Sharing – Ideas are shared sequentially in a round-robin format without discussion.
3. Definition and Clustering – Each idea is clarified, defined, and grouped into related categories.
4. Prioritisation through Voting – Participants vote to rank ideas based on priority.
5. Final selection and consensus – All participants' votes are concluded

This structured process ensures a systematic and inclusive approach to gathering expert opinions and identifying key priorities. Refer to Figure 3.

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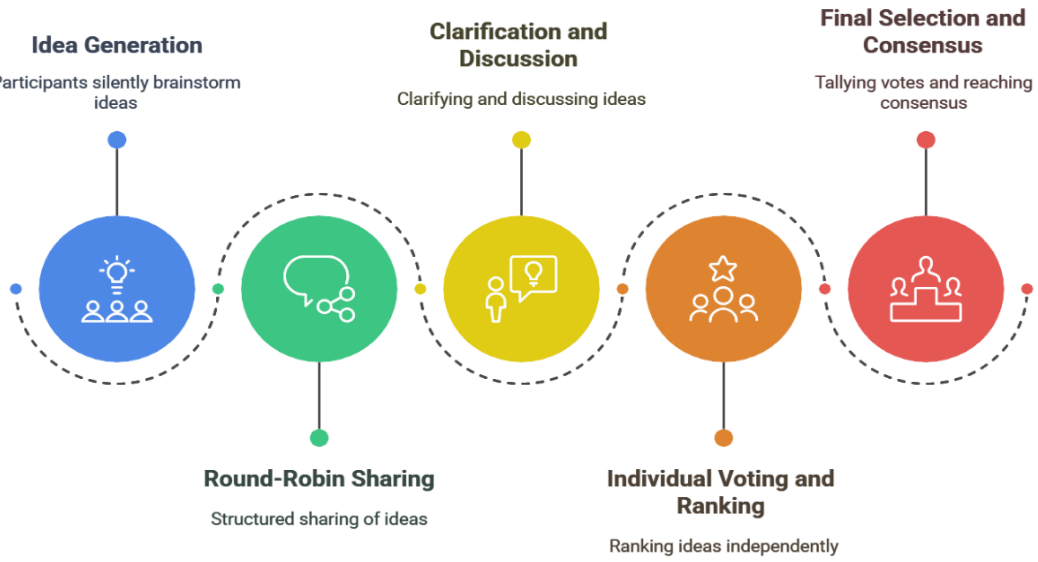

Figure 3: Five Basic Steps of NGT

Step 1: After the primary researcher explained briefly the PICA Model, including the objectives, methodology framework including the process of the design and development, and underlying theories or approaches, all 27 Malaysian SLTs were briefed to discuss and brainstorm ways to improve social communication in early interventions for children with ASD. Acting as the facilitator, the primary researcher instructed participants to generate ideas or suggestions independently and write them down quietly.

Step 2: Participants were asked to type their responses in the chat box, after which the primary researcher gathered them and displayed them on the screen for everyone to see.

Step 3: The primary researcher reviewed and highlighted each suggestion to ensure clarity. Some shared unclear concepts, requiring further clarification before proceeding to the next step.

Step 4: The primary researcher introduced a 7-Likert rating system to streamline the ranking process. Each participant was asked to rank their seven preferred ideas using these cards through online voting. Per the standard NGT procedure, all participants were assigned a rank for each idea. After participants ranked their top ideas using this system, the ideas were generated, listed, and clarified following the procedures in Steps 1 to 3.

Step 5: The primary researcher summarises the result based on voting collected from all the participants.

Data Analysis

Participants discussed the concepts and corresponding questions presented in categorised sets. Following this discussion, they voted on each item based on their viewpoints. Each item in the component required responses from seven options of Likert Scale: 1 - Absolutely Not Suitable, 2 - Very Not Suitable, 3 - Not Suitable, 4 - Slightly Suitable, 5 - Suitable, 6 - Very Suitable, and 7 – Absolutely Suitable. The participant's total agreement score is based on the Likert scale, then calculated to determine the agreement consensus percentage for each item, with at least 70% achieved for an item considered suitable to be part of PICA Model elements.

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This study presents five key components of the PICA Model: Training Objectives, Children's Social Communication, Parents' Communication Knowledge, Parent-Child Interaction Skills, and Training Supports and Generalisation. A set of specific items represents each concept. The first category, Training Objectives, consists of nine items, while Children's Social Communication also includes nine items. Parents' Communication Knowledge and Parent-Child Interaction Skills contain three items, whereas four represent Training Supports and Generalisation.

The data analysis involved calculating the numerical values of the voting marks provided by the respondents, which were then converted into percentage format. These votes were quantitatively analysed using a ranking procedure to prioritise ideas. The final results reflected the voting marks assigned by experts, transformed into percentage values, and compared against evaluation criteria established in the literature.

A minimum score of 70% was required, representing the approved threshold in the Nominal Group Technique (NGT). This range must align with expert opinions, where acceptance of suitability and usability is determined based on the percentage score value, ensuring that the measured element's applicability exceeds 70%. Additionally, the findings were organised based on the overall scores obtained, allowing for the prioritisation of elements according to their significance.

Findings

Table 1 presents the analyses of the nine training objectives, including the evaluation of their total responses, percentage (%) of acceptance, ranking, and acceptance status. Most objectives (Objectives 1, 2, 3, 5, and 7) achieved 96.8%, indicating strong agreement of suitability designated training objectives in the PICA model. Objectives 4 and 8 had the highest percentages (97.4%), suggesting higher agreement of suitability among respondents. Objective 6 had the lowest percentage (95.8%) but remained within an acceptable range. The ranking scores vary, with most objectives scoring at the same ranking, number 3, while Objectives 4 and 8 were ranked at number 1, implying they were highly prioritised. All objectives were perceived by SLTs as suitable for inclusion as training objectives in the PICA model, demonstrating overall consensus and validity of the objectives that focus on improving parental knowledge, skill, confidence, and competence.

Table 1: PICA Model Training Objectives

No.	Component: Training Objectives	Total Score	Percentage %	Rank	Evaluation Status
1	To enhance parents' knowledge of communicative behaviour in parent-child interactions	183	96.8	3	Suitable
2	To enhance parents' knowledge of evidence-based communication strategies in parent-child interactions	183	96.8	3	Suitable
3	To improve parents' use of learned strategies in parent-child interactions	183	96.8	3	Suitable
4	To increase parents' competence to implement the strategies they have learned in their daily interactions with their children at home	184	97.4	1	Suitable

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5	To improve the communicative behaviour of parents in parent-child interactions	183	96.8	3	Suitable
6	To increase parents' confidence in implementing the strategies they have learned in their daily interactions with their children	181	95.8	9	Suitable
7	To apply parents' problem-solving approaches in implementing the strategies learned in daily interactions with children at home and in other settings	183	96.8	3	Suitable
8	To enhance parents' knowledge of their children's social communication skills development	184	97.4	1	Suitable
9	To apply the strategies learned with children in different social environments, people (e.g., important caregivers such as siblings and grandparents), and contexts	182	96.3	8	Suitable

Table 2: Children's Social Communication

No.	Component: Children's Social Communication	Total Score	Percentage %	Rank	Evaluation Status
1	Interaction	188	99.5	1	Suitable
2	Communication Modalities	186	98.4	5	Suitable
3	Receptive and Expressive Language	187	98.9	3	Suitable
4	Communication Function	188	99.5	1	Suitable
5	Play	187	98.9	3	Suitable
6	Eye Gaze	179	94.7	8	Suitable
7	Affection	176	93.1	9	Suitable
8	Imitation	184	97.4	6	Suitable
9	Communication development milestones	183	96.8	7	Suitable

From Table 2, the analyses of nine items in children's social communication component showed that the Interaction and Communication Function item had the highest agreement (99.5%), indicating strong consensus on their importance as training content of the PICA model. Receptive and Expressive Language (98.9%) and Play (98.9%) also received high agreement of suitability. The lowest agreement was for Affection (93.1%) and Eye Gaze (94.7%), suggesting variability in SLTs' perspectives. The ranking scores varied, with Interaction (1) and Communication Function (1) sharing the highest rank. The experts approved all items, demonstrating broad agreement on their relevance in social communication development for children with Autism. Additionally, these findings aligned with Training Objective 8, which collectively gathered the highest percentage of agreement on the suitability of the social communication content in the PICA model.

Table 3 below shows an analysis of three items under the component of parent's communication knowledge related to parent-child interaction (PCI) in naturalistic settings. PCI in a naturalistic

Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
Journal of Islamic, Social, Economics and Development (JISED)
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Journal website: www.academicinspired.com/jised
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setting received the highest agreement (98.9%) and ranked first, indicating its importance to be part of the content in the PICA model. Items of Communication Function in PCI followed with 98.4%, ranked second, while Environmental Adaptation scored 97.4%, ranking third. All items were approved by SLTs as experts in PICA model evaluation, demonstrating strong consensus and agreement on its suitability and usability. Besides, this training content aligns with Training Objectives 1 and 2, which focus on improving parental knowledge.

Table 3: Parents' Communication Knowledge

No.	Component: Parents' Communication Knowledge	Total Score	Percentage %	Rank	Evaluation Status
1	Parent-child interaction in naturalistic interactions	187	98.9	1	Suitable
2	Environmental adaptation in naturalistic interactions	184	97.4	3	Suitable
3	Communication function in parent-child interactions	186	98.4	2	Suitable

Table 4 presents the analysis of three items related to parent-child interaction skills. The reflective practice received the highest agreement (98.4%) and ranked first, highlighting the higher agreement of its suitability and usability among SLTs. Communicative Behaviours in PCI followed with 97.9%, ranked second, while evidence-based strategies in social communication (SC) had 96.3%, ranking third. All items were approved, indicating a strong consensus to include them as content in the PICA model, corresponding to Training Objectives 3 and 5, which stressed enhancing parental skills.

Table 4: Parent-Child Interaction Skill

No.	Component: Parent-Child Interaction Skill	Total Score	Percentage %	Rank	Evaluation Status
1	Social communication evidence-based strategies in parent-child interactions	182	96.3	3	Suitable
2	Reflective practice through coaching and feedback in parent-child interactions	186	98.4	1	Suitable
3	Communicative behaviours in parent-child interactions	185	97.9	2	Suitable

Lastly, the data in Table 5 showed four items related to training support and generalisation, mental health, and intervention effectiveness. Monitoring mental health, supporting fidelity, and increasing intervention perception all received 96.3% agreement and ranked first, indicating their high importance in supporting parental engagement towards the PICA model. Support generalisation had the lowest percentage (94.2%) and ranked fourth. All items were approved by all 27 SLTs, as highly suitable and usable as the PICA model's training content. The findings support the suitability of Training Objectives 4,6,7, and 9, highlighting empowering parental confidence and competency in delivering knowledge and skill at home.

Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
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Table 5: Training Support and Generalization

No.	Component: Training Supports and Generalization	Total Score	Percentage %	Rank	Evaluation Status
1	Monitoring (screening) of parents' mental health status for readiness during and after program implementation	182	96.3	1	Suitable
2	Supporting the fidelity of parents in the implementation of the intervention	182	96.3	1	Suitable
3	Support generalisation of the intervention across different activities, settings, or/and significant others	178	94.2	4	Suitable
4	Increase parents' perception (e.g., satisfaction, acceptance) of intervention by acquiring sufficient knowledge and able to implement strategist with their children	182	96.3	1	Suitable

Discussion

The findings indicate a strong agreement consensus among SLTs on the suitability and usability of the training objectives and four training content components developed in the PICA model. The high agreement percentages, ranging from 93.1% to 99.5%, validate the relevance and high consensus among SLTs as experts and intended users of the PICA Model. As seen in Table 1, most objectives achieved 96.8% agreement, with Objectives 4 and 8 scoring the highest at 97.4%. These findings suggest that SLTs perceive these objectives as particularly important. Although Objective 6 had the lowest percentage (95.8%), it remains within an acceptable range, confirming the overall suitability of the training objectives in the PICA model.

The ranking scores indicate that specific objectives are prioritised over others, reflecting the SLTs' clinical perspectives on training objectives. For example, parents must acquire sufficient knowledge (Objectives 1, 2, 8) and skill (Objectives 3, 5) to be a competent (Objectives 4, 7) implementor of intervention at home. These findings are supported by the ranking of priorities in which all SLTs mutually agreed on training objectives related to knowledge and skill to be among the earliest objectives to achieve among the other training objectives.

Table 2 highlighted the strong agreement for 'Interaction' and 'Communication Function' (99.5%), suggesting that these elements are fundamental to early intervention strategies in Children's Social Communication components. High agreement for 'Receptive and Expressive Language' and 'Play' (98.9%), followed by 'Communication Modalities,' 'Imitation,' and 'Communication Development Milestones', further underscores the necessity of these components in supporting communication development. However, the slightly lower agreement for 'Affection' (93.1%) and 'Eye Gaze' (94.7%) suggests variability in SLTs' perspectives. These findings may stem from differing clinical approaches or varying levels of emphasis placed on these skills in current intervention models (Hampton et al., 2021). Despite these differences, all items were approved, reinforcing their relevance as part of social communication content in the PICA model.

The data in Tables 3 and 4 showed results from parent-child interaction (PCI) components of knowledge and skill, with knowledge of PCI in naturalistic settings receiving the highest agreement (98.9%). These findings confirm that SLTs consider naturalistic parent-child

Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
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interactions essential for effective intervention. Reflective practice (98.4%) was also highly rated for the skill component, aligning with research emphasising the role of parental self-awareness in communication strategies (Meadan et al., 2022). The strong endorsement of PCI components indicates that equipping parents with structured training can enhance communication outcomes for children with ASD. However, the lower ranking for items in evidence-based strategies in social communication (96.3%) suggests that some SLTs may perceive challenges in training parents to implement evidence-based methods consistently, considering parents have different learning attitudes and capabilities.

As seen in Table 5, the training support and generalisation component was analysed. The items 'Mental Health Monitoring,' 'Fidelity Support,' and 'Intervention Perception' scored 96.3% each, highlighting their critical role in sustaining parental engagement and adherence to the PICA model. The lowest-ranked component, 'Support Generalization' (94.2%), may reflect challenges in ensuring parents apply learned skills across various contexts.

The findings suggest that while the PICA model is able to support parents through knowledge and skills improvement, certain components, particularly in cultural adaptation and generalisation of learned skills, need further refinement. Generalisation remains a key issue in parent-implemented interventions, as parents may struggle to adapt strategies beyond structured training sessions (Hampton et al., 2021). These findings emphasise the need for targeted approaches to bridge the gap between training environments and real-world applications. Despite these challenges, all items were approved; thus, their significance in the PICA model as training objectives and contents is reinforced.

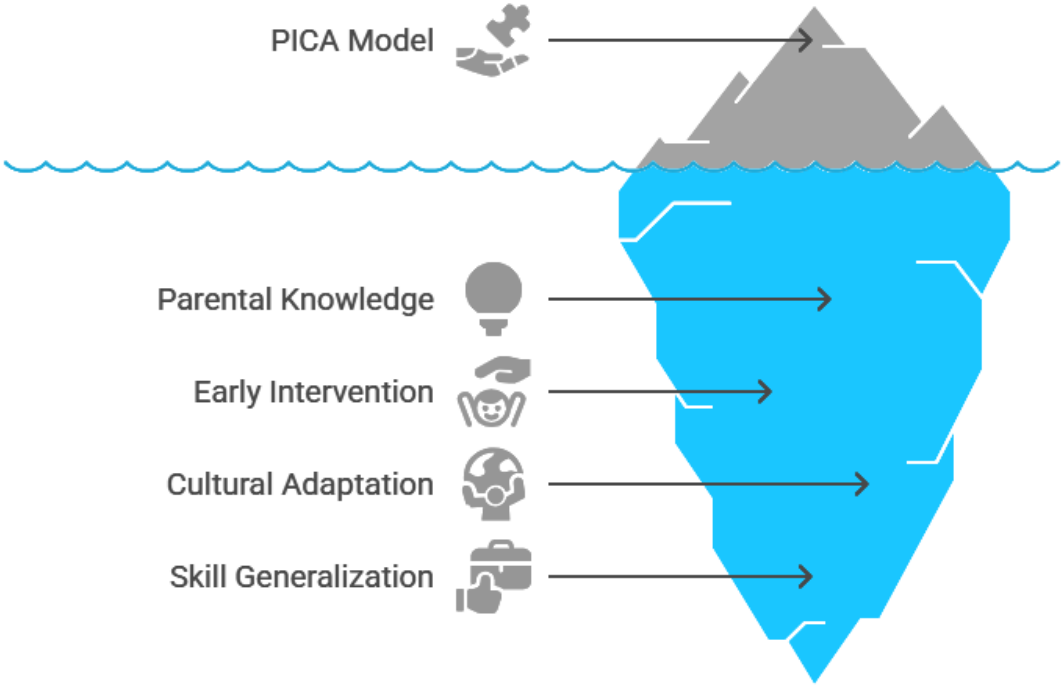

Figure 4: PICA Model Prioritization Areas

Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
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Suggestions for Researchers in the Future

Future research should explore the factors influencing variability in agreement levels to enhance the PICA model's effectiveness. The lower agreement percentages for 'Affection' (93.1%) and 'Eye Gaze' (94.7%) indicate that SLTs may have differing perspectives on the importance of these components. Further qualitative research could provide insights into whether these variations stem from differences in clinical training, intervention approaches, or parental engagement levels. By identifying the factors contributing to these differences, researchers can refine the model to ensure that all components are aligned with best practices in social communication interventions.

Another important recommendation is the development of strategies to improve generalisation in parent-implemented interventions. The findings suggest that parents may struggle to apply trained skills across various contexts, as evidenced by the lower agreement for 'Support Generalization' (94.2%). Future studies should explore the effectiveness of telehealth coaching, real-time feedback systems, and community-based reinforcement programs to facilitate skill transfer. Implementing structured follow-up sessions and providing parents with additional resources may help bridge the gap between training environments and daily interactions.

Additionally, cultural and socioeconomic factors should be further investigated to ensure that the PICA model is accessible to diverse populations. Socioeconomic constraints may affect parents' ability to participate in training, while cultural beliefs could influence perceptions of intervention strategies. Future research should examine how culturally responsive adaptations, such as language-specific training materials or culturally tailored coaching techniques, can enhance parental engagement. Studies have shown that culturally adapted interventions improve participation and long-term adherence in parent-implemented programs (Hampton et al., 2021).

Finally, incorporating technology-driven solutions into the PICA model may enhance accessibility and effectiveness. Digital platforms, such as mobile applications and virtual reality training models or modules, can provide parents with interactive and on-demand resources to support their learning. Recent studies have demonstrated that digital interventions improve parental confidence and adherence to communication strategies (Meadan et al., 2022). Future research should assess the feasibility of integrating digital training tools or Artificial Intelligence (AI) systems into the PICA model to maximise its reach and impact.

Contributions

This study empirically validates the PICA model's training objectives and contents components by demonstrating high levels of agreement among SLTs. The findings confirm the model's relevance in empowering parents in parent-led early intervention focusing on social communication outcomes for children with ASD. By aligning the training objectives and contents with SLTs' expert perspectives, this study contributes to the growing research on parent-implemented interventions, particularly in Southeast Asia.

One of the significant contributions of this study is knowledge. Identifying important areas to be prioritised within the training objectives, as displayed by the ranking system, provides a structured framework for understanding which components are most valued by SLTs. This insight can inform curriculum development for parent training programs, ensuring that key areas receive appropriate emphasis.

Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
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Additionally, integrating different theories, models, and approaches such as Parent-Implemented Interventions (PIIs), Sociocultural Theory, and Speech-Language Therapy as the foundation of PICA Model development, highlighting the importance of parents-professional collaboration and empowering parents in early intervention programs. Moreover, the PICA Model is tailored towards the different needs of the children with ASD and their parents. Aligning with Sustainable Development Goals (SDGs) 3 and 4 to improve healthcare and education for children with special needs.

Practically, the PICA model provides SLTs with evidence-based strategies and a flexible framework to support parents and enhance social communication in children with ASD. The PICA Model was developed based on professionals' perspectives, accommodating their clinical practice and making it highly adaptable to diverse training and educational contexts.

Conclusion and Recommendation

The findings of this study demonstrate the high suitability and usability of the PICA model's training objectives and training content components, as perceived by Malaysian SLTs. However, variability in agreement levels suggests the need for further exploration of generalisation strategies, cultural adaptations, and technology-driven solutions.

Future research should explore ways to optimise these programs through technology-based interventions, improved therapist-parent collaboration, and long-term follow-up studies to assess the sustainability of outcomes. It is recommended that three key areas, generalisation, cultural adaptations, and technology integration, be focused on to enhance the PICA Model.

Firstly, generalisation should be prioritised by addressing the challenges in transferring skills learned in training environments to real-world situations. The findings underscore the importance of developing targeted approaches that address parental engagement challenges. By identifying these areas, this research lays the groundwork for future studies to refine intervention models for diverse populations.

Secondly, cultural responsiveness elements are needed in parent-implemented intervention practise. Cultural adaptations are essential to ensure that the diverse cultural needs of the families involved are met and that they are relevant and practical across different contexts.

Lastly, technology integration offers an excellent opportunity for innovation, making the interventions more interactive and responsive. The endorsement of digital solutions in existing literature suggests that incorporating virtual training tools could enhance accessibility and effectiveness. This study's insights provide a foundation for future research on the role of technology, including AI-based applications, in parent-implemented communication interventions.

By addressing these areas, future research can optimise the PICA model, ensuring it remains a practical and accessible framework for parent-implemented interventions. Through an iterative process of refining these strategies, professionals can ensure that more parents of children with ASD receive practical, adaptable, and accessible communication support throughout their endless journey.

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Volume: 10 Issues: 72 Special Issue [April, 2025] pp. 46 - 61
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