CHAPTER 1

Introduction

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Interest in gesture has existed since ancient times. However up to the twentieth century, it was primarily studied in two ways – as it related to rhetoric (from Roman times to 1700), i.e., how gestures could enhance a speaker's presentation and as a precursor of oral language (from 1700 to 1900) for the information it could give about language evolution (for an extensive discussion of the history of the field of gesture studies, see Kendon 1982, 2004). It was not until 1941 that gesture began to be studied in a systematic manner in human interaction with the ground-breaking work of David Efron (1941/1972), and it was not until the 1970s with the work of David McNeill (1979, 1981) and Adam Kendon (1972, 1980) that speech and gesture were viewed as aspects of the same process (see Kendon 2004, Stam 2006, Stam & McCafferty 2008), and the field of modern gesture studies was born.

Gestures are ubiquitous and natural in our everyday life, and they convey information about culture, discourse, thought, intentionality, emotion, intersubjectivity, cognition, and first and second language acquisition. Additionally, they are used by non-human primates to communicate with their peers and with humans. Consequently, the field has attracted researchers from a number of different disciplines such as anthropology, cognitive science, communication, neuroscience, psycholinguistics, primatology, psychology, robotics, sociology and semiotics, and the number of modern gesture studies has grown. The purpose of this volume is to present an overview of the depth and breadth of current research in gesture. Its focus is on the interdisciplinary nature of gesture, and the twenty-six chapters included in it represent research in the following areas: the nature and functions of gestures, language development, use in the classroom and in problem-solving, discourse and interaction, and music and dance. Before we present the areas of research, we will present an overview of what gestures are.

What are gestures?

The term 'gestures' has many different meanings, and the gestures that each researcher examines are not always the same. This, of course, can make cross-researcher comparisons difficult at times. Nevertheless, the gestures that each author in this volume deals with are all visible bodily actions employed intentionally and meaningfully. This is a broad definition that covers the many different aspects of gestures.

Kendon (1982) has classified gestures into four types: gesticulation, pantomime, emblem, and sign language. According to the presence or the absence of a language-like property, McNeill (1992: 37) lined up these four types on a continuum and termed it 'Kendon's continuum.' This continuum was later elaborated into four continua by McNeill (2000, 2005). According to this continuum, gesticulations are "idiosyncratic spontaneous movements of the hands and arms accompanying speech" and obligatorily accompany speech (McNeill 1992: 37). Spontaneous gestures are distinct from emblems and sign languages in that they are not regulated by convention and are global, "the meanings of the parts are determined by the whole" and synthetic, "different meaning segments are synthesized into a single gesture" (McNeill 1992: 41). Spontaneous gestures are synchronous with speech and often occur with elements of high communicative dynamism, i.e., contrastive, focused or new information (McNeill 1992, 2002). In addition, their strokes tend to co-occur with prosodic peaks (Nobe 1996, 1998). They perform the same pragmatic functions as speech (Kendon 1980, McNeill 1992). These gestures and their co-occurring speech can represent the same entities, or they can complement each other, where the gestures indicate an aspect present in the speaker's thought, but not expressed through speech.

Spontaneous gestures serve many functions (Stam 2006, in press; Stam & McCafferty 2008) and may serve several functions simultaneously (Heath 1992). They may add information that is not present in individuals' speech or emphasize information that is there (Goldin-Meadow 1999, McNeill 1992). They may serve to lighten speakers' cognitive load (Goldin-Meadow et al. 2001) and improve their performance in other areas. They may help speakers organize spatial information for speaking and aid in the conceptual planning of speech (Alibali et al. 2001). They may also indicate transition in cognitive and language development (Goldin-Meadow & Alibali 1995, Goldin-Meadow & Butcher 2003, Iverson & Goldin-Meadow 2005). In addition, they may be used to retain turns during conversation (Duncan 1972), and listeners may gesture to indicate their active involvement in the conversation (de Fornel 1992). Finally, gestures may indicate speech production difficulties (Feyereisen 1987) and facilitate lexical retrieval (Butterworth & Hadar 1989, Hadar & Butterworth 1997, Krauss & Hadar 1999, Krauss et al. 1995, Morrel-Samuels & Krauss 1992, Stam 2001, in press).

Emblems are culturally codified gestures and include such gestures as the 'OK sign' and the 'two-thumbs-up sign' in the United States or the Dutch gesture for *lekker* 'tasty, yummy' (flat hand moving back and forth roughly parallel to the head at a small

distance, 1–2 inches from the ear). The semantic contents of emblems are understandable without speech, though they can co-occur with speech (Morris, Collett, March, & O'Shaughnessy 1979). Emblems are signs, and they have "standards of well-formedness" and "the OK sign must be made by placing the thumb and index finger in contact" (McNeill 1992: 38). Furthermore, they are not part of language in that they do not have syntax as sign languages do. Many emblems go back to Roman times (Morris et al. 1979), and the same form may have various meanings as well as different meanings in different cultures. Emblems are learned gestures and are, therefore, teachable (for reviews and studies on emblems, see Brookes 2001, Calbris 1990, Ekman & Friesen 1969, Kendon 1981, Morris et al. 1979, Ricci Bitti & Poggi 1991).

With pantomime, we find meaningful gestures that are by definition never accompanied by speech. Pantomimes can depict objects, actions or an entire story. These are the types of gestures people make when they are playing a game like charades or when they are asked to explain an action without speech.

Sign languages, such as American Sign Language (ASL), are full-fledged languages. They are composed of signs which are codified gestures that have linguistic properties and are equivalent to lexical words (McNeill 2005). While it is possible to speak while signing, sign language can be fully understood without speech.

Some authors in this volume deal with gestures which spontaneously co-occur with speech, while others deal with gestures which do not accompany speech. The contrast between those gestures that occur with speech and those that occur without have important implications for the essence of what gestures are.

Typology and coding

Spontaneous gestures can be analyzed in terms of their semiotic properties, and several different classification systems have been developed for categorizing them (Bavelas 1992, Cosnier 1982, Cosnier & Brossard 1984, Cosnier & Vaysse 1997, Efron 1941/1972, Ekman & Friesen 1969, Freedman 1972, McNeill 1992, McNeill & Levy 1982). The majority of these are variations of Efron's (1941/1972) original system of batons, ideographs, deictics, physiographs, and emblems (for a detailed discussion of the various classification systems, see McNeill 1992; Kendon, 2004; Rimé & Schiaratura 1991). The system adopted by many authors in this volume is in line with that of Kendon or McNeill.

In relation to their form and meaning, McNeill (1992, 2005) has classified coverbal spontaneous gestures into four major categories: (1) iconics (2) metaphorics (3) beats and (4) deixis. Gestures that provide "a *representation* of the content of an utterance" are termed representational gestures (Kendon 2004: 160) and include iconic and metaphoric gestures. Iconic gestures express images of actual objects and/or actions. Metaphoric gestures, on the other hand, express images of the abstract. Beats stress important words with baton-like movements that are timed to occur with

thematic content in discourse and do not depict any imagery. Beats can, however, be superimposed upon iconic or metaphoric gestures. Importantly, beats often manifest pragmatic significance despite their simplicity in form and/or movement. They occur at the meta-level of discourse and highlight information: they may introduce new characters and new themes, summarize action, and accompany repairs. Deictic gestures are not representational; they are pointing movements. Depending on the existence or the presence of their referents, pointing (or deictic) gestures are classified into two types: concrete and abstract deixis (McNeill, Cassell, & Levy 1993). Concrete deixis makes a reference to physically present entities while abstract deixis are points directed towards a seemingly empty space. McNeill, Cassell, and Levy (1993) found that abstract deixis provides new references in space. Contrastively, concrete deixis conveys a reference in its generation. Claiming that "none of these categories is truly categorical," McNeill (2005: 41) has advocated that gestures be analyzed in terms of dimensions, i.e., iconicity, metaphoricity, temporal highlighting, deixis, and social interactivity rather than types because a single gesture often shows multiple dimensions. While emphasizing that it is not easy to determine which categories are dominant or subordinate and that in some gestures, each dimension is not equally displayed, McNeill (2005) introduces the notion of saliency. McNeill mentions that saliency is of theoretical interest and has an impact on the occurrence of "the kind of imagery that occurs" through gesture (McNeill 2005: 43). This claim by McNeill is confirmed in some of the chapters in this volume which employ his typology of gestures.

Areas of research

The research in this volume is divided into six sections or themes: the nature and functions of gesture, first language development and gesture, second language effects on gesture, gesture in the classroom and in problem-solving, gesture aspects of discourse and interaction, and gestural analysis of music and dance.

Nature and functions of gestures

As previously mentioned, gestures are multifunctional: some communicate (Kendon 1994), while others serve cognitive functions. What can be said about the nature of gestures is very much dependent on the paradigm in which they are studied. The chapters in the first section provide us with more insight into the nature and various functions of gesture and give us several models for future gesture research. The studies themselves include gestures that accompany speech as well as those that do not.

Erica A. Cartmill and Richard W. Byrne (Chapter 2) analyze gestures of twenty-eight captive orangutans and show that there are some tight relationships between gesture forms and meanings and that non-human primates can communicate their

intentions with one another through gestures. In Chapter 3, David McNeill and Claudia Sowa present evidence from a study in which speech was prevented. Their study sheds light on the ontogenesis of morphemes of gestures as well as the functions of gestures. They demonstrate that in the absence of speech, participants' gestures become more like a language (segmented and analytic) with morphemes (i.e., parings of forms and meaning), syntagmatic values, and standards of form emerging unlike the gestures that co-occur with speech.

Janet Bavelas, Jennifer Gerwing, Meredith Allison, and Chantelle Sutton (Chapter 4) report on a micro-analysis they conducted of grounding steps in dyadic dialogues. Their study shows that participants in discourse make use of abstract pointing gestures to accumulate common ground and indicate understanding. They suggest that their method of analysis could be useful for future research in the understanding of gestures in different situations. In Chapter 5, Autumn Hostetter, Martha Alibali, and Sheree Schrager examine whether speakers' motivation to communicate has an impact on the rate or size of the gestures speakers produce. They find that there is no effect on the frequency of gestures; however, there is an effect on the size of the gestures. Speakers produced a higher proportion of larger gestures when they want their interlocutors to cooperate with them. Their findings suggest that speakers vary the size of their gestures based on whether they want to communicate information clearly or not.

Katharina Hogrefe, Wolfram Ziegler, and Georg Goldenberg (Chapter 6) present a method, the Hamming Distance, for the analysis and transcription of the physiological and kinetic aspects of hand gestures that does not rely on the analysis of the concurrent speech. This method provides gesture researchers a way to measure in how many formal features two gestures differ from each other. Furthermore, they argue that application of this method opens up the potential to conduct quantitative analyses of gestures and is useful when analyzing the data of individuals with severe language disorders.

Many gesture researchers assume that speech and gesture of one person is an integral unit of thinking. Maria Graziano, Adam Kendon, and Carla Cristilli (Chapter 7) argue that speech and gesture among interlocutors is a unified unit of thinking, and they call gestures repeated completely or partially by an interlocutor 'parallel gesturing.' Based on the claim that such 'parallel gesturing' is a gesture-speech ensemble (Kendon 2004), a single-unit of production, they describe parallel gesturing in adult-child conversations and show that parallel gesturing in adult-child conversations serves as a way for interlocutors to show their understanding of the speaker's utterance and alignment to the other's expressive style. Furthermore, they suggest that just as children must acquire adult pronunciation, they must also acquire adult gestures to fit within the gesturing style of their community.

First language development and gesture

The section on first language development and gesture includes research on children from infancy through school age. Researchers in this area work from the assumption

that the gestures children produce serve as a window onto their cognitive and/or first language development. Claire Vallotton (Chapter 8) shows that preverbal infants as early as 9 months can create gestural sentences and as early as 10 months can reply to a caregiver's gesture and converse in the gestural mode. Maria Fusaro and Claire Vallotton (Chapter 9) examine infant signs and their environment and find that infants begin to produce gestures modeled by their caregivers when they are about ten months of age. Maria Zammit and Graham Schafer (Chapter 10) suggest that child-directed communication is systematically modified both linguistically and gesturally because it scaffolds language learning. Mats Andrén (Chapter 11) shows that parents give significantly more elaborated responses when children performed *sustained* index finger pointing gestures, and in so doing, he also raises a question of timing of gesture phases. Şeyda Özçalışkan and Susan Goldin-Meadow (Chapter 12) observe the spontaneous gestures of children interacting with their parents from 14 to 34 months of age and find that the number and types of iconic gestures that children produce significantly increase around 26 months.

Kazuki Sekine (Chapter 13) investigates the development of spatial perspectives in preschool age children by looking at how children use gestures in route descriptions, i.e. whether they used *a survey map perspective* which views the environment from a fixed, single viewpoint or *a route map perspective* which takes the form of an imaginary journey. His findings suggest that an understanding of the environment from a bird's-eye viewpoint and the use of a survey map perspective is available as early as 5 years of age, an age much younger than was originally thought such a perspective was acquired, around 8 to 9 years of age. Focusing on the use of representational gestures in narratives, Olga Capirci, Carla Cristilli, Valerio De Angelis, and Maria Graziano (Chapter 14) analyze how children develop their competence in the formal and semantic aspects of gesture. They show that there are formal and semantic properties of gesture children have to acquire in order to develop their communicative competence. In addition, they argue that gesticulation and sign languages, previously identified as the two extremes of "Kendon's Continuum," share some characteristics in common. Hannah Sowden, Mick Perkins, and Judy Clegg (Chapter 15) present a case study of a child with Autistic Spectrum Disorder (ASD), age 2:6 years, interacting with his teacher. As mentioned earlier, speech and gesture is assumed to be an integral unit. However, in children with autism, the development of both language and gesture is impaired. Sowden, Perkins, and Clegg investigate gesture forms, discourse functions of the gestures and the dynamic nature of gesture form and function in the interaction between the child with ASD and the teacher and find that in the beginning the teacher makes use of deictic gestures in order to draw the child's attention and the child immediately imitates the teacher's gestures. Additionally, Sowden, Perkins, and Clegg find that the teacher produces iconic and emblematic gestures in the later phase in the interaction and the child with ASD imitates them as well. They argue that the child's gestures serve a back-channeling function to display his engagement in the interaction.

Second language effects on gesture

The two chapters in the section second language effects on gesture investigate how speaking more than one language affects gesture use. Meghan Zvaigzne, Yuriko Oshima-Takane, Fred Genesee, and Makiko Hirakawa (Chapter 16) investigate whether the presence of mimetics (sound-symbolic words) in language influences children's verbal and gestural descriptions by conducting a cross-linguistic comparison of cartoon narrations by Japanese and French monolingual and bilingual children. While Japanese is rich in mimetics, French is not. The results of their study suggest that the presence of mimetics in Japanese has an impact on co-speech gesture use in the course of the description of motion events; however, this was more evident in the monolingual children than the bilingual ones. Kendra Newbury (Chapter 17) examines the emblematic gesture use of border bilinguals in northern Uruguay, where Portuguese, the traditional language, is being supplanted by Spanish, the national language. She finds that as the speakers shift languages, they also shift emblematic gestures, but that the gesture shift lags behind the linguistic shift.

Gesture in the classroom and in problem-solving

The role that gestures play in communication and cognitive processes both in the classroom and during problem-solving is explored in this section. Susan Gerofsky (Chapter 18) offers an observational analysis of students' elicited gestures of graphs of mathematical functions. Her results show that the students who internalize the graphs and make large gestures are more able to notice mathematically salient features than those whose gestural motions are more restricted. She claims that these findings have implications for the teaching of mathematics in secondary schools. Mitchell Nathan and Martha Alibali (Chapter 19) demonstrate that teachers facilitate intersubjectivity or common ground by their use of gestures in the classroom during conversational repairs and the presentation of a novel (target) representation. They point out that this is done through both linking gestures and gestural catchments. They stress both the personal and social roles that gestures play in establishing intersubjectivity.

Mingyuan Chu and Sotaro Kita (Chapter 20) investigate how gestures reveal the process of problem solving in mental rotation tasks and what role gestures play in the development process. Their results show that when adults solve new problems with regard to the physical world, they experience deagentivization and internalization processes which are similar to the processes that young children experience. In the problem-solving task, adults first simulate the manual manipulation of the stimulus through gestures and then are eventually able to solve the problem without gestures.

Gesture aspects of discourse and interaction

The chapters in this section present evidence of how gestures vary in discourse and interaction. Stephani Foraker (Chapter 21) examines how information structure in

discourse is reflected in gestures and whether speakers use different gestures in their presentation of new and given information in discourse. Her study shows that the function of gestures produced reflect differences between new and given information. Katie Wilkin and Judith Holler (Chapter 22) also investigate how gestures reflect information structure in discourse and common ground. Their findings suggest that common ground, i.e., definite articles in their study, is associated mainly with iconic gestures and action information, and no common ground, i.e., indefinite articles, mainly with abstract deictic gestures and entity information.

Claire Maury-Rouan (Chapter 23) examines nonverbal parameters of reported speech and perspective shifts and finds that prosodic cues, head movements, posture shifts, and facial expressions mark reported speech. Furthermore, her findings suggest that a shift in posture, typically a shift in head position mark perspective shifts. Adopting the framework of conversational analysis, Lorenza Mondada and Florence Oloff (Chapter 24) study overlaps in turn-taking. They show how speakers use gestures to display their treatment of different kinds of overlap as being more or less problematic, and whether a speaker continues to gesture is dependent on whether the overlap is viewed as collaborative or competitive. They argue that overlaps need to be looked at from a multimodal perspective as it provides a better understanding of how participants use all resources to manage their talk-in-interaction.

Gestural analysis of music and dance

The two chapters in the section gestural analysis of music and dance provide examples of the type of research that is being done on gesture and the arts. Isabella Poggi (Chapter 25) observes and analyzes a choir conductor's multimodal behavior and his social interaction in music performance. She points out that a conductor as the leader of the choir must pursue common goals shared by the singers and himself to perform beautiful music. Using an annotation scheme, Poggi shows that bodily behavior and facial expressions such as gaze, eye and mouth movements of the conductor play a significant role in his pursuing these goals while conducting. Ellen Campana et al. (Chapter 26) describe an interactive art installation, *Handjabber*, which uses a Laban framework of movement to analyze how people use their bodies to communicate and collaborate. They discuss technical aspects of the installation as well as their experience using the installation to explore participants' metaphoric gestures, body orientation, and interpersonal space.

Conclusion

A wide range of research from various disciplines is represented in this volume. Although it does not cover all fields of current gesture research such as sign languages, neurolinguistics, and artificial intelligence/robotics, it provides a flavor of the type of

research that is currently being done on gesture and its interdisciplinary nature. We hope that you enjoy reading the research and are inspired to do some yourself.

References

Alibali, M. W., Kita, S., Bigelow, Lisa J., Wolfman, Chai M. and Klein, S. M. 2001. "Gesture plays a role in thinking for speaking." In *Oralité et Gestualité: Interactions et Comportements Multimodaux dans la Communication*, C. Cavé, I. Guaïtella, and S. Santi (eds), 407–410. Paris: L'Harmattan.

Bavelas, J. B. 1992. "Interactive gestures." *Discourse Processes* 15: 469–489.

Brookes, H. J. 2001. "O clever 'He's streetwise'. When gestures become quotable: The case of the clever gesture." *Gesture* 1 (2): 167–184.

Butterworth, B. and Hadar, U. 1989. "Gesture, speech and computational stages: A reply to McNeill." *Psychological Review* 96 (1) : 168–174.

Calbris, G. 1990. *Semiotics of French Gesture.* Bloomington: Indiana University Press.

Cosnier, J. 1982. "Communications et langages gestuels." In *Les Voies du Langage: Communications Verbales Gestuelles et Animales*, J. Cosnier, A. Berrendonner, J. Coulon and C. Orecchioni (eds), 255–304 Paris: Bordas/Dunod.

Cosnier, J. and Brossard, A. 1984. «Communication non verbale: co-texte ou contexte ?» In *La Communication Non Verbale*, J. Cosnier and A. Brossard (eds), 1–29. Paris: Delacaux et Niestlé.

Cosnier, J. and Vaysse, J. 1997. "Sémiotique des gestes communicatifs." In *Geste, Cognition et Communication, Nouveaux Actes Sémiotiques, 52–54,* J. Cosnier, J. Vaysse, P. Feyereisen, and G. Barrier (eds), 7–28. Limoges: PULIM.

de Fornel, M. 1992. "The return gesture: Some remarks on context, inference, and iconic gesture." In *The contextualization of language*, P. Auer and A. Di Luzio (eds), 159–176. Amsterdam: John Benjamins.

Duncan, S. J. 1972. "Some signals and rules for taking speaking turns in conversations." *Journal of Personality and Social Psychology* 23 (2): 283–292.

Efron, D. 1941/1972. *Gesture and Environment*. Morningside Heights, NY: Kings Crown Press.

Ekman, P. and Friesen, W. V. 1969. "The repertoire of nonverbal behavior: Categories, origins, usage, and coding." *Semiotica* 1: 49–98.

Feyereisen, P. 1987. "Gestures and speech, interactions and separations: A reply to McNeill 1985." *Psychological Review* 94 (4): 493–498.

Freedman, N. 1972. "The analysis of movement behavior during the clinical interview." In *Studies in Dyadic Communication*, A. W. Siegman, and B. Pope (eds), 153–175. New York: Pergamon Press.

Goldin-Meadow, S. 1999. "The role of gesture in communication and thinking." *Trends in Cognitive Science* 3: 419–429.

Goldin-Meadow, S. and Alibali, M. W. 1995. "Mechanisms of transition: Learning with a helping hand." In *The Psychology of Learning and Motivation, Vol. 33*, D. Medin (ed), 117–157. New York: Academic Press.

Goldin-Meadow, S. and Butcher, C. 2003. "Pointing toward two-word speech in young children." In *Pointing: Where Language, Culture, and Cognition Meet*, S. Kita (ed), 85–107. Mahwah, NJ: Lawerence Erlbaum Associates.

Goldin-Meadow, S., Nusbaum, H., Kelly, S. D. and Wagner, S. 2001. "Explaining math: Gesture lightens the load." *Psychological Science* 12: 516–522.

Hadar, U. and Butterworth, B. 1997. "Iconic gestures, imagery, and word retrieval in speech." *Semiotica* 115 (1/2): 147–172.

Heath, C. 1992. "Gesture's discreet tasks : multiple relevancies in visual conduct and in the contextualisation of language." In *The contextualization of language*, P. Auer and A. Di Luzio (eds), 101–127. Amsterdam: John Benjamins.

Iverson, J. M. and Goldin-Meadow, S. 2005. "Gesture paves the way for language development." *Psychological Science* 16 (5): 367–371.

Kendon, A. 1972. "Some relationships between body motion and speech: An analysis of an example." In *Studies in Dyadic Communication*, A. W. Siegman, and B. Pope (eds), 177–210. New York: Pergamon Press.

Kendon, A. 1980. "Gesticulation and speech: Two aspects of the process of utterance. In *The Relation Between Verbal and Nonverbal Communication*, M. R. Key (ed), 207–227. The Hague: Mouton.

Kendon, A. 1981. "Geography of gesture." *Semiotica* 37:129–163.

Kendon, A. 1982. "The study of gesture: Some remarks on its history." *Recherches Semiotique/ Semiotic Inquiry* 2: 45–62.

Kendon, A. 1994. "Do gestures communicate? A review." *Research on Language and Social Interaction* 27 (3): 175–200.

Kendon, A. 2004. *Gesture: Visible Action as Utterance*. Cambridge: Cambridge University Press.

Krauss, R. M. and Hadar, U. 1999. "The role of speech-related arm/hand gestures in word retrieval." In *Gesture, Sign and Speech,* L. Messing and R. Campbell (eds), 93–116. New York: Oxford University Press.

Krauss, R. M., Dushay, R. A., Chen, Y. and Rauscher, F. 1995. "The communicative value of conversational hand gestures." *Journal of Experimental Social Psychology* 31: 533–552.

McNeill, D. 1979. *The Conceptual Basis of Language*. Hillsdale, NJ: Lawrence Erlbaum Associates.

McNeill, D. 1981. "Action, thought, and language." *Cognition* 10: 201–208.

McNeill, D. 1992. *Hand and Mind*. Chicago: University of Chicago Press.

McNeill, D. 2000. *Language and Gesture*. Cambridge: Cambridge University Press.

McNeill, D. 2002. "Gesture and language dialectic." *Acta Linguistica Hafniensia* 34: 7–37.

McNeill, D. 2005. *Gesture and Thought*. Chicago: University of Chicago Press.

McNeill, D. and Levy, E. 1982. "Conceptual representations in language activity and gesture." In *Speech, Place, and Action: Studies in Deixis and Related Topics*, R. J. Jarvella and W. Klein (eds), 271–295. New York: John Wiley and Sons.

McNeill, D., Cassell, J. and Levy, E. T. 1993. "Abstract deixis." *Semiotica* 95: 5–19.

Morrel-Samuels, P. and Krauss, R. M. 1992. "Word familiarity predicts temporal asynchongy of hand gestures and speech." *Journal of Experimental Psychology: Learning, Memory and Cognition* 18: 615–623.

Morris, D., Collett, P., Marsh, P. and O'Shaughnessy, M. 1979. *Gestures: Their Origins and Distribution.* New York: Stein and Day.

Nobe, S. 1996. *Representational gestures, cognitive rhythms, and acoustic aspects of speech: A network/threshold model of gesture production.* Unpublished doctoral dissertation, University of Chicago.

Nobe, S. 1998. "Synchrony between gestures and acoustic peaks of speech: A cross-linguistic study." In *Oralité et Gestualité: Communication Multimodale, Interaction*, S. Santi, I. Guaïtella, C. Cavé and G. Konopczynski (eds), 543–548. Paris: L'Harmattan.

Ricci Bitti, P. E. and Poggi, I.. 1991. Symbolic nonverbal behavior: Talking through gestures. In *Fundamentals of Nonverbal Behavior*, R. S. Feldman and B. Rimé (eds), 433–457. Cambridge: Cambridge University Press.

Rimé, B. and Schiaratura, L. 1991. Gesture and speech. In *Fundamentals of Nonverbal Behavior*, R. S. Feldman and B. Rimé (eds), 239–281. Cambridge: Cambridge University Press.

Stam, G. 2001. Lexical failure and gesture in second language development. In *Oralité et Gestualité: Interactions et Comportements Multimodaux dans la Communication*, C. Cavé, I. Guaïtella and S. Santi (eds), 271–275. Paris: L'Harmattan.

Stam, G. 2006. *Changes in Patterns of Thinking with Second Language Acquisition*. Unpublished doctoral dissertation, University of Chicago.

Stam, G. and McCafferty, S. G. 2008. "Gesture studies and second language acquisition: A review." In *Gesture: Second Language Acquisition and Classroom Research*, S. G. McCafferty and G. Stam (eds), 3–24. New York: Routledge.

Stam, G. in press. Gestes et recherche de mots en langue seconde. In R. Vion, A. Giacomi and C. Vargas (eds). *La corporalité du langage : Multimodalité, discours et écriture*, Hommage à Claire Maury-Rouan. Aix en Provence : Presses Universitaires de Provence.