Published in final edited form as:

Aphasiology. 2011 June ; 25(6-7): 675–687. doi:10.1080/02687038.2010.536841.

Distributed impact of cognitive-communication impairment: Disruptions in the use of definite references when speaking to individuals with amnesia

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Abstract

Background—Definite references signal a speaker's belief that a listener can uniquely identify the referent (e.g., the dog, as the only dog among a group of animals). Clark's (1992) collaborative referencing model provides a way to examine the speaker's display of confidence that his/her reference will be understood by the listener without further clarification. We previously found that amnesia participants, as directors in a barrier task with a familiar partner, used referencing forms that displayed less confidence than forms used by comparison participants. If this is an interactional consequence of managing the memory impairment (as opposed to a language deficit), we should also expect a decrease in definite referencing by their partners.

Aims—To examine the use of definite references by healthy non-brain-damaged participants when speaking to their memory-impaired partner during repeated trials of a barrier task.

Methods & Procedures—We replicated our previous work with 11 of the same participant pairs—6 individuals with hippocampal amnesia and 5 comparison participants—each of whom was paired with a familiar partner of their choosing. Focusing on the productions of the partners (i.e., partners became directors) we (1) coded referential expressions as definite or indefinite; (2) tracked changes in the use of indefinite and definite references across trials; and (3) compared data to previous analyses (when amnesia participants were directors).

Outcomes & Results—The productions of comparison pairs were overwhelming definite (95%, 1359). In sharp contrast, partners of the amnesia participants used a definite initiating reference less than half the time (48%, 825), when speaking to their memory-impaired partner and used definite references that signalled a lack of confidence more often and across more trials.

Conclusions—These findings support the assumption that disruptions in language-and-memory-in-use are not limited to the productions of the individuals with amnesia, but rather extend to the discourse of their communication partners. Observing disruptions in the use of definite references of individuals with intact language and declarative memory, when communicating with their

partner with amnesia, points to the complex interaction of memory and language. Even when attention is paid to grammatical forms, the decisions are never linguistic alone.

Keywords

Definite reference; Declarative memory; Hippocampus; Discourse; Communication partners

Successful referencing depends on speakers and listeners working together to establish a shared perspective so that each has confidence that they are talking about the same thing. Agha (2007) differentiates between *denotational* *successful or correct forms of referencing* and *interactionally successful acts of referring*, noting “that the social consequences of an act of referring may depend on its degree of interpersonal success, or on its denotational appropriateness, or on both” (p. 89). Definite references (Agha, 2007; Arnold, 2008; Clark, 1992; Hanks, 1990) are *denotational* constructed to indicate a specific or known referent, allowing the speaker to signal his/her belief that the listener can identify the referent from a set of shared or situationally specific referents. Such signalling devices may include linguistic forms that presuppose shared perspective, experience, or knowledge with the label/object, including use of definite and demonstrative articles (e.g., *the, this*), or possessive pronouns and proper nouns (e.g., *your, Mary*). Not surprisingly, disruptions in the use of canonical linguistic forms of definite reference (e.g., errors and omissions of definite articles) have been well documented in language production of patients with acquired language impairments (e.g., agrammatic aphasia; Bates, Friederici, & Wulfeck, 1987). However, of interest to us here is how profound memory impairment impacts the use of definite referencing in the interactional discourse of individuals with memory impairments and their non-brain-damaged communication partners.

A COLLABORATIVE REFERENCING MODEL

Grounded in a theoretical perspective that all communication is fundamentally joint activity, Clark and colleagues (Clark, 1992; Clark & Wilkes-Gibbs, 1986) offered a processing model designed to account for *how* interlocutors work together to establish definite references in conversational interactions. Although Clark attends to linguistic and denotational forms, the purpose of his *collaborative referencing model* is to account for how such forms are deployed in, and contribute to, *interactionally successful acts of referring* (Agha, 2007). Using a barrier task protocol, Clark examined how the patterns of referencing novel cards used by participant pairs (matchers/directors) evolved through repeated acts of referring to the same cards across six trials. In Clark’s protocol the participants in the pair were hidden from each other’s view by an opaque screen or barrier. To complete the task the participant assigned as director for the pair describes each card one at a time, telling the matcher to place each card in a specific numbered place on the playing board. A consistent finding of referencing tasks is that the referencing expressions used by directors for specific cards, when addressing the same matcher, simplify and shorten across repeated trials (Clark & Wilkes-Gibbs, 1986; Krauss & Glucksberg, 1969; Yule, 1997). In its most streamlined form, this process appears quite simple—the director identifies the target card using a definite noun phrase (e.g., “The next one is *the house*”) and the matcher confirms that s/he has the right card as s/he places it on the board (e.g., “The house, got it”).

Clark’s (1992) collaborative referencing model accounts for how the pairs come to mutual understanding of such streamlined definite references for the target cards. Briefly, the collaborative referencing model has three phases—initiating, refashioning, and evaluating/accepting referencing presentations. Denotationally, a reference is either definite or indefinite. However, in the collaborative view, definite references are deployed in ways that indicate the director’s confidence in the interactional success of the definite reference. By

using a simple definite noun phrase (or in Clark's terms an *elementary* or *episodic noun phrase*) to initiate referencing the director indicates his/her confidence that the matcher will know what the director means—that is, that the matcher should be able to accept the reference (without the need to refashion or clarify) and use it to identify the correct card. However, not all initiating referencing expressions display such confidence. Clark identifies four other initiating definite referencing forms (*installment*, *provisional*, *dummy*, *proxy*), each of which is marked as displaying the speaker's varying levels of confidence that the matcher will be able to use this reference to identify the target card (see Table 1 for definitions and examples). In addition, any initiating referencing expression can be said with a trial, or questioning, intonation that can also signal the director's lack of confidence in the interactional success of this definite reference form. By displaying a lack of confidence in the definite reference, the director opens up the referencing process, essentially inviting (or entailing) the matcher to refashion or evaluate the referencing expression for the target card. Clark argued that in order to initiate referencing with a definite reference the director must have confidence that s/he and the matcher are seeing the target card from the same perspective—e.g., as a person doing something, a building resembling a barn, or an animal. For common types of items, such as photographs of everyday objects, the director could reasonably assume that the matcher would share his/her perspective and so initiate referencing with confidence using a definite reference (e.g., “the book one”) even on first trials. However, for unusual cards (such as geometric tangram shapes) a shared perspective could not confidently be assumed.

IMPACTS OF NEUROGENIC IMPAIRMENT ON DEFINITE REFERENCING IN INTERACTIONAL DISCOURSE

The finding from Clark's data that we focus on here is how consistently his directors used definite referencing expressions (e.g., often signalled with definite articles) to mark their shared experiences of referring to target cards depicting unfamiliar tangram shapes. In his initial study Clark (Clark & Wilkes-Gibbs, 1986) examined how college students who did not know each other collaborated to establish definite references for 12 novel tangram cards across six trials. Clark found that on first trials with novel cards, directors always initiated referencing by using indefinite descriptions (0% definite references), whereas on subsequent trials definite referencing expressions dominated (83–93%). Also, the pairs quickly settled on specific labels for most cards and the directors initiated referencing using these labels in streamlined elementary or episodic noun phrases 76% of the time, displaying confidence that the label alone would be sufficient for the matcher to identify the target card.

When one of the partners has a brain injury that interferes with language or memory, their ability to use definite references may also be impaired. Indeed, in our work using a barrier protocol similar to Clark's to study collaborative referencing practices of familiar communication partners managing neurogenic communication disorders, our pairs' use of definite referencing expressions was not so consistent. We first looked at pairs managing aphasia (Hengst, 2003). In these pairs the directors used initiating references coded as definite more often than Clark's pairs, and not only on subsequent trials (87%), but also on first trials (40%). Despite marked linguistic errors typical of aphasia, this pattern of high use of definite initiating referencing expressions held for trials when the partner with aphasia was director (90% on subsequent trials, 36% on first trials) and when the partner without aphasia was director (93% on subsequent trials, 55% on first trials). However, when directing, the partners with aphasia initiated referencing with streamlined labels less often than their partners without aphasia (50% vs 80% use of elementary/episodic references, respectively). Whether due to aphasic errors or not, the referencing forms used by the directors with aphasia displayed less confidence that the denotational form alone would be

sufficient for the matcher to understand which card the director was referring to, and interactionally invited the partner to actively contribute to, refashion, or openly evaluate the referencing expressions.

We next looked at pairs managing profound memory impairments or hippocampal amnesia (Duff, Gupta, Hengst, Tranel, & Cohen, in press). In these pairs the directors with amnesia used significantly fewer definite references across trials (trial 1 = 10%; 60% = subsequent trials) than directors in comparison pairs (trial 1 = 20%; 93% = subsequent trials). Interestingly, both aphasia and amnesia pairs produced more definite references on the first trial than Clark's stranger pairs (40% and 10%, vs 0%, respectively). This most likely reflects familiar partners drawing on personal common ground and/or more detailed understanding of communal common ground resulting in more confidence in initial referencing labels for cards even on first trials. However, whereas Clark's healthy college-aged pairs and the pairs managing aphasia had comparable rates of definite reference use on subsequent trials (83–93% and 87%, respectively), the amnesia pairs produced significantly fewer definite references on subsequent trials (60%). Whereas healthy comparison directors quickly moved to streamlined definite references in the form of elementary/episodic references (trial 1 = 18%; subsequent trials = 90%), amnesia directors displayed a lack of confidence that the labels alone would be sufficient and produced few elementary/episodic references (trial 1 = 10%; subsequent trials = 54%).

That the pairs managing amnesia would use significantly fewer definite references than both healthy comparison pairs and pairs managing aphasia suggests that declarative memory is critical for the successful use of definite references. This makes sense given the nature of declarative memory. The declarative memory system creates relational representations; the relationships among the constituent elements of experience, including information about the co-occurrences of people, places, and objects along with the spatial, temporal, and interactional relations among them, as well as representations of higher-order relationships among various events, providing the larger record of one's experience over time (Cohen & Eichenbaum, 1993; Eichenbaum & Cohen, 2001). In the absence of such a declarative record of previous events and communicative exchanges to draw on, amnesia participants were less confident about what information is shared and with whom. Thus the memory deficit significantly disrupts the use of definite references.

In the aphasia data, while the use of definite vs indefinite reference use was similar between individuals with and without aphasia, the individuals with aphasia were less confident in their labels and used fewer definite initiating references coded as elementary/episodic than their partners without aphasia. What about the partners of the individuals with amnesia? We propose that the interactional consequences for *language-and-memory-in-use* and the ongoing management of the memory deficit (i.e., establishing what is in shared knowledge and with whom) would not be limited to the productions of the individuals with amnesia. Rather, such consequences should also be visible in the referential practices of the healthy partners in these interactions as well. For example, in interacting with their memory-impaired partner, familiar partners might avoid using definite references to explicitly draw attention to shared information. Anecdotal evidence suggests that referencing specific events that a memory-impaired person does not recall can evoke significant stress for interlocutors (Colorado State University, 1999). This is consistent with our work documenting differences of partners' discourse (e.g., fewer episodes of reported speech; less verbal play) when communicating with an amnesic vs a healthy (non-memory-impaired) participant (Duff, Hengst, Tranel, & Cohen, 2007, 2008, 2009).

THE CURRENT STUDY

The current study replicated the barrier protocol from our previous work with pairs managing amnesia (Duff, Hengst, Tranel, & Cohen, 2006) and focuses on the productions of their communication partners. To do this, participant pairs managing amnesia switched roles (i.e., communication partners became directors and participants with amnesia became matchers) and completed another four-session barrier task protocol. Given that the use of a definite reference can signal that the speaker has in mind a particular referent that s/he believes the listener can uniquely identify from among other possible ones, we predicted that when interacting with a partner with a profound memory impairment, whose deficit includes disruptions in the ability to consciously determine what information is shared and with whom, the speaker will mark this lack of confidence in the use of significantly fewer definite references to refer to the stimuli. In addition to furthering our understanding of the communicative/linguistic consequences of amnesia in interactional discourse, the analysis may also inform models of common ground and referential deictics. To examine our prediction, we (1) used existing coding procedures (Duff et al., in press; Hengst, 2003) to code the referential expressions of these partner-directors in the barrier task trials as definite (e.g., the game) or indefinite (e.g., a game); (2) tracked changes in their use of indefinite and definite references across trials; and (3) compared these data to healthy comparison pairs and to previous analyses of definite referencing during the barrier task in which the individuals with amnesia were directors.

Method

Participants and data set—Analyses were completed on interactional data obtained from six amnesia participant pairs (individuals with amnesia and their familiar partners) and five comparison participant pairs (healthy participants and their familiar partners) as they completed a barrier task protocol. These are the same pairs who participated in our previous studies (Duff et al., 2006; Duff et al., in press) reported above, although one comparison pair from the original study was no longer available. This follow-up study was conducted at least 6 months after the original protocol. Shifting our attention to the productions of the partners, in this study *the familiar partners* were responsible for verbally directing amnesia participants to place a new set of 12 tangram cards.

Details of the protocol are reported elsewhere (see Duff et al., 2006; Duff, Hengst, Tranel et al., 2008) but briefly, to complete the task, a participant pair sat at a table facing each other and each member of the pair had boards with 12 numbered spaces and identical sets of 12 playing cards displaying Chinese tangrams. A partial barrier obscured the view of the others' stimulus cards but allowed participants to see each other's facial expressions and gestures. The director (always the familiar partner) began with his/her cards on the board and communicated to the matcher (always the individual with amnesia) which cards to place in which numbered spaces so that at the end of the trial the two boards looked alike. The cards on the director's board were in a unique sequence for each trial, predetermined by the experimenter. Although the familiar partner was always the director, there were no restrictions placed on the communication of the matcher (the participants with amnesia); both participants of a pair were allowed to communicate freely about the cards in order to complete the task. The task was administered on 24 trials, with 6 trials conducted in each of four sessions, two sessions per day with at least 30 minutes between sessions. All sessions were videotaped.

At the time of data collection, the amnesia participants (two women) were 47 to 54 years old, were medically stable and in the chronic epoch of their amnesia, with time post onset ranging from 3 to 23 years. Years of education ranged from 9 to 23 years. Aetiologies included anoxia/hypoxia ($n = 3$), herpes simplex encephalitis (HSE) ($n = 2$), and closed head

injury ($n = 1$). Neuropsychological testing confirmed a selective and severe memory impairment, in the context of generally preserved overall cognitive (e.g., language, attention, reasoning) and intellectual functioning for all amnesia participants. Performance on the Wechsler Memory Scale-III (General Memory Index) was at least 25 points lower than performance on the Wechsler Adult Intelligence Scale-III (Full Scale IQ) (mean FSIQ – GMI difference = 41.3). Performance on the Boston Naming Test and subtests of the Multilingual Aphasia Battery were within normal limits. Healthy comparison participants were demographically matched to amnesia participants.

Each amnesia and comparison participant selected a familiar communication partner with whom they completed all barrier task trials. Familiar partners were required to have at least 5 years of frequent (at least monthly) communication with the participant. The familiar partners for the six amnesia participants included two spouses, two parents, a friend, and a sibling. For comparison participants, three friends, and two parents served as partners. The familiar partners of the amnesia and comparison participants were highly similar in age (57.6 vs 60.0) and education (14.0 vs 14.0). Familiar partners were healthy with no history of neurological disease. All participants were monolingual English speakers.

Data analyses

Coding referential expressions: Using both the videotapes and transcripts, referential expressions were coded across four phases by a primary coder, the third author. First the primary coder marked the transcripts to indicate the boundaries between each card placement sequence (CPS). A single CPS included all utterances dedicated to identifying, selecting, and placing a target card. Within a CPS it was common for pairs to engage in side talk about other cards, rules and procedures of the task, and non-task talk. For coding purposes, once a CPS was initiated the pair was considered to be acting within that CPS until the target card was placed.

Second, within each CPS the primary coder identified and marked the initiating reference. The initiating reference is the directors' first attempt on each trial at describing each of the 12 cards (*Number one uh kind a looks like a dragon reading a book*). Across all 24 trials for all 11 participant pairs, on only nine occasions (one in amnesia pairs, eight in comparison pairs) was an initiating noun phrase not explicitly produced (e.g., matcher terminated trial by saying "Done" before the director referenced the last card), resulting in a total of 3161 initiating references (1729 and 1432 for amnesia and comparison pairs, respectively) submitted for analysis.

Third, using the transcripts, an initial pass at coding each of the 3,161 initiating noun phrases using a set of seven codes derived from Clark and Wilkes-Gibbs (1992) and modified by Hengst (2003) was conducted. Of these seven codes (see Table 1) only one (descriptive) refers to referential expressions that are linguistically *indefinite* (e.g., *looks like a ballerina*; *it's got a square to the left*) while the other six codes refer to different types of *definite* referential expressions (e.g., *the sailboat*; *stoplight*; *the lady dancing with her foot straight out*).

During this phase of coding we discovered that throughout the task but particularly on later trials, when labels had become increasingly concise and streamlined, it was not uncommon for pairs to omit the definite article (e.g., *siesta man* instead of *the siesta man*) from definite initiating reference. In essence, such referencing expressions began functioning like proper nouns. This trend was higher in comparison pairs ($644/1432 = 45\%$) than amnesia pairs ($328/1729 = 19\%$). Following Clark and Wilkes-Gibbs (1992), when the article was omitted from an initiating reference that would have otherwise been coded as definite (e.g., *kicker*), these were coded as definite. However, not all initiating references with omitted articles

were coded as definite. Consistent with Clark's coding scheme, initiating references that contained carrier phrases such as "looks like ..." or "it has ...", whether or not it contained an article, were coded as indefinite (e.g., looks like somebody praying). The tendency for initiating reference with an omitted article to be coded as definite was higher for comparison pairs (635/644 = 98%) than amnesia pairs (244/328 = 74%). References with an indefinite article (e.g., *a*, *an*), however, even if streamlined (e.g., *an* angel, *a* windmill) were coded as indefinite.

Fourth, all the coding decisions were reviewed against videotapes by the primary coder to permit necessary changes. From this phase, only 26 changes were made to the 3161 referential noun phrase codes (or <1%). The majority of these changes (25/26 = 96%) came from verifying the intonation patterns associated with episodic and elementary referential productions. Only seven changes to the entire data set constituted a change in definite or indefinite status.

Reliability of coding: The primary coder and a secondary coder (the first author) performed point-by-point inter- and intra-reliability coding on the referential expression analysis obtained in phases three and four described above on three trials randomly selected per participant pair (i.e., approximately 12% of all trials). Point-by-point inter- and intra-rater reliability were above 90%.

Results

Across all collaborative referencing trials for all participants, 69% (2184/3161) of initiating references were coded as definite and 31% (977/3161) were coded as indefinite. The critical contrast for this research concerns the use of definite references in amnesia vs comparison pairs. Strikingly, the familiar partners of the amnesia participants, whose linguistic and memory abilities, by all accounts, were normal, used a definite initiating reference less than half the time (48%, 825), to initiate referencing on target cards with their profoundly memory impaired partner. In sharp contrast, the directors of the comparison pairs overwhelmingly used definite initial references (95%, 1359), a difference that was statistically significant, $t(10) = 3.258, p = .01$. Figure 1 displays the use of definite references by group, showing group differences for each of the four sessions. Comparison pairs also quickly and consistently moved to definite references for the cards (>90% after trial 3; 99% on trial 24), consistent with findings in college-aged participants by Clark and Wilkes-Gibbs (1986). Amnesia pairs, however, showed very little increase in their use of definite references across sessions and hovered around 50% for Sessions 2 (45%), 3 (55%), and 4 (54%).

The difference in the use of definite references between amnesia and comparison pairs was evident even on the very first trial: comparison pairs produced more definite references for the initiating references than amnesia pairs (31.8% vs 5.5% of expressions, respectively) on trial 1. The same group differences in the use of definite references was apparent even for the very last card of the set in each trial: Whereas comparison pairs nearly always used a definite reference for each trial's final card (93.8% of trials), amnesia pairs used a definite reference for each final card on only 54.2% of trials.

Closer examination of the types of definite references between groups revealed many similarities. As shown in Table 2, of the six types of definite references, the majority were coded as elementary for both amnesia (753, or 43%) and comparison pairs (1343, or 94%). Definite references coded as provisional, 2 (>1%), 5 (>1%); placeholder, 0 (0%), 1 (>1%); and proxy, 3 (>1%), 2 (>1%), were similar for amnesia and comparison pairs, respectively. There were also differences. Raw data for the use of episodic and instalment definite references suggest that amnesia pairs drew on these types of references more often than

comparison pairs, particularly in the earlier sessions. Overall, for the amnesia pairs, more definite initiating references were coded as episodic (30, or 2%) and instalment (37, or 2%) than for comparison pairs (6, or >1%; 2, or >1%), respectively. Table 2 presents the distribution of initiating references coded as each of the six definite reference types and the one indefinite reference type for each group.

Comparison to previous work—Of particular interest was how similar the use of definite initiating reference in the present study, when the familiar partners of the amnesia participants were the directors, when compared with our previous work (Duff et al., in press), when the amnesia participants were the directors. When the amnesia participants were the directors, 56% (967) of the initiating references were coded as definite compared to 48% (825) of initiating references coded as definite in the current study when the familiar partners were the directors. For the comparison pairs, 90% (1549) of initiating references were coded as definite in the previous study and 95% (1359) were coded as definite in the present study. For the pairs managing amnesia, these data suggest that it mattered little what role the participants were assigned; the management of the memory impairment, discursively, is disrupted across participants.

DISCUSSION

In analysing data from this replication of the barrier task protocol examining the collaborative referencing of communication partners managing amnesia, but having the partners without amnesia serve as directors, we came to focus on how amnesia impacted the production of initial referencing among those partners. The data displayed that the difference between amnesia and comparison pairs in the use of indefinite references observed in Duff et al. (in press) was not limited to the productions of the amnesia participants but also extended to their partners without brain damage. Specifically, the healthy familiar partners of the amnesia participants used a definite reference to initiate referencing with their profoundly memory impaired partner less than half as often as the directors of the comparison pairs without brain damage. Consistent with Clark's (1992) findings, both amnesic and comparison pairs displayed a decrease across sessions in the use of those definite reference forms that signalled a lack of confidence that the information was shared (e.g., instalment). However, the transition to assured definite forms was more gradual for the amnesia pairs as they continued to display an increased use of references coded as instalment and episodic across trials. These findings support the assumption that the disruption in language-and-memory-in-use is not limited to the productions of the individuals with declarative memory impairments but rather extends to the discourse of their communication partners. In other words, for us, from the theoretical perspective that communication is always distributed across participants, the impact of a cognitive-communication impairment is also always distributed.

Our coding system for collaborative referencing, Clark's (1992) system as adapted by Hengst (2003), provides a systematic means of capturing various levels of confidence for shared knowledge in the discourse of individuals with cognitive-communication disorders. Its sensitivity to the accommodating productions of the healthy partners leads us to suggest that its clinical utility should be explored as a framework for conceptualising the clinician's role during conversationally based diagnostic and intervention protocols—e.g., dialogic cuing hierarchies or scaffolding that moves from joint description, to episodic and elementary productions. We are confident this system can be adapted effectively for online, interactive use in clinical practice. This coding system may also be useful in future studies as a novel means of assessing theory of mind abilities in discourse of individuals with cognitive-communication impairments.

Finally, these results take on more significance when considering the pairs' performance on the collaborative referencing task itself—amnesia pairs displayed collaborative learning across trials as measured by high overall card placement accuracy (96%), significant reductions in time to complete each trial and, for the majority of cards, arrival at unique, simplified, and concise labels (Duff, 2005; Duff, Cohen, & Tranel, 2007). These findings provide a nice illustration of Agha's (2007) distinction between "interactionally successful" and "denotationally correct" referencing. They remind us that adult neurogenic communication impairments present not only as we have canonically conceptualised them (i.e., aphasia as an impairment of language form and cognitive-communication deficits as an impairment in language use), but also as complex patterns and interactions of spared and impaired abilities within individuals. For example, our work on definite references in amnesia (both here and in previous work) using the barrier task documents a disruption in denotational forms while simultaneously highlighting the extent of their interactional success. In contrast, in other work on the use of various interactional discourse resources (e.g., reported speech, verbal play) (Duff, Hengst et al., 2007; Duff et al., 2009), we found that the participants with amnesia had sufficient linguistic abilities to accurately produce the denotational forms necessary to deploy these discourse resources but that their overall decreased use, compared to healthy participants, impacted the interactional success of these interactive sessions. Whereas Clark (1992) analysed the collaborative work of referencing in terms of a single shared common ground, our studies of individuals with amnesia (Duff et al., 2006; Duff et al., 2008; 2009) have suggested that common ground has multiple forms and determinants dependent on the contributions of different memory systems in the brain. Procedural forms of memory (intact in amnesia) seem to support the gradual acquisition of linguistic, conceptual, and perceptual information necessary to arrive at concise labels in this task, while declarative memory (impaired in amnesia) seems needed for the use of high-level discourse practices, like managing shared perspectives and verbal play. Our findings in this paper are consistent with such a bifurcation of common ground—i.e., the pairs displayed common ground in their successful performance of card placements (and increasingly more succinct labels) but also disruptions in the discursive declaration of such shared knowledge through the use of definite references.

Returning to Agha's notion that the social consequences of an act of referring may depend on its degree of interpersonal success, or on its denotational appropriateness—or on both—we are struck by the sense that it is always both. That is, even when these pairs were "interactionally successful," their lack of reliance on definite reference represented a constant reminder of the lack of awareness of shared relationships and histories. Observing fine-grained disruptions in the use of definite references in the discourse of the individuals with fully intact language and declarative memory abilities, when communicating with their partner with amnesia, also raises difficult questions for modular views of memory and language. Even when attention is paid to quite tacit grammatical forms (i.e., the use of a definite article in the formation of a definite reference), the decisions are never linguistic alone.

Acknowledgments

Support from NIDCD 1F32DC008825, NINDS P50 NS 19632, and NIMH R01 MH062500.

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Figure 1.
Use of definite references by Session and Group.

TABLE 1

Types of referential expressions

Noun phrase type	Description	Example
1. Descriptive	<i>Indefinite</i> description of target card marked by the use of indefinite articles (a, an) and descriptive carrier phrases (It looks like a, It has a)	“looks like a man stooped over, and he’s got his feet sticking out to the left”
2. Elementary	<i>Definite</i> reference including noun and modifiers, produced by one speaker, in a single intonational group	“the guy that’s praying with his hands out”
3. Episodic	<i>Definite</i> reference including noun and modifiers, produced by one speaker, but in two or more intonational groups	“the man on one leg with ... the square attached to the body”
4. Provisional	<i>Definite</i> reference produced by one speaker, who without prompting significantly alters or replaces it	“Tree with the evergreen, I mean, not tree, house. House with the evergreen.”
5. Instalment	<i>Definite</i> reference, jointly produced, with director offering noun and modifiers in multiple tone groups, and matcher giving explicit acceptances of each instalment	D: “the one with the two floating triangles on the right” M: “Yes” D: “and a square on the left of the top” M: “Okay” D: “with a triangle pointing off- comes down to a thick body with the feet to the left” M: “Yes” D: “and a point” M: “Okay”
6. Placeholder	<i>Definite</i> reference initiated with <i>and</i> contains within it placeholder expressions, filler words, & silent pauses, which is then completed by either the original speaker or he partner	“uh the boat with ... um a square on top.”
7. Proxy	<i>Definite</i> reference, initiated by 1 partner and completed by the other, with grammatical construction and intonational contour maintained across speakers	D: “The barn with the-” M: “shed attached.”

Bold refers to words spoken with emphasis.

TABLE 2

Types of initiating references produced across sessions by group

Session	Indefinite reference				Definite reference												Total definite references			
	Descriptive		Elementary		Episodic		Provisional		Instalment		Placeholder		Proxy		Total definite references		Am	C	Am	C
	Am	C	Am	C	Am	C	Am	C	Am	C	Am	C	Am	C						
1	272 (63%)	66 (18%)	136 (31%)	285 (79%)	14 (3%)	4 (1%)	0 (0%)	1 (>1%)	11 (2%)	1 (>1%)	0 (0%)	1 (>1%)	0 (0%)	1 (>1%)	159 (37%)	293 (82%)				
2	236 (55%)	2 (>1%)	170 (29%)	357 (99%)	14 (3%)	0 (0%)	1 (>1%)	1 (>1%)	9 (2%)	0 (0%)	0 (0%)	0 (0%)	2 (>1%)	0 (0%)	295 (45%)	358 (99%)				
3	197 (46%)	1 (>1%)	224 (52%)	351 (98%)	1 (>1%)	2 (>1%)	0 (0%)	3 (>1%)	9 (2%)	0 (0%)	0 (0%)	0 (0%)	1 (>1%)	0 (0%)	236 (55%)	356 (99%)				
4	199 (46%)	4 (>1%)	223 (52%)	350 (98%)	1 (>1%)	0 (0%)	1 (>1%)	0 (0%)	8 (2%)	1 (>1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	233 (54%)	352 (99%)				
Total	904 (52%)	73 (5%)	753 (43%)	1343 (94%)	30 (2%)	6 (>1%)	2 (>1%)	5 (>1%)	37 (2%)	2 (>1%)	0 (0%)	1 (>1%)	3 (>1%)	2 (>1%)	825 (48%)	1359 (95%)				

Am = Amnesia pairs, with the non-brain-damaged partner directing; C = comparison pairs.