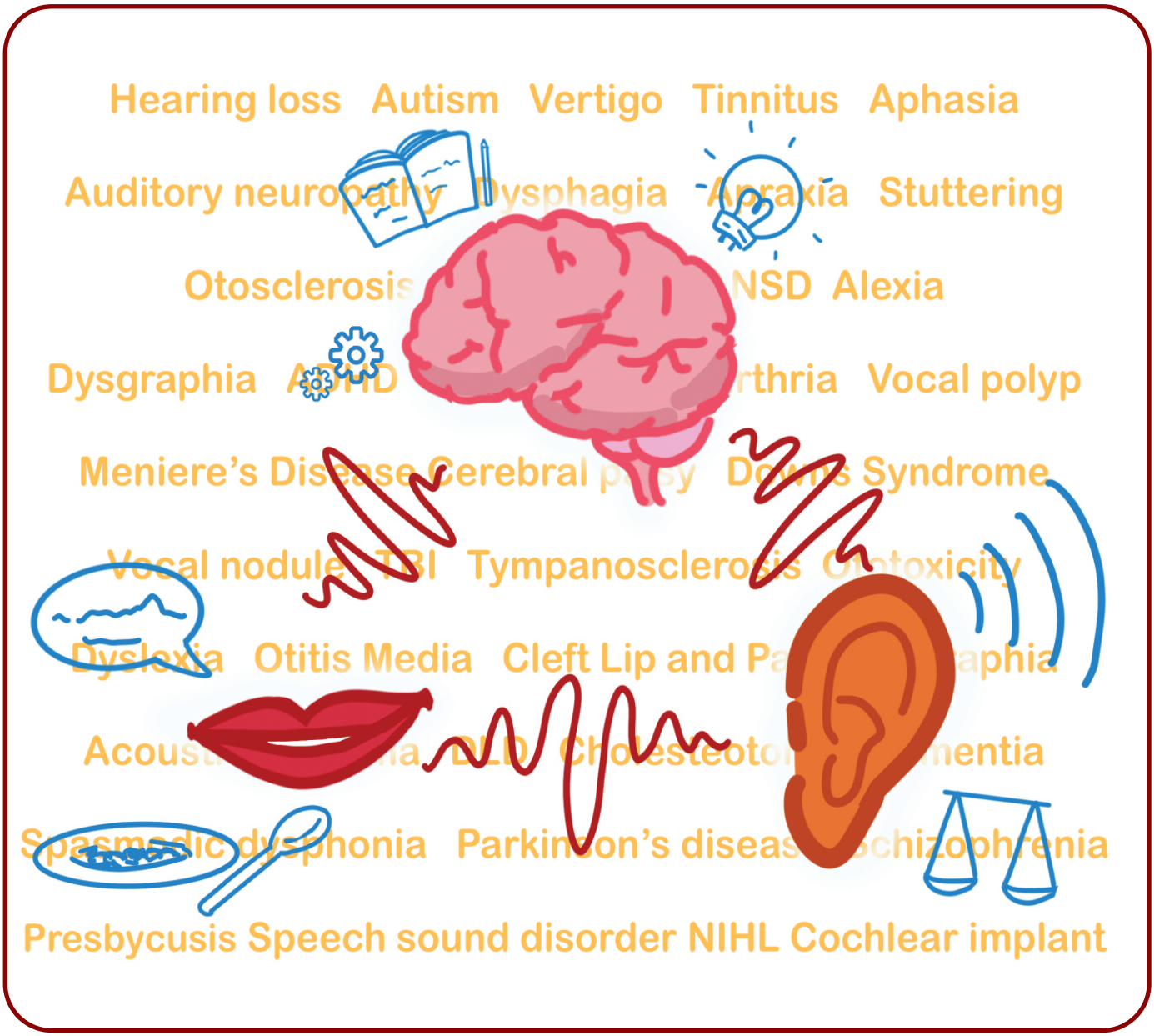
BANGALORE SPEECH AND HEARING TRUST

Journal of Hearing Language and Speech

ENGLISH HALF YEARLY

VOLUME 2 | ISSUE 1 | KARENG/2022/83838-BENGALURU | July-December 2023 | PRICE: Rs. 700/-



Information about the journal

The JHLS is a biannual publication of the Bangalore Speech and Hearing Trust.

Aims and Scope

JHLS publishes papers in both clinical and basic research related to hearing, balance, speech – language and swallowing. Articles accepted will be research articles, case studies, tutorials, perspective articles, policy and practice briefs and resource reviews. The articles selected will be peer reviewed. All articles are protected by copyright. Although care is taken in selection of articles, no legal responsibility for errors of omission will be accepted by either the author, editors, or publisher. No warranty is made for the content in the journal.

Contact - editor@jhls.src@speechear.org

Coverpage design :
Manasa R.B., MSc (SLP)

Editorial

Early identification is the key to more effective habilitation. Targeting neonates and infants in early identification of hearing loss and communication disorders would be of interest to clinicians and researchers. We begin with a perspective on neonatal hearing screening by Dr. Jayashree Seethapathy, and a tutorial on the role of hand gestures in the development of communication skills from Dr. Mili Mathew. It is planned to bring out articles focused on paediatric concerns in the following issues.

Scientific writing is not easy. Good reviewers promote research by their critical thinking shared as their inputs. The journal has been fortunate to get the inputs of Dr. M. N. Hegde, (the teacher of almost all our teachers) who suggested an exciting series on reviewing papers. The first is one by Dr. M. N. Hegde himself on reviewing Single Subject Designs. Single subject designs are often rejected and this article will educate not only reviewers but future authors. We need more reviewers who will give their time and knowledge and make paper submission a learning and exciting process.

I thank the experts for giving so willingly of their time. Their inputs will lay a strong foundation for the journal. I look forward to more inputs from the readers. The journal is available online.

Madhuri Gore
Editor
Dr. S. R. Chandrasekhar Institute
of Speech & Hearing

A perspective on neonatal hearing screening

Jayashree Seethapathy
SRIHER,
Porur, Chennai
jayashrees@sriramahandra.edu.in

The Joint Committee on Infant Hearing (JCIH) in 2007 recommended 1-3-6 guidelines; all infants should be screened prior to 1 month of age, diagnosed by 3 months of age and intervention initiated by 6 months of age. JCIH (2019) has recommended that states that met the 1-3-6 goal should strive to meet the new guideline of 1-2-3. In India, implementation of newborn hearing screening (NHS) has been attempted only in a few public and private sectors across the country. The implementation of NHS program varies across the country, with each program following a unique guideline. Though NHS is mandated, there are some barriers for implementing it universally across the country. The availability of equipment is one of the major challenges. In many tertiary care hospitals, and especially hospitals associated with graduate programs, there is an availability of screeners. In many other private birthing suites, hospitals, and especially in rural areas, the availability of equipment is questionable. The NHS remains successful in hospital-based programs, but in primary health care centres, and community-based programs it's still at the emerging level. NHS at villages, medical homes, and primary care health centres is offered along with vaccination programs.

Selective screening/ screening only high-risk infants poses a limitation as only 50% of infants with congenital hearing loss have high-risk factors. The JCIH also recommends a qualified NHS personnel. The standard of the NHS program is impacted by the lack of national and regional NHS databases and consistent data pooling. This results in a poor tracking system of refer babies for further evaluation and intervention, thereby increasing the loss to follow-up rate. As a result of the inadequate tracking mechanisms, infants with suspected hearing loss go undiagnosed. Very few screening facilities are available in rural areas, and in case of refer result, infants are recommended to undergo a detailed evaluation at the hospital where this facility is available. Various factors, such as distance to the referred hospital, fear of going to the big hospitals, poor guidance, travel, and test expenses, prevent these individuals from further evaluation. In many centres, the number of equipment and audiologists available for diagnostic evaluation is limited, resulting in fewer patients availing the services.

Progressive or late-onset hearing is not given much importance. JCIH (2019) has clearly listed the risk factors and the timeline for follow-up evaluations. Only audiologists working in the teaching institute are aware of these guidelines and feel the need for follow up evaluations. Preterm births are more common in rural areas, and the incidence of hearing loss in preterm infants is relatively high. Consanguinity continues to be practiced as a tradition in villages, and the risk of hearing loss resulting from consanguinity has not reached the community level and is ignored by health care professionals too. Consequently, hearing loss remains a low priority, with limited public awareness.

Many times, loss to follow up is blamed on the parent or family, but the flaw prevails in the system where the related medical professionals are not informed about the need for rescreening and diagnostic evaluation or there is a lack of interprofessional relationships. The success of the NHS program also lies in the relationship between the medical professionals, audiologists, personnel involved in screening, and the family. Effective communication is much needed for the successful execution of the NHS program.

In the majority of western countries, the NHS is done by a nurse. However, in India, audiologists are the personnel who are involved in screening. It is ideal that audiologists should oversee the program and they bear a greater responsibility in the implementation and evaluation of program outcomes. The majority of the valuable time of audiologists is spent on hearing screening, and the actual need to perform audiological evaluation and intervention is compromised due to a lack of manpower.

The compliance to hearing screening from parents and health care professionals is indeed a crucial element. Awareness and sensitization programs should be conducted for parents and health care professionals. Along with other mandatory tests for newborn, such as a thyroid test, medical professionals should feel the need for, and the importance of infant hearing. The government mandate for screening will further help in the implementation of a nationwide NHS program in India. We follow the quality indicators set by western countries. It will be more feasible and applicable if we have our own policies and quality indicators.

In many programs, hearing screening is performed only using OAEs and implementing the two-stage screening protocol is limited to hospitals that have sufficient resources. The two-stage screening, i.e., rescreening using other technology such as OAE or AABR prior to diagnostic referral may reduce the need to follow up. But due to the unavailability of equipment, two stage hearing screening is not uniformly followed.

The choice of screening tests such as OAE versus AABR screening, depends upon the screening population and the presence of risk factors. AABR screening is specifically recommended for NICU infants and also for infants with risk factors that cause auditory neuropathy spectrum disorder. Due to the unavailability of AABR screening, in the majority of screening centers, OAE is used in place of ABR screening. In one state, the diagnostic ABRs were used as a screening device, where they required electrode placement similar to diagnostic evaluation. Nurses or personnel involved in screening other than audiologists encounter challenges in preparing infants for electrode placement. Consequently, despite the availability of equipment, its usage remains questionable. The availability of automatic decision-making technology and in-built electrode facility devices should be made available. Equipment manufactured in other countries is expensive, so Indian-made low-cost devices such as Sohum hearing screening devices are needed to cater to the needs of the country.

Lack of resources, inadequate data management and tracking, lack of communication with health care and medical professionals regarding the requirement for follow-up evaluation, and

inconsistencies in documenting or reporting the test findings remain challenges in our country.

References

1. Joint Committee on Infant Hearing., 2007. Year 2007 position statement: Principles and guidelines for Early Hearing Detection and Intervention programs. *Pediatrics*, 120 (4): 898-921.

2. Joint Committee on Infant Hearing., 2019. Year 2019 position statement: Principles and guidelines for Early Hearing Detection and Intervention programs. *Journal of Early Hearing Detection and Intervention*, 4(2): 1-44

* * *

Role of Hand Gestures in the Development of Communication Skills

Mili Mathew
Communication Sciences and Disorders
Emerson College
Boston, MA, USA

Abstract

The aim of this tutorial is to introduce the readers to hand gestures and highlight their role in the early stages of communication development. The author discusses the developmental trends of gestures in children, the functions of gestures, and the dynamic relationship between gestural and spoken modalities in children. The tutorial also highlights the predictive quality of gestures which could help determine the nature of language impairments in children with communication disorders. Finally, SLPs and researchers are provided with solutions that could help establish gestures as a viable diagnostic and therapeutic marker to support children who have communication disorders, particularly within the context of the Indian subcontinent. This is important since cultural and linguistic factors can influence the development of gestures in children.

Keywords: Hand gestures, communication development, linguistic factors, deictic gestures, iconic gestures, cultural linguistic factors, multimodel.

Address for Correspondence: Mili Mathew Associate Professor, Communication Sciences and Disorders Emerson College, Boston, MA, USA email: mili_mathew@emerson.edu

Evidence suggests that many aspects of infant communication that are present within the first 18-24 months of life are critical for shaping language development. This points to the fact that early infant behaviors are meaningful, and can predict later communication development. These have indeed been established for behaviors such as eye-gaze, expression of emotions, and hand movements (Moreno-Núñez & Alessandroni 2021; Morales et al., 2000). Given this context, it is certainly important to document the developmental trajectories as well as the correlations between behaviors in order to better understand communicative capacities that emerge later in life. This tutorial aims to (a) highlight an important aspect of communication development in infants, i.e., hand gestures, (b) discuss the relationship between hand gestures and language development, and (c) discuss how we can apply this knowledge in our clinical practice. It should be noted that there are hand gestures, such as emblems, that are produced in isolation and do not accompany spoken output. The hand gestures discussed in this tutorial are those that co-occur with the spoken modality; i.e., they are produced when the person is speaking.

Why Study Hand Gestures?

Traditionally, hand gestures (referred to as gestures from here on) are said to function as communicative devices since they are a natural and meaningful part of spoken language. Several researchers suggest that gestures and speech form an integrated system both during language comprehension as well as production (Goldin-Meadow, 2003; Kendon 2004; McNeill, 2005). This integration is observed both temporally and semantically. Gestures are often produced and timed well with their linguistic counterpart and both modalities present the same meaning in real time (Butcher & Goldin-Meadow, 2003). McNeill (1992) posited that even though gestures and spoken language overlap they could differ in the manner in which information is conveyed during language production. Spoken modality is conventionalized and arbitrary, whereas, gestures are idiosyncratic and imagistic. However, despite these differences, both modalities are assumed to capture the same underlying cognitive process. Therefore, it is imperative that gestures are studied in the context of the spoken output they accompany.

Gestures that accompany spoken language can serve several functions (Goldin- Meadow, 1999). First, gestures can reflect the speakers' feelings and emotions (Friedman, 1979). Second, gestures produced during conversations reflect meaning (aligning with what is being spoken) and can aid in the comprehension of the message (Kendon, 2004). This suggests that listeners glean information from gestures (of the speaker) which helps them interpret messages, while also helping the speakers retrieve words from their memory (Rauscher et al., 1996; Iverson Golden-Meadow, 1998) as a way of reducing cognitive burden. Third, gestures have the potential to reflect meaning and ideas (e.g. concrete, abstract, imagistic or even information not represented in what is being conveyed) that are not directly conveyed in spoken language (Kendon, 2004; Crowder & Newman, 1993).

Historically, however, there has been debate about these modalities being an integrated system. For example, Krauss (1998) regards gestures and spoken language as separate systems and suggests that gestures only aid lexical access during language production. But evidence, particularly from research looking into the neural mechanisms for gesture-spoken language processing, supports the integrated existence of both modalities (Kelly et al., 2008).

Recent studies, in adults, document that gestures influence the neural processing (e.g. shared areas of activation such as the inferior frontal gyrus, middle and superior temporal gyri (Demir-Lira et al., 2018) during both language comprehension and production. The nature of this integration points to the strong possibility that gestures and spoken language form a single system even in young children. However, it must be noted that these modalities do not demonstrate synchrony from early on, and children demonstrate periods of asynchronous and synchronous relationship between the modalities. This is evidenced even in the brain regions recruited by children when engaged in comprehension tasks. When compared to adults, children recruited regions like the insula and the anterior frontal gyrus while making inferences about a speakers' gestures (Dick et al., 2012). This points to the possibility that the fluctuating relationship between gestural and spoken modalities in children could be linked to brain development. Therefore, children could demonstrate better synchrony with increased functional and

interactive specialization of brain regions responsible for both comprehension and production of gestures.

Gestures in Early Childhood

The repetitive motor activities of young infants towards the end of the first year of life, especially of the hand, begins to pave the way for mature, controlled and articulated movements which eventually leads to directed gestural communication. Infants begin to communicate intentionally, initially through hand gestures, and later with words (Gullberg, de Bot & Volterra, 2008). Early in development, deictic and iconic gestures are frequently used by children irrespective of their linguistic and cultural backgrounds (Bates et al., 1979; Kadiyali & Bellur, 2015; Mathew & Manjula, 2016). It must be noted that the development of these gestures is bound to be influenced by the culture and/or language backgrounds of children, and that the evidence discussed in this tutorial is mostly from studies on typically developing children, with a few exceptions, as well as children with communication disorders from American English-speaking backgrounds.

First among the gestures that children acquire are deictic in nature (Bates et al., 1979). For instance, infants often point to objects before they are able to label the object with a word before 12 months of age. For example, Mathew and Manjula (2016), found that infants from Kannada-speaking background used points between the ages of 7 to 9 months. At this stage, gestures offer children a means to refer to objects in the absence of the spoken modality. The onset and use of deictic gestures increases the likelihood that children will start labeling in the spoken modality in approximately three to six months. This suggests that pointing gestures pave the way for children's use of nouns, which are essentially their first words (Iverson & Goldin-Meadow, 2005). Children in this age range also use *request* and *give* gestures that resemble open/close hand motions (Bates, et al., 1979); however, little is documented about how these gestures influence language development.

Next to develop are the iconic gestures (also known as representational gestures). Children begin to use these gestures before 24 months of age (Bates, et al., 1979; Carpenter et al., 1998). For instance, Mathew and Manjula (2016) noted that infants in their study began to use these gestures between the ages of 9-12 months, although there were individual variations in the use of iconic gestures among the infants. Iconic gestures typically convey actions or attributes that are associated with objects, such as flapping both arms to represent *flying* (Iverson et al., 1994). However, unlike deictic gestures, children are able to verbally produce verbs 6 months prior to using iconic gestures to visually represent the same verb. Further, early iconic gestures may closely reflect meanings already incorporated in the verbs that are in the child's vocabulary, and it is only at a later stage that they will begin to convey new meaning in their gestures (Özçalişkan et al., 2014).

Around the age of 16 months, children begin to use gesture-speech combinations (Butterworth, 2003), and soon afterwards they transition to the two-word stage (Goldin- Meadow and Butcher, 2003). This marks the beginning of complex linguistic skills. It has been documented that children who take longer to combine two words as a single utterance are often observed to express a two-word idea using gesture-speech combinations (Butcher & Goldin-Meadow, 2000; Capirci et al., 1996). However, with age, the use of both deictic and iconic gestures becomes increasingly frequent and complex in

multiple contexts and topics, such as telling stories and sharing information (McNeill, 1992, Church & Goldin-Meadow, 1986).

It is clear from the above studies that infants achieve a series of important milestones in order to acquire the most complex aspect of human communication, i.e., spoken language. However, it should be kept in mind that this occurs in the context of considerable variability across individual children with the contribution of factors such as, neurobiology, gender, and parental input. It is not within the purview of this tutorial to discuss these variables.

Role of Gestures in Early Childhood

The development of gestures in children is clearly considered a predictor of language development and signals the emergence of spoken language (Iverson & Goldin-Meadow, 2005; Özçalişkan & Goldin-Meadow, 2005). Gestures have also been found to allow children to express ideas that are still forming because gestures represent knowledge visually without the demand of formulating a verbal description (Goldin-Meadow, 2003). Research has also shown that adults can glean information from a child's gesture, and they often tailor their instruction to the child according to what they believe is the child's understanding (Goldin-Meadow & Singer, 2003). In the same vein, these researchers report that the child's gesturing sets up opportunities for the adult to model the spoken language that labels what the child is gesturing, thus aiding in language development.

Several studies also suggest that the gestures children produce while speaking reveal much more about what they are thinking than what is reflected in their speech (Alibali & Goldin- Meadow, 1993). Investigations on gesture production in school-aged children in problem-solving tasks, reasoning about balance or mathematical equivalence, problem-solving strategies etc. indicate that children convey a substantial proportion of their knowledge through speech- accompanying gestures (Alibali & Goldin-Meadow, 1993; Beaudoin-Ryan & Goldin-Meadow, 2014; Church & Goldin-Meadow, 1986; Pine et al., 2004). In some other instances, children's gesture-spoken language 'mis-matches' may predict learning. Children whose speech and gestures mismatch are more likely to benefit from instruction than children whose speech and gesture match. This interesting finding suggests that spoken language and gesture can serve as an index of transitional, implicit knowledge in a topic, and may help determine a child's 'readiness to learn'. Gestures have also been suggested as an effective learning tool in the classroom to help children understand mathematical concepts (Novack et al., 2014).

Gestures in Children with Communication Disorders

The integrated relationship between gestures and spoken language has also been documented in children with communication impairments. Children with language and cognitive impairments have been demonstrated to show a positive correlation with deficits in gesture production and their communication impairments (Thal & Bates, 1988; Thal et al., 1999). For example, Charman et al. (2003) documented that pre-school aged children with Autism were delayed in their ability to produce deictic gestures. In another study, toddlers with or at risk for SLI (Specific Language Impairment) were found to have deficits in their ability to produce and imitate iconic gestures (Thal & Bates, 1988). These suggest that both gestural and spoken modalities are

equally impaired in children with communication disorders. However, there is also evidence which suggests that gestures may be used as a compensatory mechanism. For example, children with Down Syndrome (Harris et al., 1997) and SLI (Evans et al., 2001) have been found to gesture more when compared to their age-matched typically developing peers.

These studies suggest that in certain children with language impairments, the gestural modality aids in the expression of their linguistic knowledge in the visuo-spatial format.

The predictive quality of gestures remains the same for children with communication disorders, in that, gestures are useful for predicting language outcomes. Brady et al. (2004) observed that children with SLI who used pointing gestures were found to demonstrate greater increase in their expressive language abilities when compared to children who did not point. In another study using the Mac Arthur Communicative Development Inventory, researchers noted that the gestural repertoires (e.g., deictic gestures) of 12-month-old infants help in the identification of children who would or would not be diagnosed with Autism at the age of 24 months (Mitchell et al., 2006; Smith et al., 2007). These findings suggest that documenting the types of gestures, and their patterns of use in infants and children could help in the early identification of communication impairments. Further, there is the possibility that introducing a multimodal approach, which includes intensive gesture instruction in intervention could have an impact on language learning in children with communication impairments. However, this is yet to be explored.

Conclusions

It is clear that gestures play a role in spoken language acquisition and this role tends to change across various stages of development and relies heavily on the communicative/interactional contexts. By one year of age, gestures aid in the construction and expression of meaning (Bates et al., 1979). In the following years, gestures and spoken language develop together (Iverson et al., 1994). At later stages, gesture production appears to decrease in certain contexts (e.g., naming), although it is frequently used with spoken language in others (e.g., narration); nevertheless, gesturing never disappears and continues well into adulthood.

Since the primary goal of a speech-language evaluation for any infant or child is to effectively document aspects of their linguistic abilities, it is imperative that our assessment encompasses the multimodal nature of communication. However, there are a few considerations that need attention prior to developing a comprehensive assessment or treatment protocol that encapsulates multimodal aspects of communication in the Indian context.

- SLPs need to develop an increased awareness and understanding of the multimodal nature of communication systems/skills in children. This is true not just for hand gestures, but for other behaviours such as facial expressions, eye gaze, etc.
- SLPs must engage in research (qualitative and quantitative studies) in order to document the developmental ages, patterns of use and functions of gestures in children across linguistic and cultural backgrounds. The limited studies

that have included children from the Indian subcontinent point to the possibility that there are similarities as well as differences in the developmental trends of multimodal behaviours (see Kadiyali & Bellur, 2015; Mathew & Manjula, 2016; Mathew & Manjula, 2015).

- SLPs must develop appropriate clinical practices to capture both gestural and spoken modalities consistently and reliably in order to comprehensively understand the communication abilities of children with communication impairments.
- SLPs must explore interventions that support the use of gesture instruction in order to help children learn language.

By keeping these considerations in mind, clinicians can effectively use gestures as a diagnostic marker as well as a vehicle to support language development in children with communication impairments.

References

Alibali, M. W., & Goldin-Meadow, S. (1993). Gesture-speech mismatch and mechanisms of learning: What the hands reveal about a child's state of mind. *Cognitive Psychology, 25*(4), 468–523.

Bates, E., Benigni, L., Bretherton, I., Camaioni, L., & Volterra, V. (1979). *The emergence of symbols: Cognition and communication in infancy*. New York, NY: Academic Press.

Beaudoin-Ryan, L. & Goldin-Meadow, S. (2014). Teaching moral reasoning through gesture. *Developmental Science*, 17(6), 984-990. doi:10.1111/desc.12180

Brady, N. C., Marquis, J., Fleming, K., & McLean, L. (2004). Prelinguistic predictors of language growth in children with developmental disabilities. *Journal of Speech, Language, and Hearing Research*, 47(3), 663–677. https://doi.org/10.1044/1092- 4388(2004/051)

Butcher, C., & Goldin-Meadow, S. (2000). Gesture and the transition from one- to two-word speech: when hand and mouth come together. In: McNeill D. Editor, *Language and Gesture: Window into Thought and Action* (pp. 235–257). Cambridge University Press; Cambridge.

Butterworth, G. (2003). Pointing is the royal road to language for babies. In S. Kita (Ed.). *Pointing: Where language, culture, and cognition meet* (pp. 9–34). Lawrence Erlbaum Associates.

Capirci, O., Iverson, J.M., Pizzuto, E.A., & Volterra, V. (1996). Gestures and words during the transition to two-word speech. *Journal of Child Language, 23*, 645 - 673.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development, 63*, 1-143.

Crowder, E.M., & Newman, D. (1993). Telling what they know: The role of gesture and language in children's science explanations. Pragmatics & Cognition, 1, 341-376.

Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Cox, A., & Drew, A. (2003).

Predicting language outcome in infants with autism and pervasive developmental disorder. International Journal of Language and Communication Disorders, 38(3), 265–285.

Church, R.B., & Goldin Meadow, S. (1986). The mismatch between gesture and speech as an index of transitional knowledge. *Cognition, 23*, 43-71.

Demir-Lira, Ö.E., Asaridou, S.S., Raja Beharelle, A., Holt, A.E., Goldin Meadow, S., & Small, S.L. (2018). Functional neuroanatomy of gesture-speech integration in children varies with individual differences in gesture processing. *Developmental science, 21 (5)*, e12648.

Dick, A., Goldin-Meadow, S., Solodkin, A., & Small, S. Gesture in the developing brain. *Developmental Science*, 2012, *15(2)*, 165-180. doi:10.1111/j.1467- 7687.2011.01100.x.

Evans, J. L., Alibali, M. W., & McNeil, N. M. (2001). Divergence of verbal expression and embodied knowledge: Evidence from speech and gesture in children with specific language impairment. *Language and Cognitive Processes*, 16, 309–331.

Friedman, H. S. (1979). The concept of skill in nonverbal communication: Implications for understanding social interaction. In R. Rosenthal (Ed.), Skill in nonverbal communication (pp. 2–27). Cambridge, MA: OGH.

Goldin Meadow, S. (1999). The role of gesture in communication and thinking. *Trends in Cognitive Sciences, 3*, 419-429.

Goldin Meadow, S. (2003). *Hearing gesture: How our hands help us think*. Harvard University Press.

Goldin-Meadow, S., & Butcher, C. (2003). Pointing toward two-word speech in young children. In S. Kita (Ed.), *Pointing: Where language, culture, and cognition meet* (pp. 85–107). Lawrence Erlbaum Associates Publishers.

Goldin Meadow, S., McNeill, D., & Singleton, J.L. (1996). Silence is liberating: removing the handcuffs on grammatical expression in the manual modality. *Psychological review, 103 (1)*, 34-55.

Goldin-Meadow, S., & Singer, M. A. (2003). From children's hands to adults' ears: Gesture's role in the learning process. *Developmental Psychology, 39*(3), 509– 520. https://doi.org/10.1037/0012-1649.39.3.509

Gullberg M, de Bot, K., Volterra, V., & Gullberg, M. (2008). Gestures and some key issues in the study of language development.

Harris, N. G. S., Bellugi, U., Bates, E., Jones, W., & Rossen, M. (1997). Contrasting profiles of language development in children with Williams and Down syndromes. *Developmental Neuropsychology,* 13(3), 345–370. https://doi.org/10.1080/87565649709540683

Iverson, J. M., Caprici, O., & Caselli, M. C. (1994). From communication to language in two modalities. *Cognitive Development*, *9*, 23–43.

Iverson, J.M., & Goldin Meadow, S. (1998). Why people gesture when they speak. *Nature, 396*, 228-228.

Iverson, J.M., & Goldin Meadow, S. (2005). Gesture Paves the Way for Language

Development. *Psychological Science, 16*, 367 - 371.

Iverson, J. M., Hall, A. J., & Nickel, L., & Wozniak, R. H. (2007). The relationship between onset of reduplicated babble and laterality biases in infant rhythmic arm movements. *Brain and Language*, 101, 198-207.

Kadiyali, D. V., & Bellur, R. (2015). Development of communicative gestures in normally developing children between 8 and 18 months: An exploratory study. *Journal of Early Childhood Research, 13 (2),* 150-164.

Kelly, S.D., Manning, S. M. & Rodak, S. (2008). Gesture Gives a Hand to Language and Learning: Perspectives from Cognitive Neuroscience, Developmental Psychology and Education. Language and Linguistics Compass, 2, 569-588.

Kendon, A. (2004). *Gesture: visible action as utterance.* Cambridge, UK: Cambridge University Press.

Krauss, R. M. (1998). Why do we gesture when we speak? *Current Directions in Psychological Science,* 7(2), 54–60.

Kravitz, H. & Boehm, J. J. (1971). Rhythmic habit patterns in infancy: Their sequence, age of onset, and frequency. *Child Development, 42,* 399-413.

Mathew M. M., & Manjula, R.,(2015) Patterns in the Emergence of Hand Actions in Typically Developing Infants. *Journal of Communication Disorders Deaf Studies & Hearing Aids,* 3:3 DOI: 10.4172/2375-4427-1000140

Mathew, M.M. & Manjula, R. (2016). Co-occurrence of early forms of vocal and motor actions in infants: A longitudinal study. *Cognitive Linguistic Studies, 3*(1), 70-90.

McNeill, D. (1992). *Hand and mind: what gestures reveal about thought*. University of Chicago Press.

McNeill, D. (2005). *Gesture and Thought*. Chicago: University of Chicago Press. https://doi.org/10.7208/9780226514642

Mitchell, S.E., Brian, J.A., Zwaigenbaum, L., Roberts, W., Szatmari, P., Smith, I.M., & Bryson, S.E. (2006). Early Language and Communication Development of Infants Later Diagnosed with Autism Spectrum Disorder. *Journal of Developmental & Behavioral Pediatrics, 27*, S69-S78.

Morales, M., Mundy, P.C., Delgado, C.F., Yale, M.E., Messinger, D.S., Neal, R., & Schwartz, H.K. (2000). Responding to Joint Attention Across the 6- Through 24-Month Age Period and Early Language Acquisition. *Journal of Applied Developmental Psychology,* 21, 283-298.

Moreno-Núñez, A., & Alessandroni, N. (2021). What's an early triadic interaction made of? A methodological proposal to study the musical dynamics of interaction. *Infant Behavior & Development,* 63, Article 101572. https://doi.org/10.1016/j.infbeh.2021.101572

Novack, M.A., Congdon, E.L., Hemani-Lopez, N., & Goldin-Meadow, S. (2014). From action to abstraction: Using the hands to learn math. *Psychological Science*, 25(4), 903-910. doi:10.1177/0956797613518351.

Özçalişkan & Goldin-Meadow, S. (2005). Do parents lead their children by the hand? *Journal*

of Child Language, 32(3), 481–505. https://doi.org/10.1017/ S0305000905007002

Özçalişkan, S., Gentner, D., & Goldin Meadow, S. (2014). Do iconic gestures pave the way for children's early verbs? *Applied psycholinguistics,* 35 (6), 1143-1162.

Pine, K. J., Lufkin, N., & Messer, D. (2004). More gestures than answers: Children learning about balance. *Developmental Psychology, 40*(6), 1059–1067. https://doi.org/10.1037/0012-1649.40.6.1059

Rauscher, F.H., Krauss, R.M., & Chen, Y. (1996). Gesture, Speech, and Lexical Access: The Role of Lexical Movements in Speech Production. *Psychological Science, 7*, 226 - 231.

Smith, I. M., & Bryson, S. E. (2007). Gesture imitation in autism: II. Symbolic gestures and pantomimed object use. *Cognitive Neuropsychology,* 24(7), 679– 700. https://doi.org/10.1080/02643290701669703

Thal, D.J., O'hanlon, L., Clemmons, M.P., & Fralin, L. (1999). Validity of a parent report measure of vocabulary and syntax for preschool children with language impairment. *Journal of speech, language, and hearing research,* 42 (2), 482-946.

Thal, D. J., & Bates, E. (1988). Language and gesture in late talkers. *Journal of Speech & Hearing Research, 31*(1), 115–123. https://doi.org/10.1044/jshr.3101.115

* * *

Reviewing Single - Subject Research Papers
Guidelines on Peer-Reviewing Single-Subject Research Papers

M. N. Hegde
California State University-Fresno
Fresno, California, USA

Madhuri Gore
Dr. S. R. Chandrasekhar Institute of Speech and Hearing
Bengaluru

Abstract

In speech-language pathology, single-subject experimental designs (SSDs) are frequently used to generate treatment efficacy data. Nonetheless, editors of journals find a dearth of peer reviewers who have expertise in SSDs. Lacking such expertise, peer-reviewers may unfairly recommend to the journal editor rejection of papers that use SSDs. This tutorial helps promote expertise in reviewing research using SSDs. Essentially, scholars who review SSD studies should have a deep and critical scholarship in (a) their discipline, (b) ethical issues that affect research, (c) single-subject research methodology, (d) the kinds of research questions for which specific SSDs are appropriate, (e) the unique ways in which SSD study results are analyzed, (f) good research reporting standards, and (g) evaluating the kinds of evidence a particular study has generated. The paper expands upon all of these topics for the benefit of peer reviewers of SSD study reports.

Keywords: peer review, single-subject research designs, group research designs, ethics of research, levels of evidence

Address for correspondence: M. N. Hegde, Professor Emeritus of Speech Language Pathology in Department of Communication Disorders, California State University, Fresno.
email:girih@mail.fresnostate.edu

Journals are the main vehicles of scientific research publication and knowledge dissemination. However, the journal editors may not publish all the articles submitted to them. They need to assess the reliability, validity, and the overall quality of the data described in a scientific report. They should judge the appropriateness of the research methods used to answer the research question asked. The editors should assure themselves that the results, interpretations, and conclusions are closely aligned. Finally, the editors need to know whether the study contributes something new to the knowledge base or confirms what is tentatively known.

Editors may be capable of making valid judgments on most of the articles they receive, but they do not wish to be the sole arbiters of research publication. Scientific publication is a social responsibility, a collective venture. Editors need expert advice and objective evaluation, as well as a

consensus or near-consensus among the scientists consulted (peer reviewers) that the study should be published. Therefore, editors depend on their (and the investigating authors') peers to help make the most valid, objective, fair, and final decision on submitted articles. Editors select articles for publications through the peer reviewing process. As such, investigators' peers, who are as knowledgeable, if not more, as the investigators, play a crucial role in scientific research publication and dissemination.

Peer Reviewing is a Heavy Responsibility

Peer reviewers shoulder a heavy responsibility. They play multiple roles. They critically evaluate the research methods used, data collected and analyzed, and the report writing. If the methods of the study were appropriate and the data are sound, but there were problems in the analysis, interpretation, conclusions, and reporting style, the reviewers may offer constructive criticism and suggestions to improve the paper and thus increase the chances of publication. However, if the study methods were so fatally flawed as to render the resulting data invalid, the peer reviewers may recommend against the paper's publication.

In learning to write good reviews of research articles, the peer reviewers are on their own. There are few or no training programs for peer reviewers. The typical Master's and Doctoral programs do not offer training in peer reviewing. Scholars learn to review research reports on the job by trial and error. Some learn more efficiently than others; some do a better job than others. None receive any feedback on the quality of their reviews, a significant impediment to improving one's reviewing skills (Ward et al., 2015). Expertise in the subject matter is essential but not sufficient to conduct in-depth, objective, and fair evaluation of research articles. However, newer peer reviewers may read several publications on peer reviewing and learn from them (Chaturvedi, 2023; Elmore, 2017; Gough, 2009; Hill, 2016; Lovejoy et al., 2011; Provenzale & Stanley, 2006; Tandon, 2014; Ward et al., 2015).

No peer reviewer is equally competent in all aspects of research and report writing. A reviewer's expertise may be limited to certain kinds of research methods and data analysis. Consequently, editors may face a pool of reviewers whose expertise does not extend to certain methods of research. Editors of speech, language, and hearing journals in India have faced limited peer reviewer expertise in single-subject research designs (SSDs). Some editors of speech and hearing journals have seen reviewers who reject manuscripts based on single subject experimental designs because of a mistaken notion that they are only case studies. However, SSDs include experimental designs capable of establishing cause-effect relations between investigated dependent and independent variables (Hegde & Salvatore, 2021; Zuidersma et al., 2020). Single-subject designs are in no way inferior to group designs.

There is thus a need to enlarge the pool of peer reviewers in India who have gained expertise in reviewing single-subject experimental or nonexperimental study reports. This paper addresses that need.

Investigators may use either a group design (GD) or an SSD to complete their research. Evaluation of both GD and SSD studies requires certain knowledge and skills. This paper addresses common expertise needed to review any kind of research as well as the unique expertise needed to review SSD studies. Unique expertise needed to evaluate articles based on GD strategy is not addressed in this paper. The reader is referred to other sources (Hegde & Salvatore, 2021).

Conducting research, writing good research reports, peer reviewing reports submitted for publication, and editing and publishing articles in journals are separate but interrelated activities. To facilitate this complex scientific endeavor, multiple scholars have published three kinds of guidelines: (1) how to conduct research, (2) how to write research reports, and (3) how to evaluate (peer-review) reports to determine their suitability for publication in scholarly journals and to assess the level of evidence the reports present. Textbooks on research methods and designs adequately describe how to conduct research (Bailey & Borch, 2017; Cozby & Bates, 2018; Hegde & Salvatore, 2021; Shadish et al., 2002). Therefore, this topic is not addressed in this paper.

Peer reviewers evaluate not only the quality of research, but also the adequacy of report writing (Horner et al., 2005; Logan et al., 2008; Tate et al., 2008, 2016). Reading a badly written article, a reviewer cannot judge whether it is just poor writing, poor research, or both. Even so, this paper does not address the principles of good scientific report writing. The reader should consult other sources (Hegde, in press; Hegde & Salvatore, 2021).

Peer reviewing scientific articles is an ethical responsibility. Therefore all reviewers should follow accepted ethical standards. The following section gives an overview of ethical principles of peer reviewing.

Ethical Principles of Peer Reviewing

There is no legal basis to enforce ethical guidelines on peer reviewing. Nonetheless, all reviewers who agree to review an article for a journal implicitly affirm their willingness to adhere to the guidelines. Scholars who cannot uphold the ethical standards of peer reviewing should decline to review a paper for a journal. They may let the editor know the reasons for their decision to not to review.

Some ethical standards are more objective and easier to judge than others. Most require some subjective judgment. When in doubt, the reviewer may pose a question or describe an ethical dilemma to the editor. The reviewer can usually go ahead with the assignment if the editor, after considering the reviewer's query, approves it. The reviewer, however, still retains the right to recuse himself or herself even after the editor's approval. The following sections describe the major ethical standards discussed in various sources.

Expertise in Reviewing the Specific Paper: The first ethical principle is to evaluate one's own expertise necessary to review the paper in question. Few reviewers are equally proficient in evaluating research done with all kinds of research designs and every type of investigation. Editors select peer reviewers based on their known expertise. Generally, scholars specify the areas in which they would review articles. Along with the invitation to review, the editor sends the title and abstract of the paper. After reading the abstract, potential reviewers must self-evaluate their own qualifications to accept or reject the invitation to review.

Because of periodic expansion of the scope of practice in speech language pathology and audiology, reviewers need to constantly update themselves. Furthermore, not all reviewers may be equally proficient in statistical analyses of research data. Single-subject design studies are typically analyzed with visual inspection and contrast across baseline and experimental conditions. However, several statistical analyses are available for single-subject research data that the reviewers need to be knowledgeable about (de Vries et al., 2015; Shadish, 2014). Reviewers who are not knowledgeable in the specific design used in a study and the methods of analysis done on the results need to recuse themselves from reviewing the reports.

Reviewer's Conflicts of Interests: Just like the authors of research reports, reviewers, too, may have conflicts of interest in conducting their review. Conflicts of interest are present when the reviewer and the author (a) are personally close, related to each other, have collaborated in the past, or work together in the same department or institution, (b) have been in a mentor-mentee relationship in the recent past, (c) have a history of personal or professional dispute with each other, (d) are in direct competition with each other, and (d) have been joint grant recipients or have other financial entanglements (COPE Council, 2017; Min, 2021). Additionally, if the reviewer is conducting research similar to the one described in the paper to be reviewed, it may be better not to review. Also, the reviewer may not try to improve a personal study based on the methods described in the paper taken up for review. Avoiding such conflicts of interest may be difficult in speech-language pathology and audiology in India because the disciplines are small and professionals tend to know each other well. Even when the authors' identities are removed from the paper to be reviewed, a reviewer often can accurately guess the author's identity. However, just personally knowing an author is not a conflict of interest for the reviewer; there should be deeper positive or adversary relationship or professional involvement for the conflict of interest to emerge. Occasionally, the reviewer may be opposed to the theoretical views or interpretations offered in a paper under review. In such cases, the reviewer is ethically responsible to offer alternative views and interpretations in an objective way in the form of suggestions to be considered. An insistence to cite the reviewer's own publications is a conflict of interest, although it is acceptable to make such suggestions if the missing citations are relevant (Rockwell, 2006).

Sometimes there are legal reasons why reviewing a manuscript is not possible. For example, if the article is submitted from a country against which sanctions have been imposed, the editor may be reluctant to send it for review, or a reviewer may recognize the content and hence, may recuse himself/herself. UN experts have discussed the negative effect of sanctions on sharing scientific research in 2022 (Sanctions on scientific publication, 2004; United Nations Human Rights Office of the High Commisioner, 2022).

Confidentiality of the Review: Reviews are always confidential, and reviewers are typically anonymous. A few journals adopt an open review process, but the editor will let the reviewer know the policy. A reviewer who wishes to remain anonymous should decline to review for journals that adopt open review processes. The reviewer must strictly adhere to the rules of confidentiality. The paper is the authors' property, as also the ideas, methods, and the data. All are subject to the rules of confidentiality. Reviewer may contact the editor for more information necessary to complete the review, but never the author. Reviewers cannot share information about and data from the article with anyone else.

Occasionally, a reviewer may wish to get a junior scholar or one being mentored, to participate in the review. But before doing this, the reviewer must seek the permission of the editor and acknowledge the assistance of the junior scholar. Finally, the reviewer must not store the article or data or use them in any way until the paper is published.

Biased and Discriminatory Review: A reviewer's main concern should be the quality of research, soundness of data, appropriateness of analyses, justifiability of interpretations, good organization of the paper, clarity of writing, and the accuracy of citations and reference lists. Such other variables as the author's gender, sexual orientation, race, caste, ethnicity, socioeconomic status, language, and

geographical location should not influence the review. All reviewers should reflect and examine their own biases and prejudices to cultivate bias-free writing and reviewing.

Reviewers also should avoid their unfavorable disposition toward other institutions from influencing the reviews they write. This may be a critical variable where only a few competing institutions exist in given disciplines. Biases may be favorable or prejudicial, based on the reviewer's knowledge of the author's institution and prior associations and interactions with the scholars there. Because of their knowledge of an author's institution, reviewers may assume that the reported research was conducted carefully or that no care was taken. No such assumptions should influence the review.

The writing of new researchers may be obvious to senior research reviewers, and this may create a bias. The senior reviewer may suggest improvements in writing but should not rewrite the paper. The reviewer may double check the reasons for recommending acceptance or rejection to make sure they are objectively based. Because the reviewers set the tone of communication, it is important to offer clear, objective, and constructive suggestions to help improve authors' scientific reporting.

Potential Research Misconduct: Research misconduct includes unethical behaviors of investigators. Plagiarism of work published by others, self-plagiarism, submission of the same paper to multiple journals, data fabrication or falsification, undisclosed author conflicts of interest, and unethical research practices constitute major research misconduct. Research misconduct is more frequent than believed (see Hegde & Salvatore, 2021 for several examples). Peer reviewers with extensive scholarship may spot plagiarized papers but fraudulent research with data fabrication is not that easily recognized (Wager & Jefferson, 2001). That is why fabricated studies get published in peer-reviewed journals. Often, scholars later discover that certain publications were fraudulent and when the charge is substantiated, journals retract such publications (visit: retractionwatch.com for frequent updates on discredited scientific reports).

Peer reviewers should alert the editor of suspected research misconduct. The reviewers should not contact the authors of suspected reports. Ultimately, it is the editor's responsibility to investigate the matter and take appropriate action. Many journals do a plagiarism check before sending the manuscript to the reviewer.

Falsification of data is a serious offence. Generally, data that are too good to be true should be scrutinized with extra diligence. The reviewer may alert the editor of suspicious research reports, but the editor must find strong evidence before charging the author because invalid charges may unjustifiably ruin the author's reputation and damage the career.

Timeliness of the Review: Although not an ethical issue, no matter how good a review is, it is of limited use when its submission is delayed. Timely submission of reviews help expedite the publication process. It is also a matter of professional courtesy to the editor and the author. Both the author and the editor expect prompt submission of reviews. The editor may then send the review to the author with recommendations to revise and resubmit if that is what the reviewer's recommendation was and the editor had concurred with it.

General Expertise Required of All Reviewers

Certain common expertise and experience are required to review research studies regardless of the methods used. Generally, peer reviewers should be experts in their field. This expertise includes the following kinds of knowledge and experience:

- Deep and critical scholarship. The reviewer should have a good command of the extant knowledge on the subject, theories, research methods used to investigate empirical research questions, limitations of research and theory, need for better research, and so forth. A reviewer who is unaware of gaps in the extant knowledge in an area of investigation cannot critically evaluate research reports—a basic requirement of peer reviewers.
- Knowledge of research ethics. Ethical standards of research should be clear to the reviewer. Among others, the reviewer should have a firm grasp of human participant protection protocols, the rights of the participants the investigator should honor, the details and nuances of informed consent, conducting honest and valid research, protecting the integrity of research data, and ethical reporting standards.
- A history of research and publications. Potential reviewers should have done well-recognized research and should have published research reports in peer-reviewed journals. Sustained mentoring of student researchers will be an additional qualification.
- Knowledge of data organization and analysis. The reviewer should be skilled in both qualitative and quantitative data management methods. Proficiency in both statistical and nonstatistical methods of data organization and analysis is essential. The reviewer should know the kinds of analysis that are appropriate for different kinds of research designs and data.
- Good scientific writing skills. Reviewers who are poor writers cannot offer good suggestions to improve a badly written paper they review. Most inexperienced investigators need constructive suggestions on better report writing. To be helpful to the authors of research papers, reviewers should write their reviews clearly and succinctly and make specific recommendations to improve the writing. No matter how bad the research was and how poor the author's writing was, the tone of the review should never be pompous, arrogant, insulting, or angry (Mavrogenis et al., 2020).
- Experience in peer reviewing. Obviously, all peer reviewers will have started with no experience. If they do not review, they do not gain experience. Therefore, editors generally select junior scholars with little or no peer-reviewing experience to review less complicated reports and may offer more elaborate guidelines and resources on peer reviewing. As the reviewers gain experience, they may be asked to review more complex studies. This is a good method of "growing" peer reviewers.

Specific Expertise Required of Single-Subject Research Reviewers

In SLP, experimental SSDs are frequently used to research treatment efficacy. Most of the experimental evidence in treating disorders of speech sound, child language, fluency, voice, post-stroke aphasia, dysarthria, and apraxia of speech comes from SSD studies. Treatment efficacy research with GDs, though increasing, is still not as common as research with SSDs. Nonetheless, and as previously noted, there is a dearth of competent reviewers of SSD research. Therefore, this tutorial

is written to promote expertise in reviewing treatment efficacy studies that use SSDs. To competently review SSD studies, scholars should have the following specific kinds of knowledge and skills.

Conceptual Background of Single-Subject Designs: GDs and SSDs markedly differ in their conceptual background and philosophical roots (Hegde & Salvatore, 2021; Johnston et al., 2019; Kratochwill et al., 2010; Skinner, 1953; Tate & Perdices, 2019). A brief summary of some contrasting features follows.

First, SSD approach emphasizes the intensive study of individuals, individual differences, and individual uniqueness. Through more than 7 decades of research, the strategy has demonstrated that the results of experiments done on a relatively small number of individuals are generalizable to larger groups of persons. To the contrary, the results of GD studies cannot be generalized to individuals. This generalization, often called logical generality, is essential for clinical practice. Hence the SSD studies are more relevant to clinical practice than the GD studies.

Second, the SSD strategy advocates experimental analysis of behavior, including speech, language, and hearing behaviors. It is based on the philosophical position that the method of natural sciences should be applied to study all aspects of human behavior. Except for the AB case study design, all SSDs are experimental designs.

Third, repeated measurement of the dependent variables (DVs) is essential to establish reliability of measures. That is why repeated baselines and continuous measurement of the behaviors (DVs) in all treatment and probe sessions are essential in SSD studies.

Fourth, visual data inspection is the preferred method of analysis of SSD study results. Statistical analysis based on group means is not preferred because they do not promote logical generality. Special statistical techniques are available for SSD study results and investigators may opt for using them, however (Shadish, 2014).

Fifth, each individual serves as his or her own control in SSD studies, so the results of different conditions of the study, including the baseline, treatment, treatment withdrawal, treatment reversal, treatment reinstatement, and probe are compared for the same individual. In the GD strategy, group mean performances, not individual performances, are compared statistically.

Sixth, SSDs do not necessarily have single participants. Although a study with a single participant is publishable, it is often the case study (AB) variety. Most experimental SSDs have three to six participants. In multiple baseline designs, three sets of three to four participants to each set may be recruited, resulting in nine to 12 participants.

Technical Knowledge of Single-Subject Designs: The reviewer should have technical knowledge of SSDs and how each design should be set up in particular studies. The following sections offer brief descriptions of particular features of SSDs. Our discussion of designs is oriented to treatment efficacy research, but it should be noted that SSDs have been used to answer basic (non-applied laboratory) research questions. In fact, the basic SSDs were developed in behavioral laboratory research.

AB Design. This is a nonexperimental case study design. Because the design lacks experimental control, the results do not establish a cause effect relation between the treatment procedure and the resulting changes in the participants' target behaviors. When the treatment procedure is clearly described, target behaviors

are operationally defined, and detailed and continuous quantitative results are provided, case studies can claim improvement, but not effectiveness. An AB design has only two conditions. In the first baseline condition, minimally three baselines must be established. In the second condition, the experimental treatment is applied and continued until clinically significant changes in the target behaviors are documented. Mere statistical significance is inadequate in single-subject research.

Even when the dependent variables were measured after the treatment is terminated (e.g., in follow-up sessions), the design is still a case study. A common mistake is to describe AB case study as an ABA experimental study based on an incorrect assumption that the follow-up measures are equal to those obtained under the second A condition of the ABA experimental design. Follow-up measures cannot be equated with the second A condition of the experimental ABA design.

ABA Withdrawal Design. This is an experimental design that can demonstrate cause-effect relations. The three conditions of this design include (A_1) minimally three baserate measures, (B) application and continuation of treatment until clinically significant changes are evident in the DVs, and (A_2) withdrawal of treatment while the DVs continue to be measured until a change in the direction that is opposite to the B condition is evident. The design can demonstrate that the target behavior, stable at the baseline, increased when the treatment was applied and decreased when the treatment was withdrawn, thus demonstrating the cause-effect relation. If the target behavior is the one to be reduced, such as stuttering or hoarse vocal quality, a decrease under B condition and an increase under the second A condition are expected.

ABA Reversal Design. The three conditions of this experimental design include (A_1) minimally three baserate measures, (B) treatment continued until clinically significant changes in the DVs are evident, and (A_2) reversal of treatment while the DVs continue to be measured. Reversal may involve reinforcing the behavior that was observed under the baseline condition. For instance, after reinforcing the correct production of /k/ in the B condition, the investigator may reverse the treatment and reinforce the incorrect production of the same phoneme, as demonstrated under the baseline condition. If the following outcomes are obtained, the treatment effects are convincingly demonstrated: (1) when the treatment was applied, the correct responses increased and the incorrect responses decreased and (2) when the treatment was reversed, the effects were the opposite. The treatment may then be continued in a typical clinical session, not as a part of the experiment.

ABAB Withdrawal Design. The first three conditions of this experimental design is similar to the ABA withdrawal version. In the final fourth and the second B condition, the treatment is reapplied (reinstated) to the target responses. When successful, the design demonstrates that (a) the target behavior was low and stable at baseline, (b) increased when the treatment was applied, (c) decreased when the treatment was withdrawn, and (d) increased a second time when it was reinstated. The ABAB withdrawal design demonstrates the cause-effect relation more powerfully and convincingly than the ABA withdrawal design.

ABAB Reversal Design. The first three conditions of this experimental design is similar to the ABA reversal version. The treatment is reinstated in the second and the final B condition. Following the baserate condition, the independent variable is

manipulated across the three experimental conditions. Expected changes in the target behavior are the convincing evidence of the treatment effects. Because the design demonstrates the treatment effects twice, both the versions of the ABAB are the most powerful single-subject designs and are superior to any group designs in which the effects are demonstrated only once, and that too, never in the same individuals, and often not to any clinically significant extent.

Multiple Baseline Designs (MBDs): There are three versions: (1) across subjects, (2) across behaviors, and (3) across settings. In all three versions there is an initial baserate that meets the reliability criteria.

1. MBD Across Subjects. Three to six participants are recruited and initially baserated for the same target behavior or behaviors. The first participant is treated while the remaining wait for their turn to get treated. When the first participant meets the training criterion, the remaining are baserated. The second is treated while the remaining wait to be treated. When the second participant meets the training criterion, the remaining are baserated and treated. The same procedure is followed until all participants are treated.

2. MBD Across Behaviors. Three to four target behaviors are baserated in three to six participants with the same disorder diagnosis. The target behaviors may be the correct production of three or four speech sounds, grammatical morphemes, naming, and so forth. The target behaviors may be the same (e.g., the same three speech sounds across participants) or similar (different speech sounds or grammatical morphemes) but are of the same group or class. One behavior is taught while the untreated behaviors remain in baseline. The untreated behaviors are baserated, and a second behavior is taught. Treatment-baserate-treatment sequence is similar to the across-subjects variety.

3. MBD Across Settings. Instead of multiple participants or behaviors, the same behavior (or behaviors) of the same participant (or participants) are baserated in different settings (e.g., the clinic room, outside the clinic building, at home, at school or work place). Treatment-baserate-treatment sequence is as in the other two varieties.

More Complex Designs: Space will not allow us to expand on complex single-subject designs which include a design to evaluate the independent effects of two or more treatments (the ABACA/ACABA design), a design to evaluate the relative effects of two or more treatments (the alternating treatments design), and a design to evaluate potential interaction between two or more treatments (the interactional design). Table 1 gives a summary of most commonly used SSDs. The reader is referred to other sources for details (Hegde & Salvatore, 2021; Johnston et al., 2019; Kratochwill et al., 2010; Tate & Perdices, 2019).

Table 1. Summary of Major Single-Subject Designs and Their Applications.

Design	Research Questions	Strengths and Limitations
AB design Nonexperimental case study	Does the treatment result in improvement?	Improvement may be claimed, not effectiveness.
ABA withdrawal design Controlled experimental design.	Is the treatment effective? Is there a cause-effect relation?	Answers both the questions but does not produce lasting treatment effects.
ABA reversal design Controlled experimental design.	Is the treatment effective? Is there a cause-effect relation?	Answers both the questions but does not produce lasting treatment effects.
ABAB withdrawal design Controlled experimental design.	Is the treatment effective? Is there a cause-effect relation?	Answers both the questions and produces lasting treatment effects.
ABAB Reversal design Controlled experimental design.	Is the treatment effective? Is there a cause-effect relation?	Answers both the questions and produces lasting treatment effects.
Multiple baseline across behaviors Controlled experimental design.	Is the treatment effective? Do only the treated behaviors change and the untreated remain unchanged?	Clinically useful; may produce lasting treatment effects; problems of repeated measurement.
Multiple baseline across subjects Controlled experimental design.	Is the treatment effective? Do only the treated participants change and the untreated remain unchanged?	Clinically useful; may produce lasting treatment effects; problems of repeated measurement.
Multiple baseline across settings Controlled experimental design.	Is the treatment effective? Does the behavior change only in the treatment setting and remain unchanged in untreated settings?	Clinically useful; may produce lasting treatment effects; problems of repeated measurement
ABACA/ACABA design Controlled experimental design.	Are two or more treatments effective? Is one treatment more effective than the other?	Can assess the independent and relative effects of two treatments; need to use counterbalancing.
Alternating treatments designs Controlled experimental design.	What are the relative effects of two or more treatments?	Limited experimental control; separates effective from ineffective treatments; possible lasting treatment effects
Interactional design Controlled experimental design.	Is there an interaction between two or more treatments? What are the relative effects of treatment components?	Demonstrates interactive effects and can separate ineffective treatment components from effective ones
Changing criterion design Controlled experimental design.	Is a treatment effective? Do behaviors approximate changing treatment criteria?	Somewhat weak control; useful only for certain kinds of behaviors

Except for the case study (AB) design, all others are experimental designs capable of assessing effectiveness of a treatment procedure and establish cause effect relations between the independent (treatment) and dependent (changes in target behaviors) variables.

Experience in Conducting Single-Subject Research: Scholars who have done treatment efficacy studies with SSDs and have published in peer-reviewed journals will have an easier time reviewing other investigators' studies based on SSDs. Conducting single-subject treatment evaluation studies will help the investigator see how the designs unfold, the study conditions are arranged, and data emerge.

Experienced reviewers will more easily detect the errors in the application of different designs. They may readily see that the research question asked does not suit the design selected. An AB case study design, for example, cannot answer the question whether a treatment is *effective*. The right question for an AB design is whether the participants *improve* under the selected treatment. The right design for a question of treatment *effectiveness* is an experimental design (e.g., the ABA, ABAB, one of the Multiple Baseline Designs) that rules-out extraneous variables.

In essence, competent peer reviewers and competent researchers are the same people. Good research and good peer-reviewing are both learned academic skills.

Guidelines on Evaluating Single-Subject Research Reports

There are a few published guidelines on evaluating and rating single-subject treatment research studies (see Wendt & Miller, 2012 for a review of several tools). Some tools are too generic, and none consider replicated evidence. Therefore, we have developed a specific and comprehensive set of guidelines for peer reviewers. For easy access and use, we have placed the guidelines in a tabular form (Table 2) that peer reviewers of SSD studies may readily use.

To make a detailed, in-depth, and constructively critical examination of single-subject research reports, the reviewer should evaluate the following elements of report under review:

1. The title of the paper
2. Abstract
3. Introduction and the literature review
4. Methods and procedures, especially the SSD used in the study
5. Results
6. Discussion
7. Writing
8. Citations in the text and the reference list
9. Appendices and additional materials

See Table 2 for details on all of those elements of single-subject research reports to be reviewed and evaluated.

Table 2. Evaluative Criteria for Single-Subject Design Research Reports

General Aspects to be Evaluated	Specific Elements to be Evaluated	Check the Yes or No Box Score 1 Pont for Yes Score 0 for No	
Introductory Section			
Title	Short and clear.	□ Yes	□ No
	Specifies the dependent and independent variables.	□ Yes	□ No
Abstract	Typed on a separate page, with the centered title [Abstract].	□ Yes	□ No
	Structured with Purpose, Method, Results, and Conclusions.	□ Yes	□ No
	Clear and precise Under 300 words.	□ Yes	□ No
Introduction and the review of literature	Good introduction to the study.	□ Yes	□ No
	The review is comprehensive and objective.	□ Yes	□ No
	Review summarizes the existing knowledge and gaps in it.	□ Yes	□ No
	The review justifies the need for the study.	□ Yes	□ No
Purpose of the study	Clearly stated.	□ Yes	□ No
	Research question precisely stated.	□ Yes	□ No
Method and Procedures			
IRB Approval	Specified.	□ Yes	□ No
Informed consent.	Obtained from all participants and family members.	□ Yes	□ No
Participants	The number and the participant recruitment method described adequately.	□ Yes	□ No
	Demographics described in detail.	□ Yes	□ No
	Participants' history of the disorder, diagnosis, diagnostic tools and procedures, and the qualifications of clinicians who made the diagnosis are clear.	□ Yes	□ No
Design	Design is correctly named, described, and a current reference given (e.g., AB; ABA Reversal; ABA Withdrawal; ABAB; Multiple Baseline Across Subjects, Behaviors, or Settings; Alternating Treatments; Changing Criterion; ABACA/ ACABA; Simultaneous Treatments; Interactional A-B-BC-B-BC/A-C-CB-C-CB; N of 1 Randomized.	□ Yes	□ No
Instrumentation	Make, model, and calibration specified.	□ Yes	□ No
	Used appropriately.	□ Yes	□ No

Procedure	Description is detailed and complete	□ Yes	□ No
Study location and physical setup	Specified	□ Yes	□ No
Instructions to the participants	Clear and detailed	□ Yes	□ No
Stimulus materials	Described	□ Yes	□ No
		□ Yes	□ No
Dependent variables	Target behaviors described in operational terms.	□ Yes	□ No
	Target behavior measurement procedure is described; the frequency (percent correct) is reported for all conditions of the experiment.	□ Yes	□ No
Baselines	Minimally three baselines are established on all target behaviors with percent correct or incorrect response frequency.	□ Yes	□ No
	Pretreatment baselines were stable.	□ Yes	□ No
Independent variables	Treatment procedures are described in sufficient detail allowing for replication.	□ Yes	□ No
Reliability of measures recorded across conditions	Satisfactory interobserver reliability indexes are reported.	□ Yes	□ No
	Satisfactory intraobserver reliability indexes are reported		
Treatment fidelity	Measurement procedure and the results are reported.	□ Yes	□ No
Probes to measure generalization	Adequately described.	□ Yes	□ No
Results and Analysis			
Overview	An overview of all participants' data are given at the beginning.	□ Yes	□ No
Individual data	Each participant's data for all phases of the study are reported separately.	□ Yes	□ No
Visual representation	Each individual's results are graphed and the graphing method is suitable for the design used. Tables were well organized and informative.	□ Yes	□ No
Contrast across the conditions	Data charted for the baseline, experimental, reversal, withdrawal, and other conditions show convincing contrast.	□ Yes	□ No
Quantitative and Qualitative descriptions	Both are provided.	□ Yes	□ No
Optional Statistical techniques	Statistical analyses are appropriate for a SSD study.	□ Yes	□ No
Clinical significance	Results are clinically significant (improvement could make a difference in the lives of the participants.)	□ Yes	□ No

Discussion			
Overview of the study and its results	The purpose, methods, and the results are summarized at the beginning of the discussion section.	☐ Yes	☐ No
Research question	Restated the question, answered it unambiguously, and gave justification.	☐ Yes	☐ No
Meaning and implication of the results	Explored in sufficient detail.	☐ Yes	☐ No
Related the results to previous studies	Placed the results in the context of the existing knowledge.	☐ Yes	☐ No
Theoretical implications	Discussed succinctly.	☐ Yes	☐ No
Clinical implications	Gave clear suggestions for clinicians to replicate the investigated methods.	☐ Yes	☐ No
Additional research questions	Suggested questions for investigation.	☐ Yes	☐ No
Limitations of the study	Problems and limitations pointed are out frankly and directly.	☐ Yes	☐ No
Excessive speculation	Avoided.	☐ Yes	☐ No
Handling negative results.	Accepted the negative findings and explored possible reasons.	☐ Yes	☐ No
Writing			
General writing style	Clear, well organized, and easy to understand the literature review, methods and procedures, results, and discussion.	☐ Yes	☐ No
Grammar, punctuation, usage	Acceptable, uses the form of English the Journal recommends.	☐ Yes	☐ No
Technical style	Follows the style of the current APA Manual.	☐ Yes	☐ No
Bias	Free from race, caste, religion, gender, gender identity, sexual orientation, socioeconomic status, ageism, disability, misogyny, and other forms of discriminatory writing style.	☐ Yes	☐ No
Tone of writing	Objective, polite, supportive, respectful.	☐ Yes	☐ No
Citations and the Reference list			
In-Text citations	Follows the current APA Manual.	☐ Yes	☐ No
Reference list	Follows the current APA Manual.	☐ Yes	☐ No
Appendixes			
The end-materials	Additional materials are provided, Appendixes are used judiciously.	☐ Yes	☐ No

Note: If a required element is not stated in the paper, assume it was not done and rate it *No* (0 point). For example, if the paper does not affirm that an Institutional Review Board's approval was obtained, assume it was not. If the paper does not describe random allocation of multiple treatments to participants in an alternating treatments design, assume that the critically needed randomization was missing. Go only with what is stated in the paper; do not guess or give a benefit of doubt.

Aligning Evaluation With Levels of Evidence

Although this is not routinely requested of all reviewers, it will be helpful to the editors if the reviewers classified the evidence presented in a study according to a valid levels of evidence hierarchy. Levels of evidence described in medical literature vary and multiple hierarchies are in circulation. A hierarchy recommended by the OCEBM Levels of Evidence Working Group (2011) is widely cited. The American Speech-Language-Hearing Association describes a similar hierarchy. The number of levels in different classifications vary from 3 to eight. In general, often cited levels of evidence look like the following (Robey, 2004):

- **Level 1A:** Meta-analysis of multiple well-designed controlled studies
- **Level 1.** Well-designed randomized controlled trials
- **Level 2.** Well-designed non-randomized controlled trial (quasi-experiments)
- **Level 3.** Observational studies with controls (retrospective studies, interrupted time-series studies, case-control studies, cohort studies with controls)
- **Level 4.** Observational studies without controls (cohort studies without controls and case series)

The problem with most levels of evidence is that they do not take SSD data into consideration. There is no room for the SSD studies in either the OCEBM levels or the levels Robey (2004) has summarized. Almost all hierarchies place group randomized clinical trials at the top or near top of the evidence hierarchy. Many medical research experts have questioned the value of randomized clinical trials (RCTs) even to evaluate new medicines. It is tiresomely repeated that RCTs are the gold standards of treatment efficacy research, but critics have called it the fool's gold (Pringle & Churchill, 1995). There is no true randomization in RTCs and their results cannot be generalized to individual patients or clients and hence not useful to regular practitioners (see Hegde, 2007 for arguments and evidence). The typical treatment research done in SLP and other behavioral disciplines use the SSD strategy to evaluate interventions. Therefore, medically oriented hierarchies that place RCTs at a high level are mostly irrelevant to evaluating SSD treatment studies and the evidence they generate. Even if the RCTs increase in SLP, their results will not inform clinical practice.

None of the available hierarchies give due recognition to directly and systematically replicated evidence. Even some levels of evidence hierarchies developed specially for single-subject research designs fail to account for replicated evidence, a critical omission (Logan et al., 2008). Direct and systematic replications are critical in generalizing SSD research data to general clinical practice (Hegde, 2010). Replications are critical in generalizing group design studies, too, but that is a separate matter. Systematically replicated evidence obtained though controlled SSDs produce the highest level of evidence that is readily generalizable to clinical practice. No amount of randomized clinical trial data justify such generalization.

Most medically-oriented hierarchies oddly place meta-analysis of treatment studies at the top of the hierarchy. Meta-analysis is a statistical analysis of existing treatment efficacy data that produces no evidence of any kind. Only experimental research produces treatment efficacy evidence; reviews of any kind do not. Critics have called meta-analysis statistical alchemy or statistical magic (Concato & Horwitz, 2019; Feinstein, 1995). For all those reasons, we suggest the levels of evidence hierarchy that Hegde (2010) has developed. This hierarchy

takes into consideration valid and reliable evidence that both the SSD and GD strategies initially generate and subsequently replicate.

Table 3 provides brief descriptions of the levels into which SSD treatment evidence may be classified. It may be noted that the levels are applicable to group design studies, too. For details, the reviewer is referred to other sources (Hegde, 2010; Hegde & Salvatore, 2021).

Table 3. Aligning the Reviewer's Evaluation With Levels of Evidence

Evidence Level		Description of Studies	Score
1	1	Uncontrolled unreplicated evidence based on the first case study by an original investigator.	1
2	2a	Uncontrolled directly replicated evidence based on one or two (1-2) replicated case studies by the same investigator	2
	2b	Uncontrolled directly replicated evidence based on three or more (3+) replicated case studies by the same investigator	3
3	3a	Uncontrolled systematically replicated evidence based on one or two (1-2) case studies replicated by different investigators	4
	3b	Uncontrolled systematically replicated evidence based on three or more (3+) case studies replicated by different investigators	5
4	4	Controlled unreplicated evidence based on the first experimental study by an original investigator	6
5	5a	Controlled directly replicated evidence based on one or two (1-2) experimental studies replicated by the original investigator)	7
	5b	Controlled directly replicated evidence based on three or more (3+) experimental studies replicated by the original investigator	8
6	6a	Controlled systematically replicated evidence based on one or two (1-2) experimental studies replicated by different investigators	9
	6b	Controlled systematically replicated evidence based on three or more (3+) experimental studies replicated by different investigators	10

Note: A systematic replication supersedes direct replication; therefore, evidence from systematically replicated studies should receive a higher score, even if there were no direct replications.

Note 2. There are other evidence hierarchies, but most do not do justice to single-subject designs (e.g., OCEBM Levels of Evidence Working Group, 2011). They misunderstand, misrepresent, and unjustifiably downgrade the single-subject design strategy and hence are neither relevant nor useful to evaluate single-subject research evidence that predominates in speech-language pathology.

Note to the reviewer: Based on your evaluation, score the study for the level of evidence the results represent. Evaluate each study to determine if it is controlled (experimental) or uncontrolled (case study); then determine whether a study is original, a direct replication, or a systematic replication. Score each study according to the scoring system given in this table. Adapted from Hegde (2010).

Author Note

We have no conflict of interest to disclose

Author Contribution : Article format, content written and planned by MNH. MG contributed to the section on ethical principles of peer reviewing.

References

Bailey, J. S., & Burch, M. R. (2017). *Research methods in applied behavior analysis* (2nd ed.). Routledge

Chaturvedi, A. (2023). The five Cs of ethics for peer review in scientific publishing. https://asm.org/Articles/2023/June/Five-Cs-Ethical-Peer-Review-Scientific-Publishing.

Concato, J., & Horwitz, R. I. (2019). Limited usefulness of meta-analysis for informing patient care. *Psychotherapy and Psychosomatics, 88,* 257-262.

COPE Council. COPE Discussion Document: Who 'owns' peer reviews. September 2017. https://doi.org/10.24318/rouP8ld4

COPE Council. COPE Ethical guidelines for peer reviewers — English. https://doi.org 10.24318/cope.2019.1.9 @2017 Committee on Publication Ethics(CC BY-NC-ND 4.0 Ethical guidelines for peer reviewers | COPE: Committee on Publication Ethics

Cozby, P. C., & Bates, S. C. (2018). *Methods in behavioral research* (13th ed.). McGraw-Hill.

de Vries R. M., Hartogs B. M., & Morey R. D. (2015). A Tutorial on Computing Bayes Factors for Single-Subject Designs. *Behavior therapy*, *46*(6), 809–823. https://doi.org/10.1016/j.beth.2014.09.013.

Sanctions on scientific publication. (2004). *Nature neuroscience*, *7*(11), 1163. https://doi.org/10.1038/nn1104-1163

Elmore, S. A. (2017). Update on the manuscript peer review process. *Toxicologic Pathology, 45*(8), 1028-1031.

Feinstein, A. R. (1995). Meta-analysis: statistical alchemy for the 21st century. *Journal of Clinical Epidemiology, 48*(1), 71-79

Gough, N. R. (2009). Training for peer review. *Science Signaling, 2*(85), tr2. https://doi.org/10.1126/scisignal.285tr2

Hegde, M. N. (2007). A methodological review of randomized clinical trials. *Communication Disorders Review, 1*(1), 17-38.

Hegde, M. N. (2010). New levels of evidence for evidence-based practice. *Journal of Indian Speech Language and Hearing Association, 24*(2), 73-83.

Hegde, M. N., & Salvatore, A. P. (2021). *Clinical research in communication disorders: Principles and strategies* (4th ed.). Plural Publishing.

Hegde, M. N. (in press). *A coursebook on scientific and professional writing for speech-language pathology* (6th ed.). Plural Publishing (in publication)

Hill, J. A. (2016). How to review a manuscript. *Journal of Electrocardiology, 49*(2), 109-11.

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children, 71*(2), 165-179.

Johnston, J. M., Pennypacker, H. S., & Green, G. (2019). *Strategies and tactics of behavioral research and practice* (4th ed.). Routledge.

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). Single-case designs technical documentation. *What Works Clearinghouse*: http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf

Logan, L. R., Hickman, R. R., Harris, S. R., & Heriza, C. B. (2008). Single-subject research design: recommendations for levels of evidence and quality rating. *Developmental Medicine and Child Neurology, 50*(2), 99-103.

Lovejoy, T. I., Revenson, T. A., & France, C. R. (2011). Reviewing manuscripts for peer-review journals: A primer for novice and seasoned reviewers. *Annals of Behavioral Medicine, 42*(1), 1-13.

Mavrogenis, A. F., Quaile, A., & Scarlat, M. M. (2020). The good, the bad and the rude peer-review. *International orthopaedics, 44*, 413-415.

Min, S. K. (2021) Ethics and Responsibilities of Peer Reviewers to the Authors, Readers, and Editors, *Vascular specialist international*, *37*(1), 1–3. https://doi.org 10.5758/vsi.

OCEBM Levels of Evidence Working Group (2011). *The Oxford 2011 Levels of Evidence*. Oxford Center for Evidence-Based Medicine.

Pringle, M., & Churchill, R. (1995). Randomised control trials in general practice: Gold standard or fool's gold? *British Medical Journal, 311,* 1382-1383.

Provenzale, J. M., & Stanley, R. J. (2006). A systematic guide to reviewing a manuscript. *Journal of Nuclear Medicine Technology, 34*(2), 2006.

Robey, R. R. (2004). Levels of evidence. *The Asha Leader, 9(*7). https://doi.org/10.1044/leader.FTR2.09072004.5

Rockwell, S. (2006) Ethics of Peer Review: A Guide for Manuscript Reviewers. *http://ori.dhhs.gov/education/products/yale/prethics.pdf. [Accessed on: 01-09-2023].*

Sanctions on scientific publication (2004). *Nature Neuroscience, 7* (11), 1163-1163. https://doi.org/10.1038/nn1104-1163

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). Quasi-experiments: interrupted time-series designs. *Experimental and quasi-experimental designs for generalized causal inference*, (171-205) Houghton Mifflin Company.

Shadish, W. R. (2014). Statistical analyses of single-case designs: The shape of things to come. *Current Directions in Psychological Science, 23(2),* 139–146.

Skinner, B. F. (1953). *Science and human behavior.* Macmillan.

Tandon, R. (2014). How to review a scientific paper. *Asian Journal of Psychiatry, 11*, 124-127.

Tate, R. L., McDonald, S., Perdices, M., Togher, L., Schultz, R., & Savage, S. (2008). Rating the methodological quality of single-subject designs and n-of-1 trials: Introducing the Single-Case Experimental Design (SCED) Scale. *Neuropsychological Rehabilitation, 18*(4), 385-401.

Tate, R. L. & Perdices, M. (2019). *Single-case experimental designs for clinical research and neurorehabilitation settings: Planning, conduct, analysis, and reporting*. Routledge.

Tate, R. L., Perdices, M., Rosenkoetter, U., Shadish, W., Vohra, S., Barlow, D. H., Horner, R., Kazdin, A., Kratochwill, T., McDonald, S., Sampson, M., Shamseer, L., Togher, L., Albin, R., Backman, C., Douglas, J., Evans, J. J.,

Gast, D., Manolov, R., Mitchell, G., … Wilson, B. (2017). The Single-Case Reporting Guideline In BEhavioural Interventions (SCRIBE) 2016 Statement. *Neuro psychological rehabilitation*, *27*(1), 1–15.

United Nations Human Rghts Office of the High Commisioner (2022, July 07) "Unilateral sanctions threaten scientific research and academic freedom: UN experts." (Press release). https://www.ohchr.org/en/press-releases/2022/07/unilateral-sanctions-threaten-scientific-research-and-academic-freedom-un

Wager, E., & Jefferson, T. (2001). Shortcomings of peer review in biomedical journals. *Learned Publishing, 14*(4), 257-263. https://doi.org/10.1087/095315101753141356

Ward, P., & Graber, K., & Mars, H.v.d. (2015). Writing quality peer reviews of research manuscripts. *Journal of Teaching in Physical Education. 34*(11). *700-715.* http://dx.doi.org/10.1123/jtpe.2014-0158.

Wendt, O., & Miller, B. (2012). Quality appraisal of single-subject experimental designs: An overview and comparison of different appraisal tools. *Education and Treatment of Children, 35*(2), 235-268.

Zuidersma M, Riese H, Snippe E, Booij S. H., Wichers M, & Bos E. H., (2020) Single-Subject Research in Psychiatry: Facts and Fictions. *Frontiers in. psychiatry 11,539777.* https://doi.org/10.3389/fpsyt.2020.539777

* * *

Guidelines for authors

Manuscripts should be submitted in word file-.doc/.docx. and references should follow the APA 7 format.

Title page should be separate with authors names, affiliations, and corresponding author details should be included.

Abstracts: Structured abstract with Background and Purpose, Methods, Results, and Conclusion. Abstract should be less than 300 words excluding references. Sufficient details in the abstract to be provided with respect to participants, testing, and procedure.

Keywords: Five to seven key words should be listed end of the abstract.

Short running title of less than 50 characters should be included.

Main manuscript

Introduction should lead to the need of the study and aims. Methods section must include study design, details of participants, materials used, rationale, procedure, and statistical analysis. Titles for figures and text must be clear and self-explanatory, providing information as a stand-alone structure. Stand-alone, high-quality figures and tables should be included in results section. Discussion section should provide understanding of results with support from literature. The manuscript should end with conclusion that brings out implication of the study.

All manuscripts should include acknowledgements, conflict of interest statement, ethical approval statement, participant consent statement, and funding statement at the end of the article.

Resolution for figures JPEG/PNG should be a minimum of 300 DPI. It is preferred that all content be original. If figures are taken from another source, the author(s) is/are responsible for taking the permission/paying from the authors of the figure.

Ethical approval of the study and informed consent should be mentioned at the time of submission. Figures that include identifiable information about participants need to have an informed consent that is provided by the author.

Spacing- Double spaced with continuous line numbers. Single spaces after the period. Page numbers should be provided.

Articles are peer reviewed. Authors are encouraged to suggest reviewers, though the final decision is made by the editorial board.

All effort will be made to review the articles within 4 weeks.

BANGALORE SPEECH AND HEARING TRUST
JOURNAL OF HEARING LANGUAGE AND SPEECH.

English Half Yearly
July to December 2023

Contents

BANGALORE SPEECH AND HEARING TRUST JOURNAL OF HEARING LANGUAGE AND SPEECH - Printed and Published by V.V. Krishna Reddy on behalf of BANGALORE SPEECH AND HEARING TRUST. Printed at Geetanjali Graphics, # B-71, New No: 84, KSSIDC Indl. Estate, Rajajinagar, Bengaluru – 560 010. Published at Dr. S.R. Chandrasekhar Institute of Speech and Hearing, Hennur Road, Lingarajapuram, Bengaluru - 560084. Editor: Dr. Madhuri S. Gore