Gesture and the Dynamic Dimension of Language

Essays in honor of David McNeill

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John Benjamins Publishing Company
Amsterdam / Philadelphia

Library of Congress Cataloging-in-Publication Data

Gesture and the dynamic dimension of language : essays in honor of David McNeill /
edited by Susan D. Duncan, Justine Cassell, Elena Levy.
p. cm. -- (Gesture studies, ISSN 1874-6829 ; v. 1)
Includes bibliographical references and index.
1. Gesture. I. McNeill, David. II. Duncan, Susan D. III. Cassell, Justine, 1960- IV. Levy,
Elena Terry, 1952-
P117.G4685 2007
808.5--dc22 2007011245
ISBN 978 90 272 2841 3 (Hb; alk. paper)

John Benjamins Publishing Co. · P.O. Box 36224 · 1020 ME Amsterdam · The Netherlands
John Benjamins North America · P.O. Box 27519 · Philadelphia PA 19118-0519 · USA

Discourse Focus, Gesture, and Disfluent Aphasia[1]

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The telegraphic speech of Broca's aphasics, often accompanied by deficits in verb use, gives the impression that these speakers have lost their understanding of grammar. The 'agrammatism' syndrome is often taken as support for modularist and localizationist accounts of language processing and the brain's organization for language. Goodglass et al. (1967) offer an opposing, processing limitations account, based on what is *spared* in agrammatic aphasic speech, calling upon the notion of 'stress-salience' of sentence consituents. Here, we extend this account based on a three-language, comparative analysis of gesture-speech coexpression of discourse focal content in *non*-aphasic speakers. We show that verb salience in utterances varies within-language depending upon discourse context, and across languages depending on general facts about verb behavior in each language (Hopper, 1997). Finally, a case study of the discourse of an English-speaking aphasic reveals implications of multimodal discourse analysis (McNeill, 1992; 2005) for a theoretical account of the 'verb problem' of disfluent aphasia.

1. Introduction

We judge the fitness of any paradigm for understanding the human capacity for language according to a variety of criteria. Important among these is the question of how much insight application of the paradigm yields into the nature of language breakdown. As noted in the Introduction to this volume, McNeill (2005) describes the theory of language he has developed over decades (1985; 1992; 2005) as, "antireductionist, holistic, dialectical, and grounded in action and material experience" (p.4). The paradigm is fundamentally distinct from psycholinguistic and neurolinguistic research paradigms cued by formalist linguistic theories; those claiming that the human mind possesses an invariant, compartmentalized grammatical competence, autonomous from other cognitive capabilities. An aspect of the McNeill paradigm that has significant consequences

[1] We wish to thank Elena Levy, David McNeill, and James Goss for their helpful comments on earlier versions of this paper. We also wish to thank David McNeill for many years of inspired mentoring.

for our understanding of language disorders is its methodological component. The method emphasizes exhaustive, multimodal microanalysis of natural, extended, connected discourses of many types, for example, storytelling, collaborative planning, dyadic and group conversation, etc., and from many different speaker groups—children, adults, diverse language/cultural groups, and individuals with neurogenic language disorders.

In theorizing about skills we infer to be constitutive of language, and the neurological underpinnings of language systems, the study of aphasias has held a unique place. These are clinical syndromes of disordered linguistic processing consequent on focal brain lesions. Damage to identifiable neurological structures results in distinct disruptions of language with reasonable reliability. This mapping of inferred function onto identifiable brain structures has been employed as a tool to probe the nature of the psychological representations and mechanisms of human language use. We highlight the analytic method belonging to the McNeill paradigm, above, since its application to non-aphasic and aphasic language behavior can lead observers to conclusions about the nature of the psychological representations and mechanisms of human language that differ substantially from those arrived at through application of other research methods, both psycholinguistic and neurolinguistic, that do not involve close analysis of natural discourse. In this chapter we present an example outcome of such a discourse analysis.

1.1 The clinical syndrome of Broca's aphasia

A principle distinction in the phenomenology of the aphasias emphasizes the qualities of aphasic speech. 'Nonfluent' aphasias, typically associated with lesions anterior to the Rolandic fissure and characterized by effortful, halting, and laconic speech, are contrasted with 'fluent' aphasias, typically associated with lesions posterior to the Rolandic fissure and characterized by fluent or even hyperfluent speech, together with variably severe deficits in comprehension. The syndrome known as Broca's aphasia, in which speech is sparse and effortful while comprehension is relatively spared, is typically associated with damage to the dominant hemisphere (left, in most right-handers) frontal operculum (including, but not limited to, Brodmann's areas 44 and 45). False starts and omissions—often of closed class function words, morphological inflections, and verbs—typify Broca's aphasia. The utterances of these speakers are often said to sound "telegraphic," reflecting the emphasis on static, content-laden words at the expense of functors. When there is a paucity of overtly organized syntactic structure, Broca's aphasic spoken language is labeled "agrammatic."

The 'verb problem' in Broca's aphasia is the tendency to omit or nominalize verbs in utterances (Miceli, Silveri, Villa & Caramzza, 1984; Zingeser & Berndt, 1990). This characteristic symptom in the language systems of Broca's aphasic speakers is the target of our attention in this chapter. On the view that verbs are the core syntactic constituents of utterances, this symptom has been studied and

interpreted by some as one piece of evidence in support of a neurologically-grounded grammar 'module', that is somehow responsible for organizing the syntax of speech (language) output.

1.2 An example of disfluent aphasic speech

Excerpt (1) is from a narrative discourse produced by an adult with aphasia. She suffered a left hemisphere ischemic stroke, resulting in the clinical syndrome of Broca's aphasia, as determined using the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1972). The patient was referred by her neurologist. Diagnosis was verified by her speech therapist and by core examinations as outlined in Pedelty (1987). The session from which the excerpt is taken was videotaped in an examining room at the Siegler Institute of Speech Disorders, Michael Reese Hospital, Chicago, following a meeting of the MRH Aphasia Support Group. The patient gave informed consent to be videotaped telling the story of an animated cartoon she had just viewed.[2]

In the excerpt, the speaker is describing to a listener an interval of the cartoon, immediately after viewing that interval. The three main characters are a cat, a bird, and the bird's owner, an old woman. Over the course of the 6.5-minute cartoon, the cat tries repeatedly to catch the bird and repeatedly fails.[3] In her descriptions of the cartoon events, this aphasic's speech has the telegraphic quality often described in Broca's aphasia. Overall, the speaker's complete narration is a reasonable match to the criteria defining agrammatic aphasia, as well. In the excerpt (1), an article ("the") occurs only twice. The only two identifiable verbs, though inflected for person and number, are stammered. In contrast, the six noun tokens are uttered generally clearly and forcefully.

(1) (.1) the (*pause*) vlk- (*pause*) uh (*breath*) bird? (*pause*) and c- (*breath*) cat
(.2) (*pause*) and uh (*breath*) ss- uh (*pause*) she ss- (*breath*) (*pause*) apartment
(.3) and ih- (*pause*) the (*pause*) uh (*pause*) old (*pause*) my (*breath*) ss- uh (*pause*) woman (*pause*)
(.4) and uh (*pause*) she ss- (*pause*) like (*pause*) uh ae- f- f-fas-t (*breath*)
(.5) cat (*pause*) and uh (*pause*) bird is-ss-ss (*pause*) (*breath*)
(.6) I uh (*pause*)
(.7) (*breath*) sh-sho- shows t- (*pause*)
(.8) a- and down (*pause*) t- d- down (*breath*)

Aphasias with the syndrome characteristics described above have been observed in many different languages (Menn & Obler, 1990). Cross-language

[2] The narrative discourse data for this aphasic speaker comes from a corpus videotaped discourses from nine aphasic speakers (four nonfluent and five fluent), on which the analyses in Pedelty (1987) were based. A full discussion may be found there.
[3] See McNeill (1992) for details of the cartoon elicitation method.

comparative analyses of this aphasia have been concerned with the extent to which agrammatism may manifest differently, given differences among the grammars of different languages (Bates et al., 1991; Paradis, 2001). Across all languages, however, Broca's aphasics are known to exhibit impaired access to verbs in a variety of tests of production and comprehension.

1.3 Explaining agrammatic Broca's aphasia

1.3.1 *Syntactic deficits due to specific brain injury*

The seemingly systematic agrammatism of Broca's aphasia has been offered as support for modularist, 'autonomy of syntax', linguistic theories. The frequency with which the clinical syndrome arises from damage to the frontal operculum (including Brodmann's areas 44/45), suggests regional specialization for those grammatical aspects of language that seem absent in Broca's aphasic speech. This has been taken to support localizationist accounts of the brain's evolution and organization for language, at least as concerns syntactic processing (see, for example, Grodzinsky, 2000; Friedmann, 2001). The 'verb problem' as a symptom of Broca's aphasia is often discussed constrastively with Wernicke's (fluent) aphasia. The latter is associated with damage to the temporal rather than frontal cortex of the left hemisphere. Wernicke's aphasics are often reported to have impaired access to nouns (anomia), with verbs relatively spared. The relevance of such dissociations for neurolinguistic theories is clear. To the extent that damage to particular brain areas may result in deficiencies in the use of particular grammatical form classes, modularist and localizationist accounts of language processing are at least partially supported.

The significance of the 'verb problem' for theorizing about Broca's aphasia is reflected in the assertion, frequently encountered in the literature on agrammatic aphasia, that the verb is, "the most important word in a sentence, because it reveals *who* did *what* to *whom*." This assertion makes reference to the fact that, in many languages, Italian and Spanish, for instance, verbs are morphologically inflected for person, number, case, and so on. Or, in contrast, in non-inflecting languages, the verb conveys sentence argument structure by virtue of its position relative to other sequentially-ordered sentential constituents. To frame an approach to the 'verb problem' by saying that verbs are integral to the syntactic framing of utterances is to view the symptom as due to a syntactic deficit.

1.3.2 *Against a syntactic deficit account*

A modularist, syntactic deficit account of Broca's aphasia, generally, or the 'verb problem' in particular, however, cannot account for data from, for example, Chinese Broca's aphasics, in whom the 'verb problem' and the verb/noun dissociation (Bates et al., 1991a) is also observed. Non-aphasic Chinese is a morphologically very spare language with no inflections on verbs for person, number, case, or other grammatical distinction; further, the positioning of verbs in Chinese utterances is quite variable. In other words, verbs in Chinese utterances

cannot be said to have the same 'syntacticity' as verbs in, for instance, Romance languages. Yet, Chinese aphasics show the same signs of impaired access to verbs as speakers of other languages (Chen & Bates, 1998). The behavior of verbs in non-aphasic English has some of the same qualities as in Chinese (Hopper, 1997). We return to this point in section 2.4, below.

Other behavioral and brain data also tend to weaken modularist and localizationist accounts in general. Cross-language comparative research on aphasic language comprehension and production demonstrates that agrammatic Broca's aphasic native speakers of different languages can be prompted to manifest knowledge of the particular syntactic properties of those languages (Bates et al., 1991b). Further, agrammatism deficits tend to be variable and intermittent as opposed to absolute (Berndt, 1990). Undiluted cases of agrammatism are rare, perhaps nonexistent. These facts are problematic for localizationist accounts of specific defiicits.

Finally, studies of the brain damage in aphasics show that, "there is sufficient variability in lesion sites that produce clinically similar symptom pictures so that the standard 'accepted' lesion corresponding to a syndrome has only a probabalistic, rather than a fixed, relationship to the given pattern of language disturbances" (Goodglass, 1993:218).

Taking a different perspective, some researchers have linked telegraphic Broca's aphasic speech to the prosodic or phonological structure of language production and comprehension. Goodglass, Fodor & Schulhoff (1967), Kean (1977), and Goodglass (1993) have observed that constituents of utterances that can or do receive prosodic emphasis, tend to be the spared output of disfluent aphasic language production. Kean (1977) argued that morphemes that have no role in the assignment of word stress in a sentence are the ones that will be omitted. She concluded that the deficits of Broca's aphasia had been wrongly attributed to a loss of syntax competence and proposed instead that deficient phonological competence is the root cause.[4]

Goodglass et al. (1967), in a study that also focused on prosodic factors in language comprehension and production, presented agrammatic aphasics with a sentence repetition task. Goodglass and his colleagues asked the aphasics to repeat sentences that were spoken to them. The sentence constituent receiving prosodic emphasis varied from stimulus sentence to stimulus sentence; for example, "JOHN kissed mary," "john kissed MARY," and, "john KISSED mary." Results showed that the aphasics tended to be able to repeat the stressed constituent of each sentence (sometimes *only* that constituent), regardless of the constituent's grammatical role, it's morphological characteristics, or its form class. The authors considered these results to be evidence for a processing limitations account of agrammatism: "one that relates the threshhold for initiation of an utterance to the 'saliency' of available words in the message. 'Saliency' is defined roughly as a

[4] Kean's proposal is essentially an alternative modularist explanation of the deficits.

combined effect of semantic significance and word stress" Goodglass (1993:114-115).

Findings such as these direct our attention away from notions such as 'loss of grammatical competence' to factors such as the Broca's aphasic's motor impairments, related to sequencing of speaking behaviors, and how these impairments may impede or distract attention from production of all but the most focal or significant words in each utterance the aphasic attempts. What is lost *versus* what is spared in the speech of disfluent aphasics may thus be more productively viewed from the perspective of discourse processes.

1.4 Summary

A theory of the human capacity for language needs to address the empirical facts of language breakdown. The seeming systematicity of the spoken language deficits associated with the aphasias, together with the *general* claims that may be made concerning the relationship between brain lesion locations and aphasic syndromes, have tended to comport with modularist, localizationist theories of human language. The notion that a disfluent aphasic's deficits may be due to a specific lesion that has disabled all or part of a modularized grammatical competence, however, is at odds with several types of data: (i) the mutability and variability of agrammatic symptoms, (ii) cross-linguistic comparisons showing that agrammatic speakers of different languages retain degrees of proficiency in comprehension and production of the grammatical features particular to their languages, and (iii) evidence that the specific losses comprising a clinical picture of agrammatism are permeable to manipulations of discourse context.

There are non-syntactic-deficit explanations for the verb problem, as well. These include category-specific lexical dissociation (e.g., Caramazza & Hillis, 1991), Luria's (1970) distinction between nominal and predicative uses of language, and Goodglass' 'functional attitude' analysis (1993:187). We lack space to sketch these alternatives here.

2. A Multimodal Discourse Perspective on Non-Aphasic and Aphasic Language

In what follows, observations of speech and coverbal spontaneous gestures in adult speakers of English, Chinese, and Spanish are the substance of an analysis of natural discourse collected from 'neurologically typical', non-aphasic speakers. The results of this cross-language comparative analysis are then compared to the speech and gesture of a case-study, disfluent aphasic. This is the speaker of excerpt (1), above. These comparisons, between non-aphasic speakers and a disfluent aphasic, of how gestures combine with speech in connected discourse, are similar in spirit to the Goodglass et al. (1967) study of the relationship between prosodic emphasis and what is spared in disfluent aphasic spoken language. Specifically, we will suggest that the discourse-level language

processing phenomena that generate discourse focus and speech prosodic emphasis may be responsible for some of the specific characteristics of disfluent aphasic speech. Further, the observations permit us to formulate a prediction concerning the relative severity of the 'verb problem' in disfluent aphasia, across languages.

2.1 Gestures in discourse: Non-aphasic speakers

In studies of neurologically typical speakers engaged in extended, connected discourse, researchers have observed that the stroke phases[5] of meaningful gestures have a strong tendency to synchronize with prosodically emphasized constituents of the accompanying spoken utterances (Schegloff, 1984; Kendon, 1980; Nobe, 2000; Loehr, 2004). Utterance (2) is an excerpt from an English speaker's cartoon narration. In it the speaker describes how the cat tries to reach the bird sitting high up on the window sill of an apartment building. In this utterance the verb-plus-particle sequence, "climbs up," was given intonational emphasis. Precisely while uttering these two words, the speaker's hands executed the stroke phase of the gesture (indicated with boldface type). With fingers directed away from her body, the hands flap upward alternatingly, a representation of the cat's climbing manner of motion. Thus, we see that an iconically depictive gesture of climbing up occurs in synchrony with utterance constituents expressive of similar content. This representational gesture combines with intonational emphasis (indicated with superimposed rectangles of shading) to highlight the verbs-particle constituent in this utterance.[6]

(2) the [cat **climbs up** the drain]pipe

(3) this time he cli[mbs up **inside** the drain]pipe

In fact, it is routinely the case, in many speakers' tellings of the cartoon event described in (2), that the action of the cat's climbing emerges as the discourse focal element at this moment in their narrations. The cat has previously tried once and failed to reach the bird. This climb is his newly-conceived strategy, and the cartoon—cinematographically speaking—focuses the viewer's attention on the event of climbing for some moments.

About one minute after (2) is uttered, in the subsequent episode of her narration, this speaker describes the same cat climbing up the same drainpipe again. In the cartoon this time, however, the cat has decided to go up *inside* the pipe, so as not to be seen. As (3) shows, the speaker again chooses to describe this

[5] The stroke is the phase of gesture production that is meaningfully interpretable in relation to concurrent speech and discourse context.

[6] Gesture-speech annotation conventions in these examples: [...] a gesture phrase in relation to concurrent speech; **boldface**: the stroke phase of the gesture phrase; underline: a motionless hold phase; shaded rectangle: peak prosodic emphasis; / unfilled speech pause; * self-interruption.

new event using the verb-particle, "climb up"; however, the gesture stroke phase and speech prosodic emphasis do not synchronize with that constituent this time. Discourse focus has shifted now. Stroke and prosodic emphasis combine to highlight the figure-ground relational constituent of the utterance, "inside," instead. The act of climbing itself is old information at this point. The new information that (3) is constructed to deliver is the position of the cat's body with respect to the pipe. This bit of information has key relevance for how the remainder of the episode then unfolds.

Duncan & Loehr (in preparation) demonstrate more fully how the semantic contents of speech and coverbal gestures, examined together, are informative as to a speaker's specific discourse focus in each utterance of a continuous narration (see also McNeill, 2005:108-112). Their study also confirms the relationship between gesture stroke and prosodic emphasis during discourse focal intervals of speech, with instrumental assessment of vocal pitch, loudness, and syllable duration. What matters for the analysis of non-aphasic and aphasic speech presented below is that every such utterance, in extended, connected discourse, has a focal center that is given prosodic emphasis, and typically gestural emphasis as well; further, that this focal emphasis does not necessarily extend to include the verb of the utterance.

2.2 Gesture and the verb in English, Chinese, and Spanish

Research on the 'verb problem' in Broca's aphasia has been guided by a strong assumption that verbs always or routinely constitute the focal centers of utterances, since, sententially, they code 'who did what to whom.' Many researchers seem to regard this supposed centrality of the verb in the sentence as being a cross-language universal, as well. Contrary to this assumption, however, the speech and gesture data from Chinese, Spanish, and English natural discourse that we present here demonstrate that the discourse focal constituents of utterances of non-aphasic speakers are frequently constituents other than the verb, and that there is variation across these three languages in how often this is the case. As with (2) and (3) in the previous section, we identify the focal centers of utterances on the basis of observations of combined gestural and prosodic highlighting of specific constituents of the speech stream.

Utterances (4), (5), and (6), below, are excerpts from a comparison of full length cartoon narrations by eight adult, native, nonaphasic speakers each of American English, Mandarin Chinese, and Spanish; a sample of 24, five- to ten-minute narrations. A variety of cartoon event descriptions were included in the comparison. However, to simplify exposition here, each pair of representative utterances below consists of one speaker's descriptions of the same two cartoon events discussed in the previous section: (1.1) the cat climbs up on the outside of the drainpipe, followed by (1.2) the cat climbs up inside the pipe. Given our analytic focus on the location of the verb of each utterance with respect to speech prosodic emphasis and gesture stroke phase, and how this varies within- and

cross-language, the dotted-line border around the verb or phrasal verb of each utterance is a visual assist for distinguishing the relative positions of gesture stroke and verb, across the excerpts in the three different languages.

2.2.1 *English*

The English excerpts in (4) are very similar in word choice and in gesture-speech synchrony to those in (3), above, in terms of the timing of focus-highlighting gesture strokes with respect to verbs. This, in fact, is the pattern of stroke-to-speech synchrony, with prosodic emphasis, encountered in the majority of English-language descriptions of these two cartoon events (Duncan & Loehr, in preparation). In this speaker's description of the cat's climb up on the outside of the drainpipe, (4.1), the stroke phase of a gesture depicting upward movement synchronizes with the verb-particle construction, "climb up." In his description of the cat's climb up inside the pipe, (4.2), again as in (3), a gesture depictive of upward movement skips this main verb and particle to synchronize instead with the figure-ground relational term, "through." Again as in (3), the stroke-accompanied speech constituents are prosodically emphasized as well.[7]

(4) (.1) the second part [is he **climbs up** the drain] to get* try and get Tweety

(.2) this time he tries to climb [up in **throu**gh the] drain

2.2.2 *Mandarin Chinese*

The excerpts in (5), from a Chinese narration, are similar in several respects to the English, though the extents of gesture stroke phases are greater in two instances. In the stroke phase of (5.1), the speaker's two fists move upward alternatingly, depictive of climbing manner, in synchrony with the verb of the utterance *pa* (climb) as well as the words surrounding this verb.

This speaker's description of the cat's climb up inside the pipe, (5.2), is a bit complex. We see that the verb *zuan* (bore) occurs three times. In the first iteration, a gesture stroke depictive of a curving upward path of motion synchronizes, not with this verb, but instead with the ground- and figure-ground relation-expressive words; *shui-guan* (drainpipe) and *li-mian* (inside). In the second iteration, *zuan* (bore) is initially skipped again, but then the third iteration is encompassed by a rather long-lasting gesture stroke phase that again encompasses the ground- and figure/ground-relation-expressive constituents. Thus, in these representative English and Chinese utterances, we see similar patterns of gesture-speech co-occurrence highlighting discourse focal information, in ways that are typical at each of these two points in the cartoon narrations. In the first description in each language, the discourse focal constuent is a verb or includes the verb; in the second, the verb is largely excluded from discourse focus.

[7] In contrast to Duncan & Loehr's (in preparation) method, prosodic emphasis in the cases discussed here was judged by native-speaker ear.

(5) (.1) [/ **ta jiu pa shui-guan** /]
/ 他就 爬 水 管 /
he then climb water-pipe
then he climbs the drainpipe

(.2) (mao) [zuan zai **shui-gu**][an **li-mian** / **dui** /]
(貓) 鑽 在 水 管 里 面 / 對 /
(cat) bore on water-pipe in-side / right /
(the cat) bores into the drainpipe, right

[ta zuan **shui-guan li-mian zuan-jin-qu** / /]
他 鑽 水 管 里面 鑽 進 去 / /
he bore water-pipe in-side bore-enter-go
he bores into the drainpipe, bores right on in

2.2.3 *Spanish*

The Spanish excerpts in (6) present a picture that is similar to the English and Chinese examples, with respect to expression of discourse focal content. These excerpts differ, however, in that this content is expressed by the verb in both event descriptions. The Spanish utterance descriptive of the cat's ascent on the outside of the drainpipe, (6.1), is accompanied by a gesture stroke that is again somewhat longer than the one that accompanied the English utterance, (4.1). The Spanish speaker's stroke depicts upward motion and encompasses the verb-gerund construction *va subiendo* (go ascendingly), as well as a path-ground expressive constituent, *por allí* (via there). As with the English and Chinese examples, the Spanish description of this first event seems to center on the act of ascending. It is in her description of the cat's entry via the inside of the drainpipe that the Spanish speaker displays a pattern of gesture-speech co-occurrence that, overall, distinguished the Spanish event descriptions in our sample of 24 narrations from those of English and Chinese. Our Spanish narrators often chose the verb *meter* (enter, insert) when relating this event of the cat ascending inside the pipe. Inherent in this verb is something of the figure-ground relation that the English speakers expressed with "inside" or "through," and Chinese speakers expressed with *li-mian* (inside). This was the common way for Spanish speakers to express this event content that was discourse focal at this juncture in their narrations.

(6) (.1) [se* **se va subiendo por allí no**? /]
refl* refl he-go ascending via there no
he goes up that way, no?

(.2) [ahora se **mete por el baj**ante /][y cuando **se** mete]
now refl he-enter through the drainpipe / and when refl he-enter
now he goes in through the drainpipe, and when he goes in ...

Based on our gesture-speech synchrony analysis of event descriptions from all eight narrations of each speaker group, we observe that utterances with gestural and prosodic highlighting of some constituent *other than the verb* occur roughly twice as often in the Chinese and English narration data than in the Spanish data. In other words, verbs appear to function more often as focal constituents of utterances in Spanish than is the case in English and Chinese.

2.2.4 *Summary*

To summarize and conclude this sketch of our cross-language comparative analysis, our observations suggest that verbs generally less often have focal significance in Chinese or English, discourse-contextualized utterances than in such Spanish utterances. In the spirit of the Goodglass et al. (1967) salience account of what is spared in disfluent aphasic speech, the implications of these observations of non-aphasic discourse in three languages for aphasic narrative discourse are that, (i) to the extent that the aphasic has speaking ability sufficient to construct something of a narration, the aspects of events that non-aphasics tend to highlight with gesture and speech prosodic emphasis are most likely to be expressed in aphasic discourse, (ii) the constituents of utterances that speakers of an aphasic's native language tend to prefer for emphasizing of such aspects will likely be relatively spared.

2.3 Discourse focus and gesture in disfluent aphasia: An example

A small exploratory analysis of the speech and gesture of the English-speaking disfluent aphasic who contributed (1), above, tends to fulfill these implications. In this 'case study'-style analysis, we observe instances in which the aphasic's telegraphic spoken utterances and co-occurring gestures highlight just those constituents that are typically highlighted in the gesture-speech productions of non-aphasic English speakers, as described above, and at analogous points in the continuous narration. In (7) a non-aphasic English speaker describes a scene in the cartoon in which the cat falls back down inside the drainpipe after climbing up inside it. The gesture stroke phase is a plummeting downward motion, from above the speaker's head to about the level of her abdomen. This stroke synchronizes with the prosodically-emphasized path particle, "down." The verb of the utterance, "rolls," is underlined, indicating a motionless hold phase, preparatory to performing the gesture that co-expresses the discourse focal content of the cat's very dramatic fall from a great height. This verb content is not discourse-focal at this moment in the narration and the gesture does not depict any rolling manner of motion.

(7) and he rolls / **down the** drai][nspout

(8) [a- and **down**] [(*pause*) **t- d-** down (*breath*)]

As an example, the aphasic speaker's description of this same cartoon event (1.8), is given again in (8), annotated to show co-occurring gesture. This is the final utterance of the longer narration interval excerpted in (1). During the interval preceding (8), the aphasic performs several gestures representing cartoon locations, entities, and events leading up to this final utterance. Examination of these preceding gesture-speech pairings, informed by our knowledge of the content of the cartoon that the aphasic speaker viewed, permits us to be quite certain that the event the she is trying to relate in (8) is the same as that related by the non-aphasic speaker in (7), even though there is no verb in (8), nor actor, nor setting. The aphasic performs a gesture depictive of a downward path of motion, not unlike the non-aphasic's gesture in (7). Her hand moves sharply down from about the level of her shoulder to her lap. This synchronizes with the isolated path-expressive particle, "down." She repeats this gesture in synchrony with the stuttered onset of repeated, "down." Though there are no other words in her utterance, thus a judgment of prosodic emphasis is not really possible, the first vocalization of "down" is loud and sharp, compared to many of the other words in the extended interval, (1). The second "down" is strongly vocalized as well.

This example from our case study is suggestive of the possibility that a disfluent aphasic attempts utterance production on the basis of a discourse model similar to that of the non-aphasic speaker, however, her motor deficits prohibit her from uttering and gesturing about any but the discourse focal elements (similarly to Goodglass et al., 1967).

2.4 The 'verb problem' revisited

The comparative analyses above tend to undermine the notion that verbs *always* play a central, organizing role in utterances in natural discourse. A more nuanced perspective on the 'verb problem' in Broca's aphasia results from considering data drawn from extended natural discourses, comparing across languages in which the roles of verbs may differ, and across non-aphasic and aphasic speakers engaged in the same discourse production task. We find that sentential main verbs are often not the information-loaded, discourse-focal utterance constituents that our usual ways of thinkng about them would suggest. The greater tendency of Chinese and English speakers to give prominence to sentential constituents other than main verbs relative to the Spanish speakers, observed here, is in keeping with Hopper's (1997) functionalist analysis of extended phrasal verbs in English and Chinese. Focusing on English, and drawing on a large corpus of personal narrative discourse in that language, Hopper observes a paucity of "solitary" verbs (pp.96-97), an abundance of phrasal verbs in English, and a, "dispersal of verbal elements over various parts of the predicate" (Hopper: 99). Regarding Chinese, Hopper notes, "... over the centuries a stylistic premium has come to be placed on elaborate verb phrases, such that 'the longer and more complex the verbal, the more natural and appropriate the sentence.'" (Lily Chen (n.d.); Hopper p.100). He concludes that, "Languages [like

English and Chinese] abhor morphology and indicate distinctions of modality and aspect through auxiliary verbs, and various kinds of prepositional constructions, distributed discontinuously over the predicate and even across clause boundaries." In the English and Chinese speakers' highlighting of phrasal elements other than the main verb, in the relatively simple utterances descriptive of motion events examined here, we see a small reflection of the more general phenomenon identified by Hopper. Also in keeping with such claims are Tao's (1996) observations on Chinese, that non-sentential utterances, many without main verbs, predominate in the natural discourse of neurotypical Chinese speakers.

These observations by Hopper, Chen, and Tao comport with the findings of our comparative analysis. The contrast in tendency for verbs to receive focal emphasis in the utterances of non-aphasic Spanish speakers *versus* those of non-aphasic English or Chinese speakers, plausibly connects with the fact that Spanish is the relatively 'highly inflecting' language in this sample. The main verbs of Spanish utterances may indeed generally carry a greater burden of information about the utterance as a whole, and thus be important to emphasize, for successful communication.

3. Conclusions

Lesser & Milroy (1993) note that experimental work and descriptive accounts of language disrupted by brain damage have too typically relied solely on speech data and on non-discourse-contextualized language use (but note that Goodwin (2003), and other efforts in the Conversation Analysis methodological tradition are exceptions to this generalization). The multimodal analysis offered here, of aphasic narrative discourse in comparison with narrative discourses of non-aphasic speakers, demonstrates the kinds of insights that are afforded the observer by less narrow, yet still highly systematic, comparative analyses of discourse. The type of analysis illustrated in this study, with its emphasis on assessment of gesture-speech coexpressivity of meaning and precise assessment of gesture-speech timing relationships, is the essence of the methodological approach embodied in the McNeill paradigm of psycholinguistic research.

It is sometimes said of multimodal analyses of (relatively) unconstrained discourses, that their results can be unfocused, "purely descriptive," and lacking in explanatory and predictive power. The facts of Spanish, Chinese, and English discourse focus in relation to the verbs of utterances, presented here in conjunction with the seeming similarities of discourse-focal emphasis in the English-speaking aphasic with English-speaking non-aphasics, however, are clearly evidence against a modularist agrammatism account of the deficits of Broca's aphasia. They contribute to a parsimonious, alternative explanation of the deficits as being due instead to processing limitations. Further, the results resported here do yield a prediction. This is that the 'verb problem' in disfluent aphasia should be less severe in Spanish and languages like it, than in languages like English and Chinese. Relative severity should be a matter of degrees,

proportionate to the tendency of verbs in each of the languages to be vehicles for discourse-focal content in extended, connected discourse.

The study presented here demonstrates the utility of the multimodal discourse analytic method, practiced by McNeill and his students now for many years, for elucidating the psychological representations and mechanisms involved in non-aphasic and aphasic language use. The results have explanatory and predictive power and they suggest a future research direction: a larger-scale, systematic comparison of verb usage comparing languages that differ with respect to typical verb use. Results of such a study would have the potential to solidify the conclusions reached here, concerning processing capacity limitations as a root cause of a range of Broca's aphasic symptoms.

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