Top Lang Disorders
Vol. 26, No. 3, pp. 221–239

Communication Access to Conversational Narrative

Annalu Waller, PhD

This article describes methods that have been developed to provide augmentative and alternative communication communicators with better access to narrative conversation. It begins by highlighting the need to provide access to conversational narrative for people with complex communication needs, arguing that this type of conversation plays an important role in interaction that is both effective and satisfying. It proceeds by describing how young children and people with complex communication disabilities access narratives through interactional support. The results of research projects that have used technology to support interactional conversation (telling jokes, sharing experiences, telling fictional stories) are presented as examples of how technology can support people who rely on augmentative and alternative communication to become more effective conversationalists and storytellers. **Key words:** **[AQ2]**

DISCOURSE can be divided into two broad areas: transactional conversation (expressing concrete needs/wants and transferring information) and interactional conversation (telling jokes, sharing experiences, discussing philosophy, etc.) (Cheepen, 1998). Augmentative and alternative communication (AAC) traditionally has focused on providing access to transactional conversation rather than interactional conversation. This may be partially because interactional forms tend to be more complex. They require participation in topic initiation and change, turn taking, communication breakdown and repair, elaboration, and an agreed conclusion (Stuart, 2000; Waller & Newell, 1997; Waller & O'Mara, 2003; Waller, O'Mara, Tait, Booth, & Brophy-Arnott, 2001).

From the School of ~~Applied~~ Computing, University of Dundee, Scotland, UK. **[AQ1]**

The author thanks the participants and their families for participating in the research projects reported in this article. The research presented in this article was partly funded by grants (GR/L52895 and GR/R83217/01) from the Engineering and Physical Sciences Research Council.

Corresponding author: Annalu Waller, PhD, School of Applied Computing, Queen Mother Building, University of Dundee, Dundee, DD1 4HN Scotland, UK (e-mail: awaller@computing.dundee.ac.uk).

Some types of structured narrative, such as question-and-answer jokes, adhere to a strict turn-taking conventional form. Narratives can also be told as a monologue, for example, in a lecture or relating a tale. In these instances, the narrator speaks with little or no interruption from the audience. However, conversational narrative is usually co-constructed and allows evaluations to be exchanged and matched during the interaction. Although storytelling as a monologue can be found in illiterate cultures, much of "storytelling" in literate cultures is co-constructed (Cheepen, 1988).

Conversational narratives facilitate the development and maintenance of friendships and allow people to express their personal identities (Husain, 1997; Schank, 1990). It is through narratives that communicators recall and relate past experiences and translate knowing into telling (McCabe, 1991). Narratives allow humans in all cultures to develop and define who they are in relation to other people (Cheepen, 1988; Schank, 1990); thus, narratives are a means by which people make sense of their experiences (McCabe, 1991).

For many individuals with communication impairment, the ability to participate in storytelling can be severely restricted. Narrative is by definition a "sequence of clauses to the

sequence of events which (it is inferred) actually occurred" (Labov, 1973, p. ix). Relating personal narrative involves the sequencing and embellishment of conversational utterances to convey past experience. For people who rely on AAC, this process requires both pragmatic (knowing what to say and how to structure the sequence of utterances) and operational (being able to locate and retrieve or to construct words and sentences) skills. The operational construction of narrative discourse by people who rely on AAC can be slow and physically exhausting. Other people who rely on AAC may lack the experience or technological supports to construct and use narrative pragmatically.

This article summarizes the stages of narrative development and how access barriers to storytelling may limit communicative participation for people with complex communication needs (CCN). Case examples and discourse samples provide qualitative evidence of how people with CCN can access narrative using both high and low technology. The purpose is to illustrate the learning and environmental supports and system functionality that can provide access to conversational storytelling for people with CCN.

STAGES IN NARRATIVE DEVELOPMENT

Young children begin telling stories before they are verbal (Goodman, Rudy, Bottoms, & Aman, 1990; Waller, 1992). In their first stories, children assume a relatively passive role. They are provided with access to stories by a partner who "scaffolds" the story, leaving parts to be filled in by the child (Bruner, 1975). It is the partner who provides much of the detail, prompting the child for particulars along the way.

As children develop further, they take more of the initiative. They may, for example, initiate stories by providing one-liners, often a repeated phrase or emotional quote, or the punch line in a joke. In these earlier stages, they may tell well-rehearsed stories from storybooks, using the pictures as prompts. The pictures provide a way for them to access the narrative sequence (Nikolajeva, 2002; Whitehead, 2002).

By around age 6, children can create full-blown stories. They might first tell stories to others in monologic dialogue, wherein they tell the story, paying little attention to their conversational partner. Later, they can engage in balanced dialogue, where the stories are co-constructed with their conversational partner and are modified depending upon the partner's response (Peterson & McCabe, 1983).

These developmental stages in conversational narrative develop best in contexts that value and emphasize narrative storytelling. Being immersed in a storytelling environment has been shown to have beneficial effects on story learning and on early literacy (Brown, Cromer, & Weinberg, 1986; Dickinson, 1991; Hiebert, 2005).

Interest has been growing in developing fictional narrative skills in children with severe learning difficulties (Birch, Cross, Dumble, & Park, 2000; Grove, 1998; Grugeon & Gardner, 2000; Turner, 1999), and some research has addressed the writing of narratives within literacy programs (Musselwhite, 2000; Sturm, Bilyeau, & Mathy, 1998). Some authors (Stuart, 2000; Stuart, Beukelman, & King, 1997; Waller & Newell, 1997) have highlighted storytelling by older people and have stressed that AAC systems should address this type of discourse. Research in storytelling by aided communicators of various ages reveals similar employment of access techniques and stages of development (Waller, 1992; Waller, Dennis, Brodie, & Cairns, 1997; Waller & Newell, 1997; Waller & O'Mara, 2003; Waller et al., 2001). In particular, research into the use of a narrative-based communication aid with young people who have CCN has revealed that, by providing appropriate technological support, a developmental progression from the use of scaffolding to support narratives and the use of prestored story texts to produce monologues, to an ability to engage in the co-construction of narrative can be observed (Waller & O'Mara, 2003; Waller et al., 2001). [AQ3]

(A) Alice (an adult visitor to a special school) knows that Kelly has just returned from a holiday in France.

Conversational transcript	Annotations
A: Hello Kelly how's it?	
K: (Smiles).	
A: I hear you've been away?	Alice attempts to elicit a story from Kelly.
K: Yes (vocal approximation of "yes," nods).	At this stage one might expect Kelly to produce more information, but she responds to Alice's question as a closed question.
A: Where did you go?	Alice therefore has to prompt for more information.
K: COUNTRY + F (pointed to Blissword for "country," followed by the letter "f").	Alice knew that Kelly had been to France and did not expand this. A voice output communication aid might have been able to offer Kelly the word "France" using predictive software.
A: How did you get there?	Alice continues to scaffold the narrative with further prompting.
K: AEROPLANE (pointed to Blissword for "aeroplane").	

Scaffolding narrative using closed questions

Early storytelling is supported by scaffolding narrative using closed questions. The following Extract A comes from an aided conversation. It illustrates the use of scaffolding to elicit a story from Kelly, a 12-year-old Blissymbol user. Kelly has cerebral palsy and uses a wheelchair. She accesses her Blissword using direct pointing and has some spoken words. In this and other examples in this article, transcripts are coded as follows: normal text indicates spoken interaction; text in parentheses indicates nonverbal communication; text in italics reflects computer synthesized speech; and text in upper case reflects pointing to symbols. An annotation column is provided when comments are required to (a) clarify local vocabulary and (b) provide further comment on the conversation.

The conversation continued in a similar vein, with Kelly simply responding to the dominant conversation partner. At no time did she initiate or take any control of the story about her visit to France, despite many opportunities and having the cognitive and linguistic abilities to make appropriate use of available vocabulary. This problem with initiation and the use of closed questioning is commonplace in much of the literature on aided communication (Basil, 1992; Harris, 1992; Light, 1988; Pennington, Goldbart, & Marshall, 2004). [AQ4]

Punch-line narratives

People who rely on AAC often give a short punch line when responding to story elicitation. Jane, aged 17 years, uses a literacy-based communication aid with word prediction. Jane has cerebral palsy and uses a wheelchair. She accesses her device using a keyboard with a keyguard. She has little functional speech. When telling stories at the beginning of the WriteTalk project (Extract B), Jane summarizes an experience by giving the punch line without setting the context.

(B) Jane is in conversation with Sheila, a researcher.

Conversational transcript	
S:	What have you been doing lately?
J:	(Time elapsed, 30 s. Using word prediction) "The mirror broke" (laughter).

Jane burst into laughter after typing the sentence and did not attempt to elaborate on what transpired leading up to the punch line of the story. Although Jane had good literacy skills, these events suggested that she needed

to work on developing the organizational skills to structure a story with a beginning, middle, and end. Sheila spent the next 15 min helping Jane to articulate the beginning (*My dad was putting a mirror up in the bathroom while I was in the living room*), the middle (*Suddenly there was a crash. We went through and found Dad looking sheepish and a broken mirror on the floor*), and the end (*Dad had stuck the mirror up with adhesive tape instead of drilling holes for the screws*).

Partner-narrated stories

Some people who rely on AAC make use of speaking partners to relate stories for them (Waller, 1992). Communicators who use this technique might introduce a topic and then indicate to a person who knows them well to tell a story. This technique of storytelling requires a close relationship between aided and speaking partners. A variation on this technique is to have a storybook in which story texts are printed. Any speaking partner can then read the story and engage in conversation. Extract C illustrates the use of a ~~low tech~~ storybook.

Monologic dialogues

Traditional voice output communication aids (VOCAs) provide good support for the creation and access of narrative presented as monologues. Conference speakers who use VOCAs are able to prepare talks offline. The challenges of interactive storytelling are minimized: topic initiation and change are stage managed; turn taking is kept to a minimum as the speaker controls the floor; communication breakdown and repair is avoided unless questions from the floor are permitted; and elaboration and an agreed conclusion are built into the prepared talk.

Effective public speakers who use VOCAs can polish their presentations by crafting sentences, tweaking speech synthesized prosody, ~~including~~ the timing of delivery. Although talks can be edited to produce a high-quality presentation, the effort involved in this preparation requires significant technical expertise and a meta-level understanding of pragmatics in addition to the content of the talk. The difficulty in public speaking often comes after the presentation during the question/answer period when the aided speaker is required to engage in interactive communication once more.

In the personal experience of the author, it is also apparent that people with speech impairments such as dysarthria (as I have) produce more intelligible speech when using monologue dialogue, for example, giving a speech. Listeners often ask why the author's speech is easier to understand in these situations. One explanation is that when conversing, the natural turn-taking characteristic of dialogue requires the listener to slip in when the speaker pauses. A degree of speed is required to take the gap and to take control from the speaker. People with dysarthria tend to speak at a slower rate and have longer pauses than do those with unimpaired speech (Comrie, MacKenzie, & McCall, 2001; Nishio & Niimi, 2001). It is difficult for the speaker with a speech impairment to maintain control of the conversational floor, as the slower speaking speed allows the listener to take advantages of longer gaps. Monologues reduce the need for the partner with the speech impairment to fight for air time. Similarly, it is easier for aided communicators to deliver monologues because the communication repair and topic-shift and topic-elaboration demands of interactive conversation can be time-consuming or difficult if appropriate vocabulary is not available.

Monologic dialogues were observed in the early stages of the WriteTalk project with Anne, a 10-year-old with severe dyspraxia. Anne, who is ambulatory, had some functional words. She was introduced to a narrative-based communication aid that allowed her to use prestored texts about past events to tell her stories. At first, she would take control of the conversation without any consideration for the listener (Waller et al., 2001; Waller and O'Mara, 2003). Observations of Anne using the communication aid in Extract D show her

(C) Extract of conversation using a book containing printouts of all stories on the computer, arranged under primary subject headings. Heidi, an elderly woman with nonfluent dysphasia following a ~~CVA~~, is communicating with Laura, a speaking stranger in her 20s. Heidi's pressptive communication was severely impaired and her use of a small vocabulary was inappropriate. [AQ5]

Conversational transcript	Annotations
H: Oh DDDD (points to storybook entry).	Heidi's utterances are characterized by repeated "ds," phrases, and some words, most of which convey pragmatic information only.
L: What's this? (taking storybook).	
H: Rowans Rowans.	"Rowans" was the name of a work house (an institution for people who were poor, destitute, or disabled).
L: Rowans.	
H: The Rowans.	
L: Oh.	
H: Yes.	
L: (Reading from book.) When Mary and I worked at Rowans, Mary used to sing "The happy old days."	Mary is a friend of Heidi who helped to collect stories for the storybook.
H: (Overlaps with Laura) Happy old days.	
L: to the auld folk.	
H: Yes	
L: Instead of laughing, they'd all be crying by the end.	
H: Yes.	
L: The matron used to come up the stairs and say, "Are you singing to them?"	
H: Yes.	
L: "Aye," says Mary, "and now they're all crying."	
H: Yea.	
L: (Laura stops reading from the book.) Do you still sing the happy old days?	Laura responds to the narrative and eliciting more information.
H: Yes oh yes thank you very much indeed.	Heidi responds in the affirmative.

retrieving and narrating a story in its entirety without responding to the partner's interactional bids.

The conversation above seems to flow naturally. Anne initiates the story about her birthday. She responds appropriately to Paula's question as to her age. In reality, Anne had already clicked the button to speak "This year I was ten" as Paula asked the question. Anne was running through the text with little interaction with Paula and the appropriateness of the conversation here was coincidental. (It does, however, illustrate the predictability of some interactions.) Although Anne raised her eyes from the screen, she never looked at Paula. Paula's question about where Anne was going was completely ignored as Anne stepped through the text sentence by sentence without responding to Paula, without hesitation telling that her grannies,

(D) Anne (aged 10 years 1 month) is using the narrative-based communication aid in conversation with Paula.

Conversational transcript	Annotations
A: "My birthday is on the twenty-first of June" (smiles, eyes raised from computer, looks down to work with trackball).	The first sentence of the narrative text, which is highlighted automatically, is spoken when Anne presses the "speak" button. The next sentence "This year I was ten" is highlighted.
P: How old will you be?	Paula asks the question without knowing what is on the screen.
A: "This year I was ten."	The highlighted sentence of the narrative text is spoken when Anne presses the "speak" button. The next sentence is highlighted.
P: Ten.	
A: "I got a telly tubby called Laa Laa."	In subsequent months, Anne would learn to respond contingently. At this point in her development she ignores Paula and continues to press the "speak" button to say the next sentence.
P: (Giggles).	
A: "She's yellow with a blue sparkly patch. She says laa when you press her sparkly patch" (smiles, raises eyes from computer, looks down to work with trackball). "I got clothes for me going to America on holiday."	
P: Oh you're going to America whereabouts?	Again, Anne ignores Paula, but could have opened another narrative file about her impending holiday which had appropriate information in it. The system was predicting the America narrative as a possible follow-on to the birthday story.
A: "My grannies and aunties and cousins came for a barbecue."	Instead, Anne continues to press the "speak" button.

aunties, and cousins were coming for barbecue.

Co-construction of stories

In contrast to the monologic dialogue in Extract A, the structure of dialogic stories is such that both speakers share conversational control (Cheepen, 1988). The conversational partners take turns to initiate topics and subtopics, asking for and providing details and making evaluations. The dialogue represented in Extract E illustrates the use of narrative co-construction.

Helen initiated a topic in the first turn of the dialogue by asking Jane a question. Jane spends some time locating a story and then begins the story. This reflects a major development when compared to Jane's use of a punch line in the dialogue in Extract B. Jane responded appropriately to Helen's comment about her having moved to her house recently, adding an elaboration that she lived there since July. Helen was not expecting this elaboration and had already begun to ask another question in the previous turn. Jane retains control and elaborates further by telling about the size of the house and the garden before Helen in turn expands on Jane's comments about the house. Helen has helped to co-construct the conversation by expanding on Jane's communication. The balance of conversational control has shifted back and forth between both communication partners instead of residing with one or the other.

(E) Jane (aged 17 years 3 months) using the story-based communication aid in a conversation with Helen.

Conversational transcript	**Annotations**
H: And you were going to tell me something I have not heard.	
J: (Vocalizes, works on computer).	
H: Tell me something about yourself.	
J: (Works on computer, time elapsed, 21 s) "I live in the country"(looks at Helen).	Jane locates and opens a narrative text file and clicks the "speak" button, which automatically speaks the first sentence in the text, which has been automatically highlighted.
H: That's really nice. You've just moved there haven't you?	
J: (Vocalizes, works on computer).	Uses word prediction to type in the sentence: "Ever since July" in response to the question.
H: Yeh do you like,	
J: "Ever since July."	"Speaks" the new sentence. This process did not disrupt the flow of the conversation and was far quicker than typing in the phrase letter-by-letter as compared to the significant time lapse of 30 s in dialogue B.
H: Right (nods).	
J: "It is a very big house" (glances at Helen).	The highlighted sentence of the narrative text is spoken when Jane presses the "speak" button. The next sentence is highlighted.
H: That's lovely.	
J: "The garden is very big." "It is on the flat" (continues to look at Helen).	The highlighted sentence of the narrative text is spoken when Jane presses the "speak" button. The next sentence is highlighted.
H: That's good for having your chair isn't it Jane? That must mean you've got lots of space to move around. And you've got big enough spaces to move in (gestures "wide" with arms while speaking). That's really good and you can, can you move all around the house?	
J: (Vocalizes, time elapsed, 17 s) "Yes."	Responds appropriately to feedback from listener. This illustrated good turn taking in contrast with the monologue in dialogue D.

Jane's development has progressed from using the punch line of a story to using a combination of prestored and novel text in mutually co-constructing a story.

BARRIERS TO STORYTELLING

Although some individuals who use communication aids do use narrative within conversation, many more tend to use one-word or short-sentence responses to questions rather than taking the lead when relating personal experience (Alm & Newell, 1996; Light, 1988; von Tetzchner & Martinsen, 1996; Waller et al., 2001). This passive style of interaction reflects the difficulties faced by people who rely on AAC in negotiating the barriers that prevent access to a more interactional conversational style characterized by small talk and free narrative.

Research suggests that children who have CCN have reduced communicative opportunities when engaging in bedtime story time. In the study by Light, Binger, and Kelford Smith (1994), for example, typically developing preschool children chose their own books and read the same book repeatedly, whereas the caregivers of the disabled children chose different books each time. Opportunities for learning the sequence of stories and noticing the role of the printed word was thus reduced for the disabled cohort.

Another source of communication barrier to aided communicators arises from the difficulties in acquiring novel vocabulary. Storytelling is an important mechanism for the development of vocabulary (Hiebert, 2005). The ability to assimilate new vocabulary independently is crucial. In a study to promote vocabulary acquisition in preschool children, Schwanenflugel et al. (2005) observed that targeted storytelling enhanced children's receptive and expressive vocabulary. However, the independent acquisition of new vocabulary is highly problematic for individuals with CCN, and they tend to be restricted to the vocabulary given to them by others. Most computer-based devices using symbol sets restrict access to natural vocabulary acquisition. New vocabulary is added to the device by literate helpers, and users are required to learn to access vocabulary using codes (e.g., Pathfinder and Vanguard series from Prentke Romich Inc. [http://www.prentrom.com/]) or a sequence or hierarchical dynamic screens (e.g., DV4 and MT4 from Dynavox Technologies [http://www.dynavoxsys.com/]).

People who rely on AAC are encouraged to "tell" stories by retrieving prestored utterances and vocabulary. The use of home/school diaries provide an aid for parents and teachers—by knowing the essential facts of the story, novel partners are able to elicit elaborations and narrative interpretations from the person who relies on AAC. The restriction of vocabulary acquisition however limits the opportunity for children with CCN to move beyond the scaffolding stage of storytelling as they cannot easily elaborate stories by introducing information that has not been already added to their vocabulary.

Finally, the art of engaging in narrative involves knowing what story is appropriate within a conversational context and for a particular listener (Schank, 1990; Waller, 1992). [AQ6] The narrator must decide which episodes of the story should be related, the sequence of the episodes, and how the episodes should be embellished. Locating and navigating through story texts can be difficult using current low- and high-tech AAC systems. In particular, most symbol-based AAC devices store narratives as sequences of sentences, which are spoken without a break (in monologue fashion), or as separate sentences, which must be retrieved individually. The sentences themselves cannot be edited online, and it is difficult to add new sentences or embellish existing text as is illustrated in Extract E, where Jane inserts a new sentence to answer a question. Unlike other systems, this new sentence is retained within the narrative text as it may be that in a subsequent conversation, the same information will be needed. This reflects the natural tendency of narratives to expand and adapt as the narratives are retold and become older (Quasthoff & Nikolaus, 1982).

IMPROVING ACCESS TO INTERACTIONAL COMMUNICATION

Three main aspects of communication can be identified based on this review and discourse examples as being crucial to providing access to interactional communication: (a) access to different modes of conversation, including narrative; (b) the ability to edit narrative interactively; and (c) the ability to access new vocabulary independently.

Access to different modes of conversation

Although traditional VOCAs succeed in providing access to transactional conversation (expressing needs, wants, and transferring information), the design of these systems does not facilitate the development of narrative

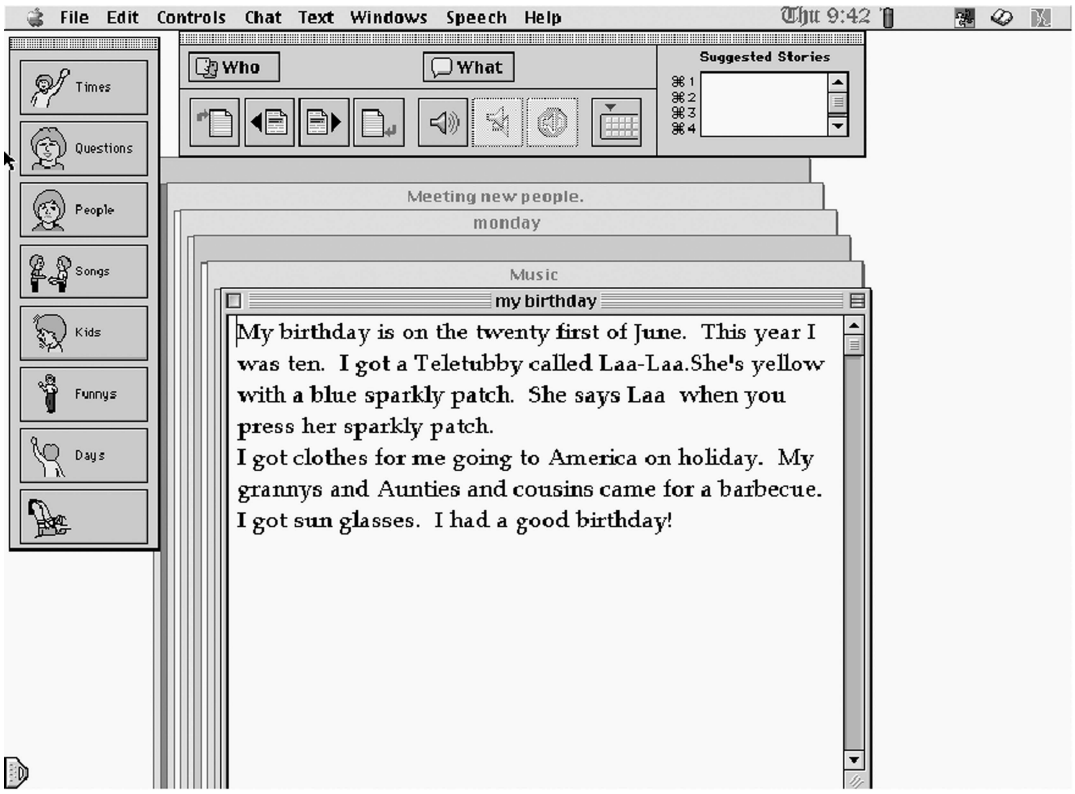

Figure 1. A screen showing a story text using the Talk:About™ software.

skills. They do not make it easy to create, or modify, stories. An integrated approach to interactive communication has been developed to provide computer-supported access to a range of conversational structures (Waller, 1992; Waller & Newell, 1997).

The approach was based on the identification of three main components within a conversation: formulaic conversation, reusable conversation, and unique conversation (Newell, 1991). Formulaic conversation includes generic speech acts such as openings, small talk, feedback, and closings (Alm, 1988). Reusable conversation includes sentences or phrases that can recur over the course of a single conversation, or across different conversations, such as when goals are reexpressed, or when retelling anecdotes. Unique conversation is word based and is created anew depending upon the needs of the situation.

The different components of conversation have been made accessible to potential storytellers through the implementation of a computer program by Don Johnston Inc. (http://www.donjohnston.com/). Talk:About™ is a literacy-based AAC software package that runs on the Macintosh platform.[1] Figure 1 shows a series of story windows, with the text of the dialogue in Extract D in the front window. CHAT buttons are found on the left panel and provide access to quick-fire utterances.

Online editing of narrative

Unlike many other AAC software programs or devices, Talk:About™ allows users to edit prestored text during a conversation. Although this specific technology is no

[1]Talk:About™ is no longer supported.

longer supported by the manufacturer, it offers features that are the focus of this discussion. Specifically, the basic facts of a narrative text can remain the same, but the user is able to use word processing facilities to embellish and/or edit the narrative to suit different conversations, as illustrated in Extract E. Text can be modified or added anywhere in a text file, to allow narratives to develop over time. Talk:About™ is complemented by Co:Writer™ (a word prediction software program also by Don Johnston, Inc.), which assists users who have language and spelling difficulties to modify the narrative text (Newell, Arnott, Booth, & Beattie, 1992; Newell, Booth, & Beattie, 1991).

Narratives produced within conversation may seem to be unique and specific to the context, yet the underlying core structures change less than one might think. Stories can expand over time. The way a story is told and the choice of how to embellish it depends on the situation, the conversation context, and the knowledge of the listener(s) (Waller, 1992). Schank (1990) has described this process of expanding on a core story for all storytellers:

> Participating in a conversation means reminding oneself of a good story to tell, either by telling one you have already told or by the far more difficult process of creating a new one. Because the creation process is so difficult, when we choose to say something, we usually have said it before. Not all conversations are one story, but in a group situation especially that tends to be the case. (Schank, 1990, p. 26).

The feature of online narrative editing (using Talk:About™) was evaluated with young people who use aided communication and has been described in two previous reports. The first report (Waller et al., 2001) documents a year-long intervention study with Anne, a 10-year-old with severe dyspraxia (see Extract D), while the second report considers the developmental stages of the acquisition of narrative skills in children with CCN (Waller & O'Mara, 2003). The reports document changes in two young people's communication skills, which were monitored and measured both quantitatively and qualitatively during a year of using Talk:About™. Results showed that stories were constantly used and updated. This feature appeared to have a positive effect on narrative skills. Participants moved from using the stories as monologue to retrieving texts appropriate to the conversation. Furthermore, their turn-taking skills improved and they learned to structure stories. The following story (Extract F) was written independently by Jane a year after she was introduced to the Talk:About™ online editing feature:

(F) Jane wrote the following text while away at college at 17 years 10 months.

> The fire alarm went off in the hostel last night. It was very exciting. The firemen came and carried us downstairs. There was one very handsome fireman. But he didn't carry me. I was so disappointed.

Compared with her initial attempt at storytelling in Extract A, Jane was able to construct a well-balanced story with a beginning, middle, and end. The story text F above also shows Jane adding evaluation ("I was so disappointed") to the story.

The Talk:About™ software included features that supported characteristics essential to a narrative development in conversation, which would be critical to include in the design of future communication devices. These are the need to develop stories over time; the need to retrieve and move between appropriate stories within conversation; and the need to narrate the story piece by piece in order to facilitate turn taking between conversational partners.

Accessing new vocabulary

Two projects are currently underway to investigate ways in which individuals with CCN can access and experiment with novel vocabulary. The ongoing BlissWord project (Andreasen, Waller, & Gregor, 1998; Arnott, Alm, & Waller, 1999; Waller, 1998; Waller & Jack, 2002; Waller, Oosterhoorn, &

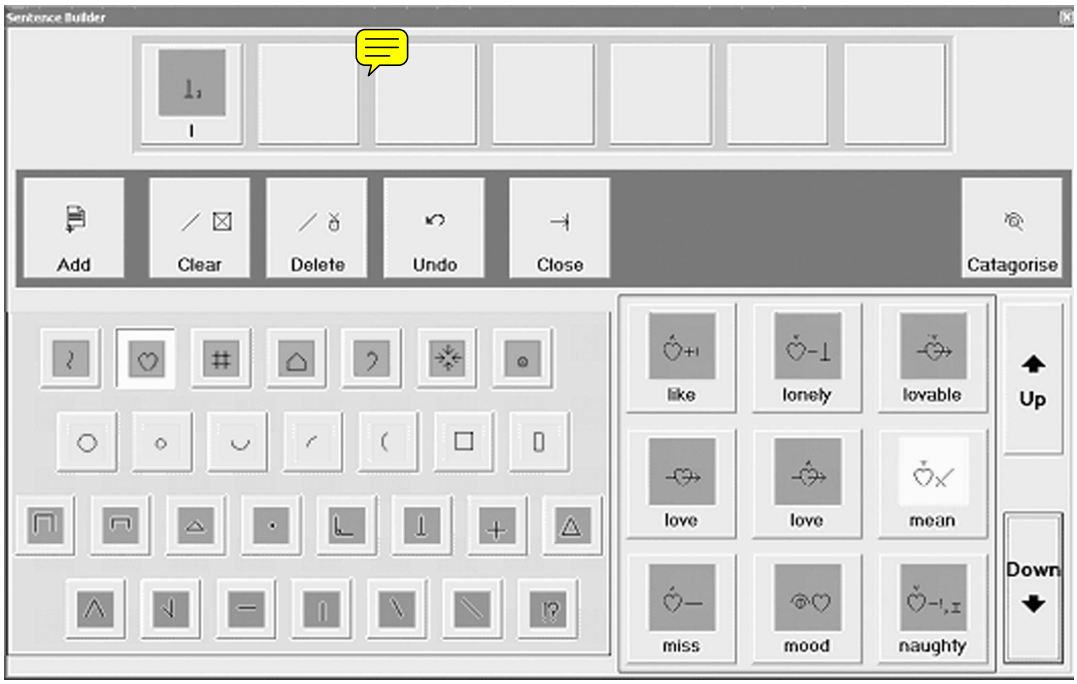

Figure 2. Screenshot showing Blissymbol keyboard on left and prediction list on right. The Bliss word for "I/me" has been chosen and is in the sentence pane above. The heart shape has been selected, resulting in the prediction of words relating to feelings.

Andreasen, 2000) is investigating ways in which users can explore new vocabulary using Blissymbolics (pictographs) in a way that reduces the time required for entering new words letter by letter. The STANDUP project (O'Mara, 2004; O'Mara & Waller, 2003; O'Mara, Waller, Ritchie, Pain, & Manurung, 2004; Ritchie, Manurung, Pain, Waller, & O'Mara, 2006) is developing software that allows children with CCN to play with language and word meanings by generating new jokes.

Although Bliss words can be spelled using a sequence of one or more Bliss characters, there is as yet no commercially available software specifically designed for people with CCN who use Blissymbolics to "write" Bliss. Existing software manipulates Bliss words as picture items, but the items cannot be broken down into characters. The current stage in the ongoing BlissWord project is the development of a Blissymbolic font that will provide a resource for future Blissymbolic applications.

An example of one such application is the implementation of a Bliss wordprocessor that will allow users to generate novel vocabulary independently. This will allow nonorthographic users to move beyond prestored narrative to elaboration and co-construction. Because of the generative characteristics of Blisssymbolics, predictive algorithms can be applied to it to assist users in the retrieval of words based on concepts they symbolize, again possibly shortening the retrieval time. Bliss words are sequenced beginning with a classifier (e.g., all emotions begin with a heart). The interface shown in Figure 2 illustrates the way in which Bliss characters and words can be predicted once a shape has been selected from the Bliss keyboard—the interface produces a list of Bliss words that begin with classifiers using that shape. Frequency and word lists can be used to further refine the Bliss words that are displayed. Users do not need to be literate to

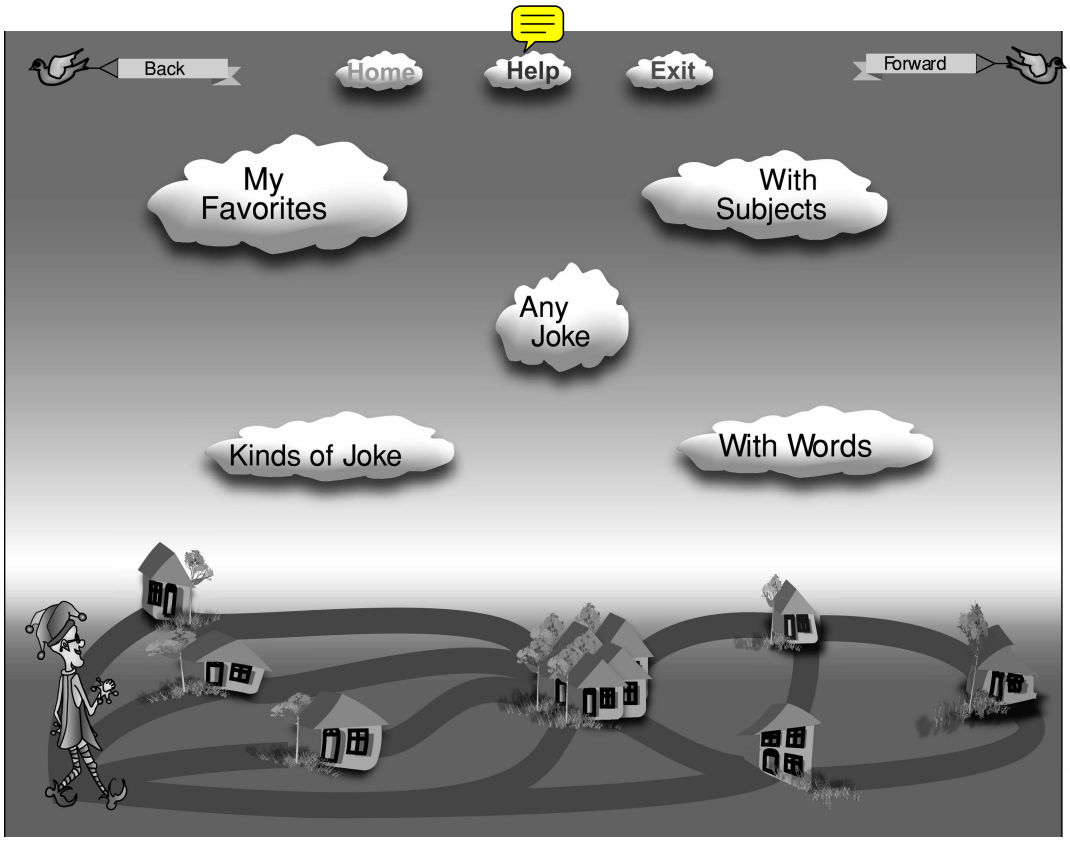

Figure 3. **[AQ18]**

explore language and vocabulary. It is envisaged that video clips and spoken explanation could further augment learning through exploration.

People who use Blissymbolics can generate new words and concepts using low-tech Blissymbol boards (McNaughton, 1993). This use of Blissymbolics is mediated by another person. If, for example, a person using Blissymbolics pointed to the Bliss character for "building," followed by the Bliss character for "book," the listener would interpret the Bliss word as "library." The ability to use Blissymbolics as a writing medium allows users to construct new concepts/words independently.

The second work in progress is part of the STANDUP project (O'Mara, 2004; O'Mara & Waller, 2003; O'Mara et al., 2004; Ritchie et al., 2006). It encourages play with words, which is a critical part of language development in children. Typically developing children enjoy jokes and riddles, which offer an opportunity to practice language, conversation, and social interaction skills. In particular, jokes are a type of conversational narrative and, as such, play an important role in the development of storytelling skills.

The STANDUP project has involved the development of interactive software that allows children with CCN to engage in building simple punning riddles. Puns, punning riddles, and jokes (verbal wordplay) form a natural part of children's discourse. They provide a structure within which words and sounds can be experienced and within which the normal rules of language can be manipulated.

However, children with CCN do not always have language play opportunities. Although some clinicians (e.g., King-DeBaun,

1997; Musselwhite & Burkhart, 2002) have reported on their use of verbal humor as a support for communication skills, little research has been reported on the role of humor in AAC or the role it plays in developing storytelling skills.

Most nontext AAC devices are based on the retrieval of prestored linguistic items, for example, words, phrases, and sentences. Even when question-type jokes are made available on a device (e.g., "What do you call a judge without fingers? . . . Justice thumbs"), the focus is on the order of retrieval and pragmatic use of the joke, rather than on generating novel humour. The 3-year STANDUP project was designed to address this gap, and has been designed for children with CCN to build their own novel jokes.

The STANDUP program is a newer generation of another program developed in 1997 at Edinburgh University. The original JAPE program (Binsted, Pain, & Ritchie, 1997) is one of the few successful examples of a working program designed to generate a variety of novel punning riddles. In these humorous texts in a question-and-answer form, the humor arises from some form of linguistic ambiguity within the text. Examples of such jokes produced by JAPE are as follows:

"What do you call a murderer with fibre? A cereal killer."

"What's the difference between leaves and a car? One you brush and rake, the other you rush and brake."

"What do you get when you cross a monkey and a peach? An ape-ricot."

Although the processing mechanisms in JAPE were crude, highly inefficient, and essentially unusable, the results demonstrated that it is feasible to have software produce punning riddles. The information for telling jokes in JAPE is available in a normal lexicon. That is, JAPE does not require arbitrarily complicated deductions about vast amounts of knowledge of the real world. It was also not possible to know whether children were understanding the double meanings (and alternative spellings, e.g., *serial* and *cereal*) generated by the software, or merely going for the effect—though this same characteristic could be attributed to almost any child in the early stages of learning to tell jokes.

The STANDUP project has taken the JAPE concept and designed a software program to generate jokes and an interface suitable for children with CCN. The goal was to provide users with the means to construct jokes on topics, using familiar vocabulary, enabling them to experiment with different forms of jokes. The resulting software is interactive, dynamic, flexible, and accessible, providing a source of language development and social interaction possibilities that enable the user to go beyond the "needs" and "wants" of assisted communication. STANDUP is currently being evaluated with nine children with CCN. Initial results show that the children are able to use the software to generate puns. The children are exploring new vocabulary and are eager to entertain others, which are not available to them without STANDUP.

In the longer term, it would be desirable to integrate joke-construction mechanisms with other AAC facilities, but the initial aim of the STANDUP project has been to determine more precisely what these joke-construction facilities might or should be, and to explore how they might be used. Adults who use AAC, teachers, and therapists were therefore consulted extensively on the design of the prototype user interface (O'Mara et al., 2004).

Based on the input from these multiple sources, it was decided that the software would use sophisticated natural language processing techniques to generate novel puns. The joke-construction mechanisms underlying the system are principally concerned with nouns, noun-modifiers (adjectives or nouns used prenominally), and compound nouns (two-word sequences of noun-modifier and noun). The system uses a large-scale lexical database—quantities of data about words, running into thousands or tens of thousands of items—to produce jokes that fit predefined joke schemas, such as "What do you get when you cross a . . .," interspersed with keywords of the three syntactic classes such as *sheep*, *kangaroo*, *woolly jumper*. The heart of the system is the WordNet electronic

lexicon (Miller et al., 1993), which has more than 200,000 entries, where each word form has multiple senses, which are grouped into sets of synonyms and linked to hyponyms and hypernyms.

A significant technological challenge for STANDUP has been that of filtering language to be age appropriate and within the reading ability of the children. The system has a range of parameters, which can be set to accommodate specific children. These parameters include the use of synthesized speech and a choice of Picture Communication Symbols (PCS) and/or Widgit Rebus symbols to assist with reading. The symbol sets and word lists provide ways to filter the content words in jokes.

The software can be used in different modes to accommodate the abilities of specific children. For example, the easiest level of task difficulty would be to select one button to select any joke. More complex tasks would require the user to choose a topic word so that the software can generate a joke of that topic.

In sum, unlike current use of humor in AAC where jokes are prestored in communication devices, STANDUP helps users generate novel puns using a computer algorithm. One of the goals for this research has been to develop a system that will allow users to create novel conversational items so that they can have control of what they use and what they discard. When typically developing youngsters engage in early humor, they construct their own jokes, which are seldom funny. It is through experimentation that children learn to manipulate the semantic simultaneously with the pragmatic use of language, and it is hoped that by providing children with CCN access to novel puns, they may engage in similar learning experiences.

DISCUSSION

The examples in this article illustrate how technology can be designed to promote communication access to narratives for aided communicators. Table 1 presents the different functionalities that would be desirable in a communication device and compares this with both high- and low-tech systems that are currently available.

The examples argue for the creation of systems that facilitate access in different ways, as a function of their different design characteristics:

- Systems can be designed to allow the aided communicator to respond more naturally, following the pragmatic demands of different situations. The features of the Talk:About™ software were designed to allow users to move between different modes of communication. Such features should be replicated in future generations of software. They encourage the development of narrative skills by allowing users to move from monologues inserted within conversations to more balanced conversations, in which partners share control. Such features enable users to edit story texts when further elaboration is required.
- Systems can be designed to provide access and explore vocabulary possibilities. Even if a user is in the emerging stages of literacy development, software can give users access to vocabulary items without being dependent on others' scaffolding or prompting. Additional natural language processing techniques can be employed to provide online explanation and access to multimedia learning resources.
- Systems can be designed to provide access to language play in the form of humor generation. Jokes form an early type of narrative and are therefore an important aspect in providing access to stories.
- Systems can be designed to grow with the user as their language develops. Many aided communicators lose significant data when they progress beyond the capabilities of their current device. There should be no reason why both data and access methods should need to be lost. Ideally, system functionality should develop with the user.

[AQ19] **Table 1.** Features of AAC systems to support access

	Examples of low and high technological supports						
Functionality	**Low-tech picture books/boards, e.g., Rebus, Picture Communication Symbols**	**Low-tech picture books/boards, e.g., Blissymbolics**	**Semantic compaction, e.g., Pathfinder**	**Dynamic screens, e.g., DynaVox**	**Literacy-based AAC devices, e.g., LightWriter**	**Literacy based AAC software, e.g., EZ Keys**	**Literacy-based AAC software, e.g., Talk:About**
Transactional interaction	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Phatic communication, e.g., hello, I am ok	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Static narrative (monologue style)	Yes, if stories are written in a book	Yes, if stories are written in a book	Yes, either a short story under one code or a sequence of coded segments	Yes, either a short story under one symbol or a sequence of coded segments on a page	Yes, either a short story under one code or a sequence of codes	Yes, stories can be stored in files	Yes
Dynamic narrative (online editing)	Yes, but slow and not reusable. Users have to have underlying pragmatic knowledge	Yes, but slow and not reusable. Users have to have underlying pragmatic knowledge	Yes, but slow and not reusable—word for word. Users have to have underlying pragmatic knowledge	Yes, but slow and not reusable—word for word. Users have to have underlying pragmatic knowledge	Yes, but slow and tends to be word for word	Yes	Yes

(*continues*)

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Table 1. Features of AAC systems to support access (*Continued*)

	Examples of low and high technological supports						
Functionality	**Low-tech picture books/boards, e.g., Rebus, Picture Communication Symbols**	**Low-tech picture books/boards, e.g., Blissymbolics**	**Semantic compaction, e.g., Pathfinder**	**Dynamic screens, e.g., DynaVox**	**Literacy-based AAC devices, e.g., LightWriter**	**Literacy based AAC software, e.g., EZ Keys**	**Literacy-based AAC software, e.g., Talk:About**
Support for narrative narration (supports turn taking)	No, supported by partners	No, supported by partners	No, supported by partners	No, supported by partners	No, supported by partners	No, narration is not based on narrative style, but a word processing paradigm	Yes
Support for independent access to new vocabulary	Limited. New vocabulary provided by literate assistant	Yes, Bliss is a generative language	No, unless user is literate	No, unless user is literate	Yes—if user is literate	Yes	Yes
Support for retrieving related stories	No	No	No	No	No	No	Yes

Note. AAC = augmentative and alternate communication.

CONCLUSION

Engaging in storytelling, whether it is fictional or based on real experience, is part of everyday conversation. Storytelling forms the basis of relating and sharing experiences, developing organizational skills, and developing an understanding of self. For disabled individuals, as with typically developing people, being able to tell one's own story helps to deal with life issues, such as transition from school to college. Access to narrative is crucial when supporting survivors of abuse by listening and facilitating the telling of their story. Being good at storytelling also equips one for inclusion in society—being an entertaining person attracts friends and helps to provide form and meaning to life.

People who use aided communication are often denied access to conversational narrative because of an inadequate and story-rich school/home environment. Even when children are immersed in a story-rich culture, individuals must be given access to storytelling equipment. Research suggests that current devices still fall short of providing functionality to support the retrieval, modification, and narration of conversational narrative. Few, if any, dedicated communication devices go beyond being a tool to retrieve stored items. Sophisticated natural language tools exist that prompt the user in ways that are commensurate with their abilities and needs. In this way, aided communication can support access in a number of ways, providing (a) physical access to spoken words; (b) a language prosthesis that supports language development in a variety of ways, using a range of pictures to graphic languages to traditional orthography; and (c) means for moving from expressing one's basic needs to telling jokes and sharing experiences and stories with others.

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[AQ15] **[AQ16]** **[AQ17]**

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