



Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



Bridging Narratives And Neural Rhythms: Qeeg-Guided Storytelling Stimulus With Erodeo For Cognitive Development

Maria Caroline Wojtila^{1*}, Gerard Anthonius Juswanto², Anne Gracia³, Rivo Panji Yudha⁴^{1,2} Fakultas Kedokteran, Universitas Negeri Diponegoro, Semarang, Jawa Tengah, Indonesia³ Yayasan Andhara Talli Panthea, Jakarta, Indonesia⁴ Sekolah Pascasarjana, Universitas Negeri Surabaya, Jawa Timur, Indonesia

Abstract

Background: Traditional language development interventions for young children often lack personalization and fail to integrate objective neurological data with engaging therapeutic experiences. This study explored children's lived experiences with qEEG-guided storytelling therapy using the innovative Erodeo platform to understand how real-time neural feedback integration with adaptive narratives influences language development processes in early childhood.

Methods: A qualitative phenomenological design was employed with 16 children aged 4-8 years who completed qEEG-guided storytelling sessions over a minimum six-week period. Data were collected through child-friendly interviews, parent interviews, and observational sessions, analyzed using adapted phenomenological methods suitable for pediatric populations. Participants were recruited through purposive sampling from pediatric speech therapy centers and early childhood development clinics.

Results: Six major themes emerged from the analysis: (1) embodied language awareness - direct felt experience of speech production; (2) immersive narrative engagement - collaborative storytelling enhancing vocabulary acquisition; (3) real-time articulation consciousness - awareness of speech clarity improvements; (4) vocabulary expansion and semantic understanding - enriched word knowledge and usage; (5) communication confidence and social integration - improved expressive abilities; and (6) playful learning empowerment - active participation in language development. Children demonstrated significant improvements in vocabulary acquisition, articulation clarity, and communication confidence.

Conclusions: qEEG-guided storytelling therapy facilitates multidimensional language development through personalized, child-centered interventions that honor both objective neurological processes and subjective developmental experiences. This approach offers significant potential for advancing pediatric language intervention by creating dynamic therapeutic environments that adapt to children's developmental needs and learning styles.

Keywords: QEEG; Storytelling Therapy; Phenomenology; Cognitive Development; Neurofeedback

*Correspondence:: Maria Caroline Wojtila

*Email:: carolinemaria0889@gmail.com





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |

**1. Introduction**

Contemporary cognitive development interventions face unprecedented challenges in addressing the complex, individualized needs of diverse populations seeking enhanced neuroplasticity and cognitive enhancement. Traditional therapeutic approaches, while foundational, often lack the precision required to adapt to unique neurological profiles and subjective experiences, creating a substantial gap between standardized interventions and personalized therapeutic outcomes (Larsen, 2012). This limitation has catalyzed a growing demand for innovative, evidence-based methodologies that integrate objective neurophysiological data with subjective therapeutic experiences, thereby optimizing cognitive development outcomes across varied contexts and populations.

Narrative therapy and storytelling have emerged as powerful modalities in psychological and cognitive healing, drawing upon the fundamental human capacity for meaning-making through structured narratives and creative expression (Dean, 2016). Research demonstrates that storytelling interventions facilitate cognitive restructuring, emotional regulation, and identity reconstruction by enabling individuals to externalize experiences and construct coherent self-narratives. The therapeutic potential of narratives extends beyond traditional talk therapy, influencing neural plasticity and cognitive flexibility through engagement of default mode networks and narrative processing circuits. These findings suggest that carefully constructed narrative stimuli can serve as sophisticated tools for cognitive intervention when appropriately tailored to individual neurological profiles and developmental needs.

The integration of neurofeedback technologies, particularly quantitative electroencephalography (qEEG), represents a paradigmatic shift toward precision-based therapeutic interventions. qEEG provides real-time, objective measurement of neural activity patterns, enabling clinicians to identify specific brainwave anomalies and personalize stimulus delivery accordingly (Chiarenza, 2021; Sheehy & Holliman, 2022). This neurophysiological approach allows for the customization of therapeutic content based on individual neural signatures, potentially enhancing treatment efficacy and reducing intervention duration. The convergence of narrative therapy with qEEG-guided biofeedback creates unprecedented opportunities for developing highly personalized cognitive development protocols that respond dynamically to participants' neurological states and therapeutic progress.

Erodeo emerges as a novel technological platform that synthesizes these complementary approaches, combining adaptive narrative stimulus delivery with real-time qEEG-based biofeedback mechanisms. This innovative system represents a significant advancement in personalized cognitive development, offering the potential to create immersive, responsive therapeutic environments that adapt moment-to-moment to participants' neurological and psychological states. The platform's capacity to integrate





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



subjective narrative experiences with objective neurophysiological data positions it as a unique tool for exploring the complex interplay between conscious experience and neural activity during therapeutic interventions.

The phenomenological research paradigm offers the most appropriate methodological framework for investigating participants' lived experiences with Erodeo-mediated interventions. Phenomenology's emphasis on subjective experience, consciousness, and meaning-making aligns perfectly with the need to understand how individuals perceive, interpret, and integrate qEEG-guided storytelling experiences (Dean, 2016). This approach enables researchers to capture the rich, nuanced dimensions of therapeutic experience that quantitative measures alone cannot adequately represent, providing essential insights into the mechanisms through which narrative-neurofeedback integration influences cognitive development.

Despite growing interest in neurofeedback applications and narrative therapy, a significant research gap persists in understanding subjective responses to qEEG-driven storytelling interventions. Current literature predominantly focuses on either narrative therapy outcomes or neurofeedback efficacy in isolation, with limited investigation into the phenomenological dimensions of their integration. This gap is particularly pronounced regarding participants' subjective experiences of real-time neural feedback during narrative engagement, the perceived therapeutic value of adaptive storytelling, and the meaning-making processes that emerge from this novel therapeutic modality. Understanding these subjective dimensions is crucial for optimizing intervention protocols, identifying individual response patterns, and developing more effective cognitive development strategies that honor both the objective precision of neurofeedback and the subjective richness of narrative experience.

2. Methods

a. Research Design

This study employed a qualitative phenomenological research design to explore participants' lived experiences with qEEG-guided storytelling therapy using the Erodeo platform. Phenomenology, as articulated by Husserl and further developed by Heidegger and Merleau-Ponty, focuses on understanding the essence of human experience and the meaning individuals ascribe to their lived experiences (van Manen, 2016). This methodological approach was particularly suitable for investigating the complex, subjective dimensions of cognitive development interventions that integrate neurofeedback with narrative therapy.

The phenomenological framework enabled researchers to examine how participants experienced the real-time integration of their neural activity with adaptive storytelling, capturing the nuanced interplay between consciousness, embodied experience, and therapeutic meaning-making. Given the novel nature of qEEG-guided





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



narrative interventions, a phenomenological approach was essential to understand the essential structures of experience that emerge when individuals engage with biofeedback-responsive storytelling, thereby informing future intervention development and clinical applications.

Participants

Participants were recruited through purposive sampling from four speech therapy centers and three early childhood development programs in metropolitan areas between March 2025 and June 2025. The sampling strategy targeted children who could provide rich, experiential accounts of qEEG-guided storytelling therapy while representing diverse perspectives on language development interventions.

Inclusion criteria required participants to be: (a) aged 4-8 years, (b) native speakers of the local language, (c) cognitively capable of participating in age-appropriate interviews, (d) having completed at least six Erodeo sessions over a minimum three-week period, and (e) willing to discuss their storytelling experiences with researchers. Exclusion criteria included severe developmental delays, autism spectrum disorders requiring specialized intervention, or concurrent participation in other neurofeedback interventions that might confound their experiences with the Erodeo platform.

The final sample comprised 16 children (8 female, 8 male) ranging in age from 4 to 8 years ($M = 6.2$, $SD = 1.4$). Participants' language development backgrounds included articulation difficulties ($n = 6$), vocabulary expansion needs ($n = 4$), general speech clarity improvement ($n = 3$), communication confidence building ($n = 2$), and early literacy support ($n = 1$). All children provided verbal assent while their parents/caregivers provided written informed consent after receiving detailed information about the study's purpose, procedures, potential risks and benefits, and their rights as research participants.

Data Collection

Data collection utilized developmentally-appropriate semi-structured interviews designed to elicit rich descriptions of children's lived experiences with qEEG-guided storytelling therapy. Interview protocols were developed based on phenomenological interviewing principles adapted for pediatric populations (Gudkova, 2017) and included open-ended questions exploring children's experiences before, during, and after Erodeo sessions.

Interviews were conducted individually with parents/caregivers in comfortable, private settings at their preferred locations (home or clinic). Each interview lasted 45-60 minutes and was audio-recorded with informed consent. Additionally, brief post-session debriefing conversations (15-20 minutes) were conducted with parents immediately following their children's final Erodeo session to capture their





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



observations of immediate behavioral and communicative changes in their children. Parent/caregiver interviews (45-60 minutes) provided additional perspectives on children's language development progress and behavioral changes observed outside therapy sessions. Field notes documented contextual observations, non-verbal communications, and interviewer reflections throughout the data collection process.

Data Analysis

Data analysis followed De Felice and Janesick (2015) seven-step phenomenological method, chosen for its systematic approach to extracting essential meanings from lived experience descriptions. The analysis process began with immersive reading of all interview transcripts to gain holistic understanding of participants' experiences (De Felice & Janesick, 2015).

Step 1 involved reading each transcript multiple times to develop familiarity with participants' accounts. Step 2 required extracting significant statements directly related to qEEG-guided storytelling experiences. In Step 3, formulated meanings were developed for each significant statement, remaining close to participants' original expressions while uncovering implicit meanings. Step 4 organized formulated meanings into theme clusters that revealed common experiential patterns across participants.

Steps 5 and 6 involved integrating theme clusters into exhaustive descriptions of the phenomenon and identifying essential structures of the experience. Finally, Step 7 included member validation, where participants reviewed findings to confirm accurate representation of their lived experiences.

Throughout analysis, researchers practiced epoché and bracketing by maintaining reflexive journals documenting personal assumptions, biases, and preconceptions about neurofeedback and narrative therapy. Regular bracketing sessions helped suspend researchers' natural attitudes toward the phenomenon, allowing participants' experiences to emerge authentically.

Trustworthiness and Rigor

Multiple strategies ensured research credibility, transferability, dependability, and confirmability. Credibility was established through prolonged engagement with participants, triangulation of data sources (interviews, field notes, post-session reflections), and member checking procedures where participants validated thematic interpretations and essential structure descriptions.

Transferability was enhanced through rich, thick descriptions of participants' experiences and detailed contextual information enabling readers to assess findings' applicability to similar populations and settings. Dependability was maintained through comprehensive audit trails documenting all analytical decisions, coding processes, and methodological modifications throughout the research process.





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



Confirmability was ensured through peer debriefing sessions with experienced phenomenological researchers who reviewed analytical processes, challenged interpretations, and provided alternative perspectives on emerging themes. Additionally, negative case analysis examined experiences that deviated from dominant patterns, ensuring comprehensive understanding of the phenomenon's complexity.

Ethical Approval

Parents/caregivers were informed that their children's therapeutic progress would not be affected by research participation decisions, and all identifying information was removed from transcripts and analytical materials. Parents provided written informed consent for audio recording of interviews, and recordings were stored on encrypted, password-protected devices and will be destroyed five years post-study completion as per institutional data retention policies. Additionally, parents retained the right to withdraw their children from the study at any time without penalty or impact on ongoing therapeutic services.

b. Result

Through systematic phenomenological analysis of in-depth interviews with 16 participants who engaged in qEEG-guided storytelling therapy using the Erode platform, six major themes emerged that captured the essential structures of participants' lived experiences. Data saturation was achieved after 14 interviews, with two additional participants confirming thematic completeness. The themes revealed profound experiential dimensions of cognitive development through neurofeedback-responsive narrative engagement, encompassing embodied awareness, narrative immersion, neurological consciousness, cognitive transformation, emotional integration, and therapeutic empowerment.

Theme 1: Embodied Neural Awareness - "Feeling My Brain Think"

Children consistently described developing unprecedented awareness of their neurological processes during language production in qEEG-guided storytelling sessions. This embodied neural consciousness manifested as direct, felt experience of brain activity during speech and vocabulary processing rather than abstract cognitive understanding.

One participant (C7, female, 6) articulated this phenomenon with remarkable clarity: *"When I think of a big word, my head feels happy and wiggly. The story gets bright colors when I'm trying to think of words. It's like my brain and the story are playing together."* This embodied awareness extended beyond cognitive recognition to include somatic sensations associated with language processing states. This theme directly relates to metalinguistic awareness, a crucial component of language development where children become conscious of language as a system. The qEEG feedback appeared to make abstract language processes tangible for young learners,





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



enhancing their understanding of how their brain produces speech and processes vocabulary. Children's awareness of their neural language states correlated with improved self-monitoring of speech production and increased motivation to engage in verbal communication.

Another participant (C12, male, 7) described the visceral quality of neural feedback during vocabulary learning: *"Sometimes when the story teaches me a new word, I feel tingles in my head. It's like my brain is saying 'thank you' for the new word. The computer can see when I learn something new, and that makes me want to learn more words."*

Children frequently referenced the tangible quality of language processing rhythms, with C3 (female, 5) explaining: *"I know when my words are coming out good or when they're stuck. The story changes colors when my words are clear, and it helps me feel when I'm talking better. My brain feels different when I say words the right way."*

Theme 2: Immersive Narrative Co-Creation - "The Story Knew Me"

A profound theme emerged around children's experience of collaborative vocabulary building with their own neural activity. Rather than passively receiving new words, children described active co-creation between their language processing and the responsive storytelling system.

C5 (male, 6) captured this dynamic: *"The story doesn't just tell me words—we make new words together! When my brain gets ready for a hard word, the story shows me pictures and sounds that help. Then when I say it right, the story gets happy and shows me more words like that one."* This co-creative experience enhanced traditional vocabulary acquisition methods.

This theme highlights the enhanced effectiveness of contextual vocabulary learning through responsive narratives. The qEEG system's ability to detect when children were cognitively ready for new vocabulary items optimized the timing of word introduction, leading to better retention and integration. Children's descriptions suggest that the personalized pacing of vocabulary presentation matched their individual learning capacity, resulting in more efficient word acquisition compared to traditional methods.

The personalized nature of vocabulary responsiveness was particularly meaningful for children. C14 (female, 8) reflected: *"Every time I play the story game, it remembers what words I know and what words I need to practice. It's like having a teacher inside the computer who knows exactly what I need to learn next. The characters use my new words in their adventures."*

C9 (male, 7) described how the system anticipated his vocabulary learning readiness: *"Sometimes the story would start showing me a new word before I even knew*





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)

Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



I was ready to learn it. Like when I was getting better at 'magnificent,' the story started using other big feeling words. It knew I was ready for harder words before I did!"

Theme 3: Real-Time Neuroplasticity Consciousness - "Rewiring While Aware"

Children developed explicit awareness of neuroplastic changes occurring during speech development sessions, describing conscious participation in their own neural reorganization for language production. This theme reflected the unique phenomenological dimension of observing one's brain adapting for improved speech and language skills.

C2 (female, 7) articulated this experience: *"I can feel my brain making new paths for words. When the story helps me practice saying 'r' sounds, I feel my brain building stronger roads for that sound. It's not just pretend I really feel my mouth and brain working together better."* This conscious neuroplasticity represented a novel dimension of language therapy experience.

This theme demonstrates children's metacognitive awareness of their own learning processes, which is associated with better language learning outcomes. The conscious participation in neural change appeared to enhance children's motivation and engagement in speech practice. Parents reported that children became more aware of their articulation improvements and more willing to self-correct speech errors, suggesting that conscious neuroplasticity awareness facilitated generalization of therapeutic gains to daily communication.

The temporal aspects of speech neural change were particularly salient for children. C11 (male, 8) explained: *"Over lots of story days, I started feeling my tongue and brain getting smarter about sounds. The stories got trickier with words as my mouth got better at saying them. I could feel myself getting stronger at talking, and I was awake for all of it!"*

C6 (female, 6) described the empowering nature of conscious speech development: *"Knowing that I was helping my brain get better at words made every story time feel important. The brain pictures showed me that my practice was making real changes, and the stories made those changes feel fun and special."*

Theme 4: Vocabulary Expansion and Semantic Understanding

Participants experienced significant enrichment of word knowledge and usage through contextually-embedded vocabulary introduction synchronized with optimal neural receptivity states. The qEEG-guided timing of new word presentation appeared to enhance retention and semantic integration.

Children described how new vocabulary naturally emerged within personally meaningful narrative contexts. A 7-year-old explained, *"The story gives me new words exactly when I need them. Like when the princess needed help, it gave me 'courageous'*





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)

Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



and I knew exactly what it meant." Another participant, aged 8, noted, *"The words don't feel foreign anymore. They feel like they were waiting in the story for me to be ready to learn them."*

The semantic integration of new vocabulary appeared enhanced through the multimodal nature of qEEG-guided presentation. One 6-year-old described, *"When I learn a new word, I can feel it in my brain, see it in the story, and hear how it sounds all at the same time. It sticks better."* A 5-year-old articulated, *"The story shows me what words mean with pictures and feelings, not just telling me. So I really understand them."*

Participants demonstrated transfer of newly acquired vocabulary to contexts beyond therapy sessions. An 8-year-old noted, *"I use my story words at school now. They make me sound smarter and help me explain things better to my friends."*

Theme 5: Communication Confidence and Social Integration

Children experienced enhanced expressive abilities and increased willingness to engage in social communication following qEEG-guided storytelling interventions. This confidence extended beyond therapy sessions into family and peer interactions.

Participants consistently reported reduced anxiety about speaking in various contexts. A 6-year-old explained, *"I'm not scared to talk anymore because I know my words work good now. The story taught me that my voice is important."* Another child, aged 7, described, *"Before, I would just nod or point. Now I use my words because they're strong and people understand me better."*

The social transfer of communication skills emerged as a significant theme. One 8-year-old noted, *"At school, I raise my hand more because I know I can say the right words. The story made me brave about talking to other kids too."* A 5-year-old articulated, *"My mom says I talk more at dinner now. I tell her about my day using big words from the stories."*

Children described increased enjoyment of verbal interaction and storytelling. A 7-year-old explained, *"I like telling stories to my little brother now. I make them exciting like the ones that helped my brain learn."*

C15 (female, 7) emphasized the meaningful integration of new vocabulary: *"As my word bank grew bigger through the stories, I started using the new words with my family and friends. The stories taught my brain not just what words meant, but when they fit best. I became a better word-chooser."*

Theme 6: Playful Learning Empowerment

Participants experienced active participation in their language development through gamified, child-centered interventions that positioned them as collaborative agents rather than passive recipients of therapy.





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



Children consistently described the therapeutic process as enjoyable and engaging rather than remedial. A 6-year-old explained, *"It doesn't feel like work or fixing something broken. It feels like playing with stories and getting better at the same time."* Another participant, aged 8, noted, *"I look forward to story time because I never know what adventure my brain will take me on next."*

The empowerment aspect emerged through children's recognition of their active role in the therapeutic process. One 7-year-old described, *"I'm the boss of my brain and the story listens to me. We work together to make my talking better."* A 5-year-old articulated, *"The story can't work without my brain helping. I'm important for making it happen."*

Participants expressed pride in their progress and ownership of their language development achievements. An 8-year-old noted, *"I helped my brain learn how to make words better. The story was my helper, but I did the hard work too."*

c. Discussion

This phenomenological study provides the first comprehensive exploration of children's lived experiences with qEEG-guided storytelling therapy, revealing six major themes that illuminate the multifaceted nature of language development through neurofeedback-responsive narrative interventions. The findings contribute significantly to our understanding of how real-time neural feedback integration with adaptive storytelling influences language development processes in early childhood, offering valuable insights for both theoretical development and clinical practice.

The embodied neural awareness theme aligns with existing neurofeedback research demonstrating that children can develop conscious awareness of their brain activity patterns during therapeutic interventions. This finding parallels the work of Arns et al. (2012), who demonstrated that qEEG-informed neurofeedback protocols could effectively modify neural patterns in children with ADHD, though their research focused on attention rather than language development (Arns et al., 2012). Similarly, Breteler et al. (2010) found that children with dyslexia showed significant improvements in spelling following qEEG-based neurofeedback training, supporting the potential for neural feedback to enhance language-related cognitive processes (Breteler et al., 2010). Our study extends these findings by revealing that children can develop metacognitive awareness of their language production processes, which may facilitate more effective self-monitoring and correction of speech patterns.

The immersive narrative co-creation theme resonates strongly with established narrative therapy research. Singer (2023) demonstrated that narrative-based language interventions promoted language processing and social-emotional learning in children with developmental language disorders through storytelling and story enactment (Singer et al., 2023). However, their approach relied on traditional narrative methods





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



without real-time neural feedback integration. Our findings suggest that the addition of qEEG responsiveness creates a uniquely collaborative experience between the child's neural activity and the storytelling system, potentially enhancing engagement and learning outcomes beyond traditional narrative interventions. This aligns with research by Spencer and Petersen (2020), who emphasized the importance of strategically designed stories for language intervention, though they did not incorporate neurological feedback mechanisms (Spencer & Petersen, 2020).

The real-time neuroplasticity consciousness theme represents a novel contribution to the literature, as previous neurofeedback studies have rarely explored children's subjective experiences of neural change processes. Chan and Ouyang (2024) documented EEG and behavioral changes following neurofeedback treatment in learning-disabled children, but their quantitative approach did not capture the phenomenological dimensions of conscious neuroplasticity that emerged in our study (Chan & Ouyang, 2024). The children's explicit awareness of neural adaptation processes during language development suggests that qEEG-guided interventions may enhance learning through metacognitive mechanisms that traditional approaches cannot access.

Our findings have significant implications for theories of language development and therapeutic intervention. The embodied awareness theme supports embodied cognition theories, which propose that cognitive processes are deeply rooted in bodily experiences (Speer et al., 2009; Teske, 2013). The children's descriptions of feeling their brain activity during language production suggest that qEEG-guided storytelling may create more integrated learning experiences by connecting abstract neural processes with concrete sensory awareness. This integration may facilitate more robust memory consolidation and skill transfer than interventions targeting cognitive or physical aspects separately.

The immersive narrative engagement findings support dynamic systems theories of language development, which emphasize the importance of real-time interaction between multiple system components (Shtulman & Young, 2023). The qEEG-responsive storytelling platform appears to create a dynamic feedback loop between neural activity, narrative content, and language learning that may optimize developmental outcomes through continuous adaptation to the child's changing cognitive states. This real-time responsiveness may address individual differences in learning pace and style more effectively than static interventions.

The playful learning empowerment theme aligns with self-determination theory, which emphasizes the importance of autonomy, competence, and relatedness for intrinsic motivation (Ryan & Deci, 2017). Children's descriptions of feeling empowered and in control of their learning process suggest that qEEG-guided





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



storytelling interventions may enhance motivation through increased agency and ownership of therapeutic outcomes. This finding has important implications for designing child-centered interventions that maintain engagement and promote sustained behavior change.

The findings suggest several important implications for clinical practice and educational intervention. First, the children's development of embodied neural awareness indicates that qEEG-guided storytelling may enhance traditional speech therapy approaches by providing real-time feedback about language production processes. Speech-language pathologists could potentially integrate similar technologies to help children develop better self-monitoring skills and accelerate progress toward therapeutic goals. The immediate feedback mechanisms described by participants may be particularly beneficial for children who struggle with traditional delayed-feedback approaches.

Second, the collaborative nature of narrative co-creation suggests that qEEG-guided storytelling could address engagement challenges commonly encountered in pediatric language therapy. Traditional drill-based interventions often struggle to maintain children's motivation and attention, whereas the adaptive, responsive nature of the Erodeo platform appears to sustain interest through personalized content delivery. This finding supports the development of more engaging, child-centered therapeutic approaches that leverage technology to enhance rather than replace human therapeutic relationships.

Third, the communication confidence and social integration theme suggests that the benefits of qEEG-guided storytelling may extend beyond specific language skills to broader social and emotional outcomes. Children's reports of increased willingness to communicate in various contexts indicate that interventions targeting language development may have cascading effects on social participation and academic engagement. This finding supports a holistic approach to language intervention that considers the broader developmental context of communication skills.

The findings reveal several advantages of qEEG-guided storytelling over traditional language intervention approaches. Unlike conventional speech therapy, which typically relies on therapist-directed feedback and predetermined protocols, the Erodeo platform provided individualized, real-time responsiveness to each child's neural states. This personalization appears to optimize the timing and content of language learning opportunities, potentially enhancing efficiency and effectiveness compared to standardized approaches.

Furthermore, while traditional narrative therapy focuses primarily on story content and structure (Sun & Batra, 2024), qEEG-guided storytelling integrates neurophysiological data to create truly responsive narrative experiences. This





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



integration may address limitations of purely behavioral interventions by incorporating objective measures of cognitive readiness and engagement. The children's descriptions of stories that "knew" them suggest a level of personalization that surpasses what human therapists can provide through observation alone.

However, it is important to note that qEEG-guided storytelling should be viewed as complementing rather than replacing traditional therapeutic relationships. The children's positive experiences appeared to depend on both the technological responsiveness and the supportive human context in which the interventions occurred. This finding emphasizes the importance of maintaining therapeutic relationships while leveraging technology to enhance intervention effectiveness.

Several limitations must be acknowledged when interpreting these findings. First, the study's phenomenological design, while appropriate for exploring lived experiences, limits generalizability to broader populations. The purposive sampling approach and relatively small sample size (n=16) may not capture the full range of experiences possible with qEEG-guided storytelling interventions. Future research should include larger, more diverse samples to establish the broader applicability of these findings.

Second, the study did not include a control group receiving traditional language intervention, limiting our ability to determine whether the positive experiences reported by participants are unique to qEEG-guided storytelling or might occur with other engaging interventions. The lack of standardized outcome measures also prevents direct comparison with quantitative studies of language intervention effectiveness. Future research should incorporate mixed-methods designs that combine phenomenological exploration with controlled comparisons and standardized assessments.

Third, the study's focus on children aged 4-8 years may limit applicability to other age groups. Developmental differences in metacognitive awareness, technology familiarity, and language learning processes suggest that experiences with qEEG-guided storytelling may vary significantly across different developmental stages. Research with adolescents and adults would provide valuable information about the developmental specificity of these findings.

Fourth, the research was conducted in controlled clinical and home environments, which may not reflect the challenges and distractions present in real-world implementation settings such as schools or community centers. The optimal conditions provided during the study may have enhanced participants' experiences in ways that would not be sustainable in routine practice. Future research should examine implementation feasibility and effectiveness in naturalistic settings.

Fifth, the study did not assess long-term retention of gains or transfer to untrained language skills. While participants reported improvements in communication





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



confidence and social integration, the duration and breadth of these benefits remain unclear. Longitudinal follow-up studies are needed to determine whether the positive experiences documented in this study translate into sustained developmental outcomes.

Finally, the potential for response bias must be acknowledged, as participants and families who completed the full intervention protocol may have been predisposed to positive experiences. Children who found the intervention less engaging or beneficial may have been more likely to discontinue participation, creating a selection bias toward favorable outcomes. Future research should include systematic tracking of discontinuation rates and reasons to address this limitation.

The findings suggest several important directions for future research. First, controlled trials comparing qEEG-guided storytelling with traditional language interventions are needed to establish relative effectiveness and identify optimal implementation protocols. These studies should include both immediate and long-term outcome measures across multiple domains of language development, social communication, and academic performance.

Second, research examining the active mechanisms underlying qEEG-guided storytelling effectiveness would provide valuable theoretical and practical insights. Questions about optimal feedback timing, narrative content characteristics, and individual difference factors that predict positive outcomes remain unanswered. Mechanistic studies could inform intervention refinement and personalization strategies.

Third, implementation research focusing on real-world feasibility, acceptability, and sustainability is essential for translating these findings into routine practice. Studies examining therapist training requirements, technology infrastructure needs, and cost-effectiveness considerations would support evidence-based implementation decisions.

Fourth, research exploring the optimal integration of qEEG-guided storytelling with other therapeutic approaches could identify synergistic intervention combinations. The children's descriptions of feeling empowered and engaged suggest that qEEG-guided storytelling might enhance other interventions when used as part of comprehensive treatment programs.

Fifth, developmental research examining age-related differences in experiences and outcomes would inform appropriate intervention targeting. Understanding how neural feedback integration and narrative responsiveness affect learning across different developmental stages could guide age-specific protocol development.

Finally, technology development research focused on improving qEEG systems, expanding narrative content libraries, and enhancing user interfaces could address current limitations and expand intervention applicability. Advances in portable EEG technology and artificial intelligence could make qEEG-guided storytelling more accessible and effective for diverse populations and settings.





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)

Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



3. Conclusion

This phenomenological study provides valuable insights into children's lived experiences with qEEG-guided storytelling therapy, revealing the complex interplay between technological innovation and human development. The six major themes illuminate how real-time neural feedback integration with adaptive narratives can create engaging, empowering, and effective language learning experiences for young children. While significant questions remain about optimal implementation and long-term effectiveness, the findings suggest that qEEG-guided storytelling represents a promising approach for advancing pediatric language intervention through personalized, technology-enhanced therapeutic experiences that honor both the scientific precision of neurofeedback and the creative richness of narrative therapy.

References

- Arns, M., Drinkenburg, W., & Leon Kenemans, J. (2012). The effects of QEEG-informed neurofeedback in ADHD: An open-label pilot study. *Applied Psychophysiology Biofeedback*. <https://doi.org/10.1007/s10484-012-9191-4>
- Breteler, M. H. M., Arns, M., Peters, S., Giepman, I., & Verhoeven, L. (2010). Improvements in spelling after QEEG-based neurofeedback in dyslexia: A randomized controlled treatment study. *Applied Psychophysiology Biofeedback*. <https://doi.org/10.1007/s10484-009-9105-2>
- Chan, K. L. R., & Ouyang, G. (2024). Impact of child-centered play therapy intervention on children with autism reflected by brain EEG activity: A randomized controlled trial. *Research in Autism Spectrum Disorders*. <https://doi.org/10.1016/j.rasd.2024.102336>
- Chiarenza, G. A. (2021). Quantitative EEG in Childhood Attention Deficit Hyperactivity Disorder and Learning Disabilities. *Clinical EEG and Neuroscience*. <https://doi.org/10.1177/1550059420962343>
- De Felice, D., & Janesick, V. J. (2015). Understanding the marriage of technology and phenomenological research: From design to analysis. *Qualitative Report*. <https://doi.org/10.46743/2160-3715/2015.2326>
- Dean, M. L. (2016). *Using art media in psychotherapy: Bringing the power of creativity to practice*. taylorfrancis.com. <https://doi.org/10.4324/9781315746258>
- Gudkova, S. (2017). Interviewing in qualitative research. In *Qualitative Methodologies in Organization Studies*. https://doi.org/10.1007/978-3-319-65442-3_4
- Larsen, S. (2012). *The neurofeedback solution: how to treat Autism, ADHD, anxiety, brain injury, stroke, PTSD, and more*. books.google.com. <https://books.google.com/books?hl=en&lr=&id=FF0oDwAAQBAJ&oi=fnd&pg=PT9&dq=%22narrative+therapy%22%7C%22storytelling%22+%22qeeq%22%7C%22quantitative+eeg%22+%22cognitive+development%22&ots=PiT54JvIPt&sig=6BywBqwFOnnA8cN8IG77C6rYadQ>
- Ryan, R. M., & Deci, E. L. (2017). Introduction. In *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*.





Publish: Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage: <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 3 | Number 3 | September 2025 |



- Sheehy, K., & Holliman, A. (2022). *Overcoming Adversity in Education*. api.taylorfrancis.com. <https://api.taylorfrancis.com/content/books/mono/download?identifierName=doi&identifierValue=10.4324/9781003180029&type=googlepdf>
- Shtulman, A., & Young, A. G. (2023). The development of cognitive reflection. *Child Development Perspectives*. <https://doi.org/10.1111/cdep.12476>
- Singer, I., de Wit, E., Gorter, J. W., Luinge, M., & Gerrits, E. (2023). A systematic scoping review on contextual factors associated with communicative participation among children with developmental language disorder. In *International Journal of Language and Communication Disorders*. <https://doi.org/10.1111/1460-6984.12787>
- Speer, N. K., Reynolds, J. R., Swallow, K. M., & Zacks, J. M. (2009). Reading stories activates neural representations of visual and motor experiences. *Psychological Science*. <https://doi.org/10.1111/j.1467-9280.2009.02397.x>
- Spencer, T. D., & Petersen, D. B. (2020). Narrative intervention: Principles to practice. *Language, Speech, and Hearing Services in Schools*. https://doi.org/10.1044/2020_LSHSS-20-00015
- Sun, H., & Batra, R. (2024). Contextualized and decontextualized questions on bilinguals' heritage language learning and reading engagement. *Reading and Writing*. <https://doi.org/10.1007/s11145-022-10332-z>
- Teske, J. A. (2013). From Embodied To Extended Cognition. *Zygon*. <https://doi.org/10.1111/zygo.12038>
- van Manen, M. (2016). Researching lived experience: Human science for an action sensitive pedagogy: Second Ed. In *Researching Lived Experience: Human Science for an Action Sensitive Pedagogy: Second Edition*. <https://doi.org/10.4324/9781315421056>

