The study of communicative gestures is one of considerable interest for aphasia, in relation to theory, diagnosis, and treatment. For example, definitions and theories of aphasia differ in whether or not language impairment must cross all modalities of communication, including gesture. Some type or form of gesture is included in subtests of the Porch Index of Communicative Ability (PICA, Porch, 1967) and a pantomime recognition test (Duffy, Duffy, & Pearson, 1975, Duffy and Duffy, 1981); scored in the Communicative Abilities in Daily Living (CADL, Holland, 1980) and modeled in the Promoting Aphasics Communicative Effectiveness (PACE) treatment program (Davis, 1985). And aphasia researchers and clinicians consider gesture both as a means of communicative facilitation (e.g., (Records, 1994) and compensation (e.g. Tompkins & Scharp, in press).

Despite the broad potential relevance of gesture in aphasia, the question remains, how can we best characterize the relationship of gesture to aphasia? The discussion below will focus on four critical dimensions of gesture production that when addressed will provide essential information for both continued investigation and clinical application of gesture for people with aphasia. These dimensions include: 1) divergent conceptual frameworks on gesture production, 2) functional and temporal characteristics of gesture, 3) coding systems and definitions, and 4) treatment approaches. The discussion will address *communicative* gestures exclusively (i.e. symbolic/conversational gestures, not grooming gestures).

Conceptual Frameworks on Gesture Production

The act of spontaneously moving the hands and arms during communication, commonly referred to as gesture, yields at least two distinct perspectives most frequently represented in the gesture literature are the information packaging hypothesis (McNeill, 1992a) and the word retrieval hypothesis (Krauss, Morrel-Samuels, & Colasante, 1991) In McNeill's information packaging hypothesis, the act of gesturing for communication is essentially inseparable from the verbal message and rests at the *conceptual level*. He acknowledges Adam Kendon (Kendon, 1972, 1980) as the spearhead for proposing language and gesture as a single coordinated system where the two aspects are different parts of a whole but not completely separable. Within this single system, language and gesture are 'expressed' via verbal and spatial means, respectively, providing a temporally-linked, multidimensional, content-rich message. Spoken language and gesture are produced in parallel and gesture is subsumed in the planning stages of language production.

In contrast, the lexical or word retrieval hypothesis argues that communicative gesture is used as an exclusively supplemental mechanism, to facilitate spoken language (Morrel-Samuels & Krauss, 1992). Krauss and colleagues (1996), in conjunction with Butterworth and Hadar (1987), posit that gesture is engaged as a preverbal priming mechanism, and is enacted most frequently during word finding, specifically when additional (spatial) information is needed to prime and access a word for production. This view of gesture production is particularly relevant to aphasia and normal aging, given the noted word finding deficits that can accompany both.

Functional and Temporal Characteristics of Gesture

In addition to stark differences in theoretical perspectives surrounding the psycholinguistic origins of gesture and language, the gesture literature as a whole provides minimal agreement on several dimensions that are imperative to consider for measuring and studying gesture in both typical and neurological populations. These include the function of gesture in context and temporal characteristics of gesture. The crux of the argument for the function of gesture during spontaneous communication is embedded in the two hypotheses outlined above (planning versus production hypotheses). One reason temporal synchrony

features of gesture are of interest is the estimate that 80-90% of all gestures are co-verbal (McNeill, 1992a). In addition, it has been observed that people who stutter halt their gesture stroke (while maintaining the hand-shape) until their dysfluency resolves, at which point the gesture stroke is continued or completed (McNeill, 1992b). Unfortunately, there is no appropriate, objective measure to quantify the varied parameters and temporal dynamics of gesture in typical populations let alone in people with aphasia

Coding Systems and Definitions

The coding systems implemented to measure and study gesture (based on a seemingly limitless number of definitions) are applied differently by population and by communicative context. While there are several templates for gesture coding systems (McNeill, 1992a, Krauss et al., 1991) a single coding system (i.e. what 'counts' as a specific type of gesture) has yet to be agreed upon, such that the reliability and validity of individual gesture studies is in question, and integration or a meta-analysis of findings across gesture studies is virtually impossible. Finally, at the most fundamental level, the literature proposes an array of descriptions for what constitutes a communicative gesture in the components of the available coding systems, but there is no actual operational definition of gesture. This also complicates the interpretation and the integration of gesture studies, as well as application of findings to neurogenic populations.

Treatment Approaches

The use of gesture as a compensatory strategy for people with aphasia is a fairly common treatment technique and it has been studied in a variety of contexts. For example, Cicone et al. (1979) studied gesture as a vehicle for compensation to see if patients with aphasia preserved the capacity to use gesture during spontaneous speech. Their results provided some data to indicate that the types of gestures used by a person with aphasia during structured conversation mirror the linguistic output (e.g. a person with anomia producing more lexical gestures than a person with 'empty speech,' who used more place-holding gestures).

Hadar and Yadlin-Gedassy (1994) published two case studies of people with aphasia. They noted that more semantically-rooted or representational gestures were apparent in a subject with "lexical" deficits versus a subject with "conceptual" deficits, thereby implicating gesture as a compensatory strategy for a subset of individuals with predominantly lexical or word finding deficits. Rose and Douglas (2001) more recently studied naming abilities in six people with aphasia under four conditions: a no cue, point, visualization, and a gesture production condition. Iconic (representational) gesture was shown to be facilitative of object naming above and beyond the other conditions, specifically for subjects with "lexical" impairments over subjects with "semantic" impairments. However, both of these studies include tasks that are loaded toward lexical retrieval such that other aspects or functions of gesture more in line with the packaging hypotheses were not evident. The types of tasks employed and cueing mechanisms implemented will be critically important for both future investigations and clinical applications of gesture paradigms.

Implications

Examining the impaired linguistic system in aphasia can provide valuable insight into the intact gesture and language system(s), which in turn will have future clinical implications. The use of gesture as a compensatory strategy for people with aphasia has proven to be beneficial in certain contexts such as caregiver training (Cunningham & Ward, 2003) and in repairing communicative breakdowns via visual means, as in PACE. Clearly there are severe limitations in the available body of gesture literature ranging from a lack of operational definitions to conflicting theoretical perspectives. A marriage is needed of sound theoretical orientation,

operational definitions, and measurement approaches, to yield valid and replicable studies of gesture in aphasia. Only then will we make progress in disentangling whether, and how, incorporating gesture in aphasia diagnosis and treatment will provide a ‘helping hand.’

References

Butterworth, B., & Hadar, U. (1989). Gesture, speech and computational stages. *Psychological Review, 96*, 168-174.

Cicone, M., Wapner, W., Foldi, N., Zurif, E., & Gardner, H. (1979). The relation between gesture and language in aphasic communication. *Brain and Language, 8*, 324-349.

Cunningham, R., & Ward, C. D. (2003). Evaluation of a training programme to facilitate conversation between people with aphasia and their partners. *Aphasiology, 17*(8), 687-707.

Davis G.A., & Wilcox, M.J. (1985). Adult Aphasia Rehabilitation: Applied Pragmatics. San Diego, California: College Hill Press.

Duffy, R. J., Duffy, J. R., & Pearson, K. (1975). Pantomime recognition in aphasics. *Journal of Speech and Hearing Disorders, 44*, 156–168.

Duffy, R. J., & Duffy, J. R. (1981). Three studies of deficits in pantomimic expression and pantomimic recognition in aphasia. *Journal of Speech and Hearing Research, 24*, 70–84. *Symbolic, Spontaneous, and Pseudo-Spontaneous Nonverbal Behavior* 539

Hadar, U., & Yadlin-Gedassy, S. (1994). Conceptual and lexical aspects of gesture: Evidence from aphasia. *Journal of Neurolinguistics, 8*(1), 57-65.

Holland, A. (1980). Communicative abilities in daily living. Baltimore: University Park Press.

Kendon, A. (1972). Some relationships between body motion and speech. In A. Siegman & B. Pope (Eds.), *Studies in dydactic communication* (pp. 177-210). New York: Pergamon Press.

Kendon, A. (1980). Gesticulation and speech: Two aspects of the process of utterance. In M. R. Key (Ed.), *The relation between verbal and nonverbal communication* (pp. 207-227). The Hague: Mouton.

Krauss, R., Chen, Y., & Chawla, P. (1996). Nonverbal behavior and nonverbal communication: What do conversational hand gestures tell us? In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 26, pp. 389-450). New York: Academic Press.

Krauss, R. M., Morrel-Samuels, P., & Colasante, C. (1991). Do conversational hand gestures communicate? *Journal of Personality and Social Psychology, 61*(5), 743-754.

McNeill, D. (1992a). *Hand and mind: What gesture reveal about thought*. Chicago and London: The University of Chicago Press.

McNeill, D. (Ed.). (1992b). *Language and gesture*: Cambridge University Press.

Morrel-Samuels, P., & Krauss, R. M. (1992). Word familiarity predicts temporal asynchrony of hand gestures and speech. *Journal of Experimental Psychology, 18*(3), 615-622.

Porch, B. E. (1967). Porch Index of Communicative Ability. Palo Alto, CA: Consulting Psychologists Press.

Records, N. (1994). A measure of the contribution of gesture to the perception of speech in listeners with aphasia. *Journal of Speech and Hearing Research, 37*, 1086-1099.

Rose, M., Douglas, J., & Matyas, T. (2002). The comparative effectiveness of gesture and verbal treatments for a specific phonological naming impairment. *Aphasiology, 16*(10/11), 1001-1030.