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Methodological reflections on gesture analysis in second language acquisition and bilingualism research

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Gestures, i.e. the symbolic movements that speakers perform while they speak, form a closely interconnected system with speech, where gestures serve both addressee-directed ('communicative') and speaker-directed ('internal') functions. This article aims (1) to show that a combined analysis of gesture and speech offers new ways to address theoretical issues in second language acquisition (SLA) and bilingualism studies, probing SLA and bilingualism as product and process; and (2) to outline some methodological concerns and desiderata to facilitate the inclusion of gesture in SLA and bilingualism research.

I Introduction

Gestures – symbolic movements recognized as communicatively relevant by onlookers (Kendon, 1978; 2004; McNeill, 1992) – are an integral part of our communicative efforts and, when we speak, we typically also gesture. Despite their prevalence in language use, gestures have received surprisingly little attention in second language acquisition (SLA) and bilingualism studies. This is presumably both for theoretical and methodological reasons. Traditionally, gestures have been seen as 'paralinguistic' and therefore outside the realm of the language sciences (see Kendon, 2004), including SLA and bilingualism studies. They have

chiefly been discussed in foreign language classroom contexts as: the topic of culture-specific behaviour (e.g. Wylie, 1977); as a pedagogical practice for improving comprehension and possibly learning (e.g. Harris, 2003; Lazaraton, 2004); and in connection with assessments and evaluation (e.g. Jenkins and Parra, 2003). Bilingualism studies have occasionally discussed whether bilinguals are bimodally bilingual and switch both spoken language and 'nonverbal behaviour' (e.g. Efron, 1972; Von Raffler-Engel, 1976). Finally, gestures have been treated as a compensatory device or communication strategy (for a discussion and a critique, see Gullberg, 1998; Gullberg, de Bot and Volterra, 2008). In most of these contexts gestures have generally not been discussed as having a bearing on theoretical issues of SLA or bilingualism studies.

However, recent theoretical and methodological developments in the field of gesture studies suggest that gestures could fruitfully contribute to research in both fields. Gestures are increasingly seen: (1) as playing both an interactive, communicative, and an internal, cognitive role and (2) as tightly linked to language and speech (McNeill, 1992; 2005; Goldin-Meadow, 2003; Kendon, 2004). This situates gestures at the crossroads of interactive and psycholinguistic theoretical concerns in SLA and bilingualism studies.

This article first introduces gestures and then briefly outlines their relevance to SLA and bilingualism studies in offering novel ways to probe SLA and bilingualism as product and process. The review highlights the contribution of gestures to the study of semantic-conceptual representations – language as product – showing not only *that* second language (L2)/bilingual varieties differ from monolingual native varieties, but also *how* they differ. It also illustrates that gestures provide a window on the interaction between communicative and psycholinguistic constraints on the deployment of L2 knowledge in real-time: language as process. The next section discusses some methodological concerns and desiderata to facilitate the inclusion of gestures in SLA and bilingualism research, and the article concludes with a discussion of some implications of such an addition.

II Gestures: what are they?

1 Structure and systematicity

Gestures constitute a rich expressive resource available to speakers who deploy them with speech in sophisticated, systematic and non-trivial ways.

Contemporary gesture studies show that gestures can be systematically characterized in structural, semiotic and functional terms, highlighting their tight connection to language. Gestures can be structurally described in terms of articulators (e.g. the hand, the head) and their configurations (e.g. hand shapes), the place of articulation (e.g. where in gesture space), and the form and direction of the movement (cf. descriptions of sign language; Stokoe, 1980). The movement itself can be analysed into movement phases (preparations, strokes or nucleus phases, retractions and holds; Kendon, 1980; Kita *et al.*, 1998; Seyfeddinipur, 2006).

Gestures can also be semiotically categorized (see Kendon, 2004). For instance, representational gestures convey meaning by iconically depicting or illustrating some aspect of what is talked about (iconic, metaphoric gestures) or by spatial contiguity and proximity to the considered entity (deictic, indexical gestures). Rhythmic gestures (beats) mark scansion and interactive gestures refer to some aspect of conversation itself. Gestural forms and meanings also display different degrees of conventionalization, ranging from fully lexicalized gestures like the victory sign with fixed form–meaning pairings ('emblems'; Ekman and Friesen, 1969), via cultural forms and functions of pointing, nodding, etc. (e.g. Maynard, 1990; Wilkins, 2003), to less conventionalized or non-conventionalized gestures without established standards of well-formedness (for a discussion of this continuum, see Kendon, 2007).

Gestures have traditionally been seen as serving mainly addressee-directed, communicative functions for interlocutors, such as promoting understanding and disambiguation (e.g. Rogers, 1978; Riseborough, 1981) or regulating turn-taking (e.g. S.J. Duncan, 1973; Streeck and Hartege, 1992). A growing body of research suggests that gestures also serve speaker-directed, cognitive functions, such as aiding conceptual planning (e.g. Hostetter and Alibali, 2004) and reducing cognitive load (e.g. Goldin-Meadow *et al.*, 2001). Gestures have also been implicated in linguistic planning (Freedman, 1972; Alibali *et al.*, 2000) and lexical access (e.g. Krauss and Hadar, 1999; Frick-Horbury 2002; Ravizza, 2003). Although there is some debate regarding the predominant function of gestures (Kendon, 1994), there is general agreement that gestures are multi-functional and serve both addressee-directed, communicative and speaker-directed, internal functions.

Finally, gestures are influenced by a range of social, psychological, contextual and cultural factors that guide human interaction; much as

speech is. Despite the variation this generates there is also remarkable gestural systematicity within speech communities when contextual variables are kept constant. Overall, individual gesture production is realized within the boundaries of culturally – and linguistically – determined repertoires.

2 The connection to language and speech

Gestures, speech and language are increasingly seen as linked in production, comprehension and development, the modalities forming an 'integrated' system which is planned and processed together (McNeill, 1992; Clark, 1996; Goldin-Meadow, 2003; Kendon, 2004).

Gestures fulfil linguistic functions such as providing referential content to deictic expressions (*give me that*), and speakers distribute information across modalities purposefully depending on interlocutors' visual access and locations (Özyürek, 2002a; Holler and Beattie, 2003; Melinger and Levelt, 2004), suggesting that gestures are an integral part of the production process. Further evidence for co-planning comes from the semantic–pragmatic and temporal co-expressivity whereby the modalities express closely related meaning at the same time. This alignment is very fine grained, as seen in gesture holds where gestures wait for speech. This co-expressivity also has crosslinguistic consequences. Insofar as languages differ in what meaning they express and how it is encoded linguistically, the form and distribution of gestures also differs systematically across linguistic communities (e.g. S.D. Duncan, 1996; McNeill and Duncan, 2000; Kita and Özyürek, 2003). For instance, speakers of Turkish gesture differently when talking about motion than speakers of English (Kita and Özyürek, 2003). English speakers typically express path and manner of motion in one clause (e.g. *roll down*) accompanied by a gesture expressing both components (hand expressing rolling and downward motion simultaneously). Turkish speakers, in contrast, express path and manner in two separate clauses using two lexical verbs (*descend while rolling*), accompanying each clause with a single gesture expressing only path (downward movement) or only manner (rolling motion). Crucially, meaning in speech and gesture is aligned. Crosslinguistic differences in how meaning is expressed affect the form of gestures, their temporal alignment with speech, and possibly also the distribution of information across modalities (for an overview, see Gullberg, 2009). Speakers of different languages thus gesture differently not only for cultural, but also for linguistic reasons.

In comprehension, gestures affect the interpretation and memory of speech (e.g. Beattie and Shovelton, 1999; Kelly *et al.*, 1999). For instance, information conveyed only in gesture is integrated with speech such that it re-surfaces in retellings (Cassell *et al.*, 1999). Recent neuro-cognitive evidence further suggests that the brain processes speech and gesture in similar ways to speech alone (see articles in Özyürek and Kelly, 2007).

Finally, gestures and speech develop in parallel in childhood (e.g. Jancovic *et al.*, 1975; Nicoladis *et al.*, 1999), with gestures possibly foreshadowing speech (e.g. Iverson and Goldin-Meadow, 2005), and conversely break down together in stuttering and disfluency (e.g. Mayberry and Jaques, 2000; Seyfeddinipur, 2006).

The accumulated evidence thus suggests a tight link between speech, gesture and language. However, the nature and the locus of the link are under theoretical debate (for overviews, see Kendon, 2004; De Ruiter, 2007). Generally, theories assume a link at the conceptual level to account for the fine-grained coordination observed in production. They differ, however, in their views on whether gestures sub-serve speech or whether the modalities are equal partners (Kendon, 2007), how far down in the encoding process the two systems influence each other, in the precise role of imagistic and linguistic influences on gesture, and the interplay between these and communicative intentions (McNeill, 1992; 2005; De Ruiter, 2000; Kita and Özyürek, 2003; Kendon, 2004).

III The relevance of gestures to SLA and bilingualism studies

Why should SLA and bilingualism researchers care about gestures? The view of speech, language and gesture as an interconnected system where gestures serve both communicative and speaker-internal functions and reflect crosslinguistic differences puts gestures in the same socio-cognitive arena as speech. Consequently, it becomes a natural extension of SLA and bilingualism studies to consider gestures. More importantly, gestures can offer novel ways to address theoretical topics discussed in these fields (for more elaborate discussions, see Gullberg, 2006a; Nicoladis, 2007; Gullberg, de Bot and Volterra, 2008). Specifically, gestures can shed new light on issues such as the nature of representations and knowledge at a given moment in time: language as product. They can also illuminate how such representations are deployed in real time, as well as the changes in representations characteristic of acquisition: language as process. Importantly, gestures are implicated at

all linguistic levels reflecting the mapping of semantic-conceptual elements onto lexical and morphosyntactic devices as seen in lexicalization patterns, word order, discourse organization, etc. This section briefly exemplifies these aspects by discussing what gestures contribute to the study of: (1) the role of the first language (L1) and crosslinguistic influences on semantic-conceptual representations and (2) communicative and psycholinguistic constraints on structural and discursive properties of learner varieties. It also outlines two further domains where gestures could make important contributions, namely discussions about input, attention and noticing, and about the role of producing output.

1 The role of the L1, crosslinguistic influences and semantic-conceptual representations

A key issue in many lines of SLA and bilingualism research is what role the L1, crosslinguistic influences or transfer play for development and for properties of the L2/bilingual system both in terms of representations (product) and in terms of real-time use of those representations (process; for overviews, see Odlin, 2003; Ringbom, 2007; Jarvis and Pavlenko, 2008; Roberts *et al.*, 2008). Increasingly, studies probe the intersection between semantic-conceptual structure and morphosyntax, asking whether target-like forms necessarily imply (monolingual) target-like meanings and, if not, what the nature of L2/bilingual meaning representations is. Studies also explore whether L2 speakers re-organize their semantic representations and shift attention to different or new types of information, and to what extent representations in two or more languages are kept separate or interact with each other (e.g. Van Hell and Dijkstra, 2002; Kroll and Sunderman, 2003; Odlin, 2003; Jarvis and Pavlenko, 2008). In this endeavour they draw on findings of crosslinguistic differences in conceptual categorization (Malt and Sloman, 2003; Francis, 2005; Pavlenko, 2005), and differences in what information speakers attend to and select for expression as a reflection of linguistic categories and semantic-conceptual representations, a phenomenon alternatively known as macro-planning, linguistic conceptualization, event construal and 'thinking for speaking' (Levelt, 1989; Slobin, 1996; Von Stutterheim and Nüse, 2003).

Perhaps not surprisingly, SLA studies often find that even advanced L2 speakers continue to target information for expression typical of the L1 rather than the L2, mapping L1-typical meaning onto L2-typical morphosyntactic structures (e.g. Cadierno, 2008; Carroll *et al.*, 2000).

L2 speakers seem to look for ways to express the representations and perspectives of the L1 rather than change to the perspective typical of the L2 (compare 'transfer to nowhere' in E. Kellerman, 1995).

A vexing issue in many of these studies is whether speech reflects all types of information contained in representations and meanings speakers take into consideration as they plan to speak (see Gullberg, in press). For instance, the literature drawing on Talmy's (1991) distinction between verb-framed languages, encoding the path of motion in verb roots (e.g. *exit*), and satellite-framed ones, encoding it in satellites (e.g. *out*), often suggests that speakers of verb-framed languages attend less to manner of motion than speakers of satellite-framed languages because manner is less readily expressed in verb-framed languages (e.g. Slobin, 2006). However, it is not clear that the absence of overt manner in (monolingual native) speech means that manner is not attended to. Further, when differences between monolingual native speakers' and L2/ bilingual speakers' representations are detected, the question nevertheless remains what the nature of the difference is and what semantic-conceptual elements such speakers actually draw upon. That is to say, studies often show what L2/bilingual speakers do not mean and less often what they do mean. Gestures can shed some light on all these issues.

As seen above, gestures are vehicles of language-specific meaning: they reflect newsworthy and focal information targeted for expression and its lexical and syntactic realization in their form, timing relative to speech, and distribution of information across modalities. Two languages with different event representations should display different gesture patterns along one or more of the three dimensions. If L2 speakers have acquired target-like representations, their gestures should also be target-like. Similarly, if bilinguals have separate meaning representations, they should display two separate gesture patterns, one for each language. If their gestures are similar in both languages but different from those of monolinguals, this would suggest shared representations. Under this logic, the forms and timing of gestures offer unique opportunities to study what information L2/bilingual speakers actually do take into account, what components their meaning representations contain, and any shifts in these representations.

Overall, the findings from studies that examine speech and gestures jointly provide a more fine-grained picture of crosslinguistic influences (for overviews, see Gullberg, 2008; 2009). In some studies L2 speakers whose speech is target-like nevertheless gesture in L1 ways. For instance, L2 speakers may align path gestures with verbs (e.g. Spanish) rather than

with satellites (e.g. Dutch). The association of action (verb) with path in this case suggests that L1-like representations drive linguistic planning and conceptualization also in the L2 (Özyürek, 2002b; Kellerman and Van Hoof, 2003; Negueruela *et al.*, 2004; Stam, 2006; Choi and Lantolf, 2008). Other studies find evidence of re-structuring of representations such that some L2 speakers also produce target-like gestures. Dutch, German and French native speakers gesture differently when talking about placement, reflecting differences in the semantic granularity of the placement verbs in these language (Gullberg, in press; submitted-a). In a group of Dutch and German learners of French, who all used the French placement verb *mettre* ('put') accurately, some learners continued to gesture in L1-like ways. Others, however, gestured in French-like fashion, suggesting a shift of attention from L1-relevant semantic elements (e.g. objects, goal grounds) to L2-typical ones (direction of movement) and adjustment of meaning representations (Gullberg, submitted-b).

Gesture analysis also contributes to studies examining bidirectional crosslinguistic influences (e.g. Cook, 2003; Hohenstein *et al.*, 2006), providing some evidence that the L2 can influence L1 representations even in L2 speakers who are not functional bilinguals. For instance, Japanese speakers with intermediate proficiency in English, resident either in Japan or in the USA but matched on formal L2 proficiency, distributed information about manner of motion significantly differently across speech and gesture in their native L1, Japanese, from monolingual speakers of Japanese (Brown and Gullberg, 2008). These findings suggest that even a modest amount of knowledge of another language may shift native representations. The gesture data illustrate precisely what semantic components are affected. Moreover, as no difference was found between Japanese speakers with knowledge of English resident in Japan or in the USA, gestures seem to reflect changes in linguistic rather than cultural representations.

Overall, gestures provide a new window on the details of meaning representations, the interface between semantic-conceptual and syntactic information in lexicalization. As such, they shed new light on crosslinguistic influences in this domain.

2 Communicative and psycholinguistic constraints on the properties of learner varieties

Another line of SLA research aims to understand the principles governing the properties of learner varieties, meaning both a system to be

studied in its own right and a system whose properties are not necessarily traceable to the source or the target language (Perdue, 2000). A variety of potential factors have been discussed including communicative constraints, psycholinguistic and processing-related constraints, linguistic properties, Universal Grammar, etc. (e.g. Klein and Perdue, 1997; White, 2003; O'Grady, 2004). Gestures can shed some light on how communicative and psycholinguistic factors interact to shape the structural and discursive properties of such varieties.

For example, sustained discourse production and reference tracking pose problems for beginning L2 speakers. They are often over-explicit, using chains of lexical NPs (*the boy – the boy*) instead of alternating full lexical forms and pronouns (*the boy – he*) to mark transitions between new and maintained referents (e.g. Givón, 1984; Williams, 1988; Hendriks, 2003). Interestingly, at this stage L2 speakers are also over-explicit in gesture, accompanying lexical NPs with localizing, disambiguating gestures at every mention instead of only at first introduction (Gullberg, 2003; 2006b; Yoshioka, 2005). Moreover, gesture production decreases significantly with increased use of pronouns. One account in the SLA literature suggests that speech is over-explicit because learners want to avoid ambiguity (Williams, 1988). The bimodal over-explicitness raises the possibility that the L2 variety is a communication strategy where speech and gesture disambiguate each other. A study manipulating the visibility between L2 speakers and their addressees during discourse production showed that addressees' visual access to disambiguating gestures did not affect L2 speech, which remained over-explicit (Gullberg, 2006b). Strikingly, visual access also did not affect the rate of L2 speakers' gestures, but only their spatial realization. L2 speakers gestured with lexical NPs regardless of whether they were seen or not, but clearly exploited them for spatial disambiguation of referents when visible. The findings suggest a complex interplay between communicative (disambiguating) and psycholinguistic constraints (knowledge of pronouns, discourse planning, cognitive load) on L2 varieties. Both shape production in interaction and the combined analysis of gesture and speech provides a more detailed picture of the relative role played by each.

3 Unexplored but potentially relevant domains

a Input, attention and noticing: The role of input in SLA and what adults can or cannot do with it is a hotly debated topic as reflected in research

on the input–intake distinction, attention, noticing and issues in both interactionist and emergentist accounts of acquisition (e.g. Truscott, 1998; Carroll, 2001; Schmidt, 2001; Robinson, 2003; Ellis and Larsen-Freeman, 2006; Gass and Mackey, 2006). The spatial and functional properties of gestures suggest that they could contribute both to discussions on comprehensibility and to attention and noticing: Gestures convey meaning that can be exploited but they also direct attention (e.g. Langton and Bruce, 2000) and mark informational relevance by aligning with newsworthy, focal (and often stressed) information in speech (Levy and McNeill, 1992; Levy and Fowler, 2000). There is substantial evidence that gestures in the input in native contexts improve comprehension in noisy or ambiguous contexts (e.g. Rogers, 1978; Kelly *et al*., 1999). They also promote learning. Children and adults learn more about maths, asymmetry and new adjectives if explanations are provided with gestures than if they are not (e.g. Goldin-Meadow *et al.*, 1999; O'Neill *et al.*, 2002).

These findings have hardly been considered in the SLA and bilingualism literatures on the role of input. Despite frequent speculations that gestures should facilitate L2 comprehension in interaction (e.g. S. Kellerman, 1992; Lazaraton, 2004; Kida, 2008), this remains a virtually untested question (but see Musumeci, 1989; Sueyoshi and Hardison, 2005). Similarly, very few studies have examined whether gestures in the L2 input affect L2 learning. Two studies show that adult English learners of French and French children learning English retain significantly more expressions at a post-test if words are presented with gestures than learners who receive no gesture input with new words (Allen, 1995; Tellier, 2008). Strikingly, none of these studies relate their findings to the theoretical debate about (comprehensible) input in SLA (compare Krashen, 1985) or to discussions about learning outcomes.

Moreover, the few existing studies focus only on the role of gestures as vehicles of meaning. However, gestures may also contribute to noticing and attention as these pertain to acquisition. A study probing the adult capacity for L2 learning after minimal exposure examined whether the presence of gestures in the input would help adult learners to segment an unknown language even in the absence of meaning (Gullberg *et al*., 2007). Dutch learners were presented with audiovisual input in the form of a weather report in Mandarin Chinese. The input was naturalistic but rigorously controlled, manipulating word frequency and the presence/absence of gestures. Participants who knew no Mandarin watched the weather report and were then probed with a surprise word

recognition task. The results showed that learners recognized words that had been embedded in continuous speech significantly above chance after as few as eight encounters if these had occurred with gestures. These findings suggest that gestures in the input can serve to highlight linguistic forms, not just meaning, helping learners with the first essential learning task, namely to segment the incoming sound string (compare Carroll, 2004). Examining how gestures interact with other features in the L2/bilingual input to guide attention, achieve noticing, make input comprehensible and possibly achieve learning is an important enterprise for SLA and gesture studies alike.

b Output and usage: proceduralizing, grounding and processing load: SLA studies also debate the role of output, the active use of language and the production of language (however non-target-like it may be) for acquisition. The so-called output hypothesis states that production is crucial to automatizing or proceduralizing new knowledge (Swain, 2000; Gass and Mackey, 2006). Again, gestures could inform and complement debates on this topic by connecting to research on embodied cognition and issues of cognitive load.

In native contexts, producing gestures promotes general learning. Adults and children who gesture while learning about maths and science do better than speakers who do not (e.g. Alibali and DiRusso, 1999; Goldin-Meadow, 2003), and general recall improves when speakers gesture about events (e.g. Frick-Horbury, 2002). It has frequently been speculated that producing gesture may improve L2 acquisition. For example, learners who gesture as part of their communication strategies to negotiate and solve problems in the L2 may learn more than those who do not (e.g. Gullberg, 1998; Olsher, 2004; Mori and Hayashi, 2006). Similarly, it has been proposed that the gestures L2 speakers perform in solitude while studying for exams in medicine, for example, may help establish and consolidate both linguistic form and meaning (McCafferty, 2006; Lee, 2008). Again, very few studies have actually tested these suggestions (but see Tellier, 2008).

Crucially, the accounts for why gestures in the input and output should promote learning are of theoretical interest to SLA. Cognitive psychology suggests that the engagement of multiple types of representations and memory components (auditory, visual, motor) improve recall and learning as this leaves richer memory traces (compare Clark and Paivio, 1991). Recent studies on (embodied) neurocognition

support this view, arguing that action and language are subserved by the same neural substrates (e.g. Glenberg and Kaschak, 2002; Rizzolatti and Craighero, 2004; Pulvermüller, 2005). Gestures as bodily actions, engaging visual and motor components, clearly qualify as potential candidates for promoting (language) learning. A further possibility is that producing gestures promotes learning because it reduces cognitive load (e.g. Goldin-Meadow *et al.*, 2001). Speakers who gesture during a reasoning task do better on a parallel memorization task than speakers who do not, suggesting that gesturing frees up cognitive capacity for memorization. This line of work has important implications for L2 studies where individual differences in working memory and proficiency might interact with cognitive load to affect acquisition. If gesturing reduces the cognitive load involved in planning L2 production, then learners' gesture production may allow them to continue speaking, thus producing more output and perhaps facilitating learning (Gullberg, 2006b). SLA and bilingualism debates about input and output could gain from considering gesture as a variable to be manipulated in empirical studies by exploring the link between working memory, fluency and gesture production.

To summarize, gestures provide new information about the L2/bilingual system as product, revealing details about representations not necessarily visible in speech and shedding new light on the interface between semantic-conceptual structure and morphosyntax. Gestures also add information about how communicative and psycholinguistic factors interact to shape the L2/bilingual system both as product and as process, as visible over development and in actual language use in a range of linguistic domains. As a variable in comprehension and production studies gestures also have the potential to further our understanding of the role of input processing, attention and cognitive load.

IV How to study gestures: methodological concerns

The review above, albeit selective and far from exhaustive, suggests that gesture data offer rich opportunities for probing a range of theoretical issues further. The question is how to go about studying gestures in SLA and bilingualism research. It is less technologically challenging than it used to be, since all necessary equipment (digital video recorders, viewing and digital annotation software) is now widely and in some cases even freely available (e.g. www.lat-mpi.eu/tools). More challenging is the question of what gesture dimensions are relevant for

a given research question: form, meaning, function, timing, contextual use, presence/absence, etc., all of which have been exemplified above. There are also a number of theoretical and practical caveats. The following will sketch some of these before outlining some desiderata in checklist style primarily geared towards controlled studies with an eye to quantitative analyses.

A concern for pseudo-experimental studies and studies performing quantitative analyses is that, although gestures are pervasive in production, they are not as persistent as words or reaction times: not all participants gesture (for all items) and the same individual does not gesture all the time. For example, in a task where five video clips must be described, one speaker may provide 25 gestures and another only five. Moreover, the 25 gestures will not be evenly distributed across all items. There is thus individual variation in the propensity to gesture, which is further influenced by social factors such as nervousness, and by the content and, importantly, the amount of speech. To reach an acceptable sample size, it is often necessary to test twice as many participants as included in the final analysis. Sample sizes are consequently often relatively small and data not normally distributed. Gesture studies, like many other domains of language studies, therefore require creative designs and statistical solutions. That said, all available data suggest that, although speakers differ in how much they gesture, they are remarkably consistent in how and with what elements they gesture, all other things being equal. Companion qualitative analyses are thus needed to examine how individual, social and contextual factors interact with the phenomenon under study.

A further issue is that gesture studies lack a standardized transcription system and coding scheme (for two influential but different approaches, see McNeill, 1992; 2005; Kendon, 2004). To allow for comparability across studies, explicit descriptions and examples are therefore necessary.

An important issue for SLA and bilingual studies is that gesture production cannot be assessed in terms of 'grammaticality' or error analysis. Instead, preferential usage patterns must be established with corresponding gradient native scales of appropriateness or acceptability. That is, when comparing L2 or bilingual speakers to monolingual native speakers, the question is whether their patterns of variation resemble each other.

Finally, so little is currently known about cross-cultural and cross-linguistic gestural practices outside a handful of languages and constructions that SLA and bilingual studies must establish typical patterns

not only for L2 or bilingual speakers, but for (monolingual native) speakers of source and target languages as well (see further below). This state of affairs will hopefully change with a growing number of well-documented studies.

1 Desiderata for gesture studies in SLA and bilingual studies

As for any other domain of inquiry, replicability and methodological rigour is vital. It is essential to be explicit about theoretical assumptions, tasks and procedures, issues of baselines, units of analysis, coding and reliability. This is equally important in qualitative and quantitative approaches.

a Theoretical assumptions: Even for studies that do not test theoretical hypotheses, the view on the gesture–speech relationship underpinning the study should be specified. This is particularly important for studies where gesture is used as an analytical tool. It is crucial to specify what gestures are supposed to index (a concept, lexical access, etc.), and how the link between gesture and speech is viewed.

b Tasks and procedures: Gesture studies draw on observational, naturalistic and elicited data. Elicitation tasks are typically designed to promote spontaneous gesture production while keeping the content of speech and contextual variables constant to facilitate comparison across participants, and keeping speakers' awareness of their own gesture production at a minimum. Production tasks often involve narratives or story retellings, video description tasks, or referential communication tasks on spatial or action-related topics. They are generally dyadic in nature, since gestures are more frequent in dialogic face-to-face interaction (Bavelas *et al*., 2002; Bavelas *et al.*, 2008). Generally, given the contextual sensitivity of the phenomenon, instructions and procedures should be reported in detail. For instance, it may matter whether the interlocutor is a confederate or a naive interlocutor.

c Baselines and causes of variation: Because gesture is a novel phenomenon in L2/bilingual studies, the establishment of baselines is of fundamental importance. The variation in comparison groups in a given domain must be carefully chartered, whether they are monolingual native or other L2/bilingual speakers. Similarly, it is useful and sometimes crucial to establish an intra-individual baseline to determine what an

individual's gesture behaviour is like in a control condition compared to a 'target' condition. For example, if the study examines the impact of language choice or proficiency on some speech measure and gesture, it is useful to establish the individual's speech–gesture behaviour in the L1/L*x* (the 'control' condition) on a given task to compare it to the same individual's behaviour in the L2/L*y* (the 'target' condition); see Gullberg, 1998). It may similarly be useful to establish a baseline for behaviour in the same language on a simple vs. a complex task (see Nicoladis *et al*., 2007).

A related question concerns fluency. Many studies compare disfluent L2 speakers to fluent L1 speakers. Ideally, to isolate effects of formal proficiency, for instance, disfluent L2 should be compared to disfluent L1 production, and fluent L2 to fluent L1 production. A further issue concerns what gestures are included in analyses. Many studies currently include all gestures produced regardless of whether these occur in passages of fluent or disfluent speech. If the study is not directly concerned with disfluency, gestures occurring with disfluencies should be treated with caution. This is especially true in theoretical frameworks where gestures are considered to index linguistic conceptualization. Gestures in disfluent passages may be driven by different mechanisms (e.g. deliberate strategies), than the ones assumed to operate during the (conceptualization and) production of fluent speech (Kita and Özyürek, 2003; McNeill, 2005). To date no theory of speech–gesture production has an account of gesture production in disfluency (for a discussion, see Seyfeddinipur, 2006).

d Coding: Studies should be explicit about (1) how gestures are identified and (2) the unit of analysis (e.g. the 'gesture phrase' between major resting positions or the more fine-grained gesture stroke; Kendon, 1980). If gestural timing relative to speech is relevant, it is critical to report:

1) the temporal granularity of the video recordings (number of video frames/second);
2) how the onset/offset of a gesture was determined; and
3) how temporal overlap between gesture and speech was established.

The latter two tasks are not trivial, partly because gestures do not neatly align with words. Stam (2006), following McNeill (1992), applied a criterion whereby a gesture was considered to overlap with a syllable

if it covered the vowel nucleus, but not if it covered only a consonant onset or coda (for a similar procedure, see Gullberg, Hendriks and Hickmann, 2008).

e Distinguish form and function: Many studies conflate form and function, presumably due to misunderstandings of coding schemes and descriptive gesture taxonomies. Coding for form should rely on structural properties of gestures such as the articulator and its configuration, the place of articulation and the nature (and direction) of the movement (what moves where and how?). Moreover, such coding should be done with sound turned off in order to avoid an influence from meaning in concomitant speech. This is particularly important if the study specifically concerns the relationship between gesture and speech. Coding for function, meaning and co-expressivity of speech and gesture requires equally careful consideration (what does the gesture do/mean? what is expressed where?). Co-expressivity coding is not trivial. Gestures are imagistic, spatial and synthetic/holistic, and convey information of a different type and format from spoken language (e.g. Beattie and Shovelton, 2002; Kendon, 2004). Speech and gesture information is therefore rarely 'identical' even if closely related (e.g. *he slid down the slope* with the gesture expressing a zigzag trajectory; compare De Ruiter, 2000). Given this complex relationship, it is important to be explicit about how co-expressivity is determined.

Finally, it is worth noting that McNeill's influential notions of 'iconic', 'metaphoric', 'deictic' gestures and 'beats' are not mutually exclusive categories (McNeill, 1992; 2005: 38–44). Instead, they are co-varying semiotic dimensions such that an individual gesture can simultaneously have a deictic, an iconic and a beat component, for instance.

Analyses can take speech or gesture as their starting point depending on the research question. For instance, Kendon (2004) has identified recurring hand shapes in Neapolitan Italian and then determined their functions based on contextual use. It is equally possible to first identify a relevant stretch of speech and then investigate gestures co-occurring with it (Gullberg, 2003). Both approaches are equally valid depending on the research questions and provided the approach is clearly described.

f Interrater reliability: Always report interrater reliability measures.

g Qualitative vs. quantitative analyses: As in many other areas of language studies, qualitative and quantitative analyses are equally useful.

The most fruitful approach is to combine some degree of qualitative analysis with a quantitative approach to allow for a clear understanding of the phenomenon under study as well as generalizability. Qualitative approaches will provide much needed information about the range of variation of gestural forms and functions, and the cultural, social, linguistic, discursive, contexts where they occur and with which they may co-vary. As to quantitative analyses, even if inferential statistics are not always applicable, descriptive statistics are informative and useful as a first step towards providing a basis for discussing preferential patterns, systematicity, co-variation, etc.

Related to this, one quantitative measure often reported in L2/ bilingual studies is gesture rate. Such measures should preferably compute gestures per some speech unit – equivalent and comparable in both languages (clause, T-unit, etc.) – to account for the fact that gesture production co-varies with speech production: the more speech there is, the more gestures are likely to be produced. In L2/bilingual studies it is important to capture the difference between a disfluent L2 speaker who produces 10 utterances and 10 gestures in two minutes, and a fluent L1 speaker who produces 30 utterances and 10 gestures in two minutes.

V Further issues and implications

The questions and methods exemplified in this article constitute a sample of what has hitherto been done. A number of further issues could be explored. Most urgently, perhaps, the current dominance of gesture production studies should be complemented by comprehension studies. Such studies would deepen our understanding of the role of gestures in the input both for L2/bilingual speakers and their interlocutors in interaction, including evaluators in pedagogical settings. A combined perspective on production and comprehension in this domain could further help elucidate issues of learning beyond the level of semantic meaning. For example, McCafferty (2006) has recently suggested that rhythmic gestures or beats may affect learning by serving to internalize prosodic and phonological properties of the target language. This suggestion receives support from observations that beats occur with corrective statements in teacher and foreigner talk (e.g. Adams, 1998; Gullberg, 1998; Allen, 2000), and with L2 self-repairs (Gullberg, 1998), but remains untested. Also in the realm of L2 phonology and comprehension, the interactional consequences of 'foreign gesture' remain unknown beyond the anecdotal. That is, it is unknown whether

it matters to addressees whether L2/bilinguals gesture differently from monolingual native speakers.

Another important domain concerns discourse and information structure. Gestures have been implicated in monolingual native discourse construction at various levels (e.g. Levy and McNeill, 1992) including topic–comment structure (e.g. S.D. Duncan, 1996), reference tracking (e.g. Levy and Fowler, 2000), given–new distinctions and common ground (e.g. Gerwing and Bavelas, 2004). This opens rich possibilities for expanding the scope of studies on discourse development in L2 and bilingual discourse where a range of lexical, syntactic, and semantic-conceptual phenomena come together in online production. Issues related to planning and cognitive load could fruitfully be examined bimodally in such contexts.

Other issues awaiting attention concern possible differences between tutored vs. untutored L2 learners, and early simultaneous vs. late consecutive bilinguals, where a combined speech–gesture analysis may reveal interesting facts about developmental trajectories.

Finally, gestures can also be studied as an object of acquisition in their own right, a topic not touched upon in this review (but see Gullberg, 2006a). Virtually everything remains to be done in this domain. It is currently unknown whether L2 speakers acquire conventionalized forms of gesturing such as pointing and emblematic gestures. Given that emblems, for instance, function as idiomatic expressions, they may suffer the same difficulties as spoken idioms in production. A contrastive study of idiom acquisition in speech vs. gesture could address the question whether the visual modality always has an advantage in learning. Further, various aspects of L1 gesture use may be expected to persist in L2 and perhaps to be subject to interaction in bilinguals, such as where in space gestures are typically deployed, a feature affecting their perceived size and salience.

As a final note, the inclusion of gesture analysis has ramifications for other domains of SLA than the ones listed here, such as endeavours related to target-likeness, the native speaker norm and ultimate attainment (e.g. Hyltenstam and Abrahamsson, 2000; Davies, 2003; Birdsong, 2004). Gestures constitute another dimension along which L2/bilingual speakers can vary. Insofar as the aim is to compare them to monolingual native speakers, gesture data raise the stakes. To be (near) native-like or indistinguishable from monolingual native speakers means being bimodally native-like in speech as well as in gesture. As

we have seen, gestures add to phonological-prosodic (gesture space), to semantic-conceptual (meaning representations, information selection) and even to syntactic concerns.

Furthermore, gesture data highlight the need to consider the theoretical importance of variation and variability in monolingual native behaviour. Gesture production (and perhaps gesture comprehension) is inherently variable. There can be no 'grammaticality' of gesture but rather preferential usage patterns. Gesture data thus pave the way for a more flexible view of the (monolingual) native speaker standard, and therefore also of what it means to be 'on target'. A more flexible view of monolingual native speakers and a theoretical acknowledgement of variation may also allow the traditional gap between SLA and bilingualism studies to be bridged. It would be a welcome development if variation in L2 users, typically viewed chiefly as a sign of 'incomplete acquisition' in SLA, came to be seen as potentially similar to the variation that the bilingualism field considers a normal consequence of bilingualism (compare Grosjean's famous dictum that bilinguals are not two monolinguals in one person; Grosjean, 1989).

VI Concluding remarks

Gestures provide rich and multi-dimensional data. Their double role as interactive, addressee-directed and internal, speaker-directed phenomena makes them a useful addition to the SLA or bilingualism researcher's toolkit. Their multi-dimensional character enables interactive, structural, functional, temporal and semiotic analyses, and – in combination with speech analyses – gestures potentially provide a fuller picture of the product and processes of SLA and bilingual language use in which the multilingual speaker's individual cognition is situated in a social, interactive context. If included in theoretically informed studies of SLA and bilingualism they could open new avenues of inquiry with enormous potential for expanding the scope and depth of SLA and bilingualism research.

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