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# Using a Visual Tool to Increase Adjectives in the Written Language of Students Who Are Deaf or Hard of Hearing

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Students who are deaf or hard of hearing typically lack descriptors in their written expression. Visual tools are often used in the classroom with this population, without empirical support. This study used a single-subject changing criterion design in an attempt to fill the gap between practice and research. The purpose was to test the use of a visual tool with deaf or hard of hearing students in writing a response to age-appropriate action pictures. Three adolescent students who were deaf or hard of hearing were taught how to write a response to a series of questions using a visual tool and were guided through an experience of modeled, shared, guided, and independent attempts. The use of a visual tool in the practice of writing, along with faded teacher support, helped each student involved in the study increase the descriptiveness of his or her writing, as measured by the number of adjectives in his or her writing samples. However, while the number of adjectives increased, the number of action words and story grammar elements decreased. Further research is needed to address how to help students increase descriptiveness while maintaining action and story grammar.

The act of writing is an essential skill and an assumed part of literacy, and it entails proficiency in both reading and writing. Active participation in most cultural groups is contingent upon literacy, as are financial independence and success (Gillam, Pena, & Miller, 1999). Traditionally, societies with high levels of illiteracy have viewed positive growth in literacy as the solution to achieving more power within the larger hierarchies of the world (Fagan, 1996). The ability to read and write is an important component of one's potential academic and vocational success (Rowh, 2006) and is dependent upon already knowing how to speak or to use a sign language (McAnally, Rose, & Quigley, 1994). Writing also functions as a way of expressing what one already knows. Writing well is a critical skill, functioning as a method of clear communication as well as a path to achieving higher levels of prosperity.

Easy acquisition of the skill of writing is predicated upon an already learned language base, which deaf or hard of hearing (DHH) students do not necessarily have in either spoken or signed modes (Marschark & Spencer, 2006; Marschark, Schick, & Spencer, 2006). DHH students of hearing parents are even further jeopardized in their acquisition of language skills than DHH students of deaf parents (Luckner & Isaacson, 1990; Singleton & Newport, 2004). As a result of this poor and delayed language base, written language output by DHH persons is typically poor and delayed as well (Kretschmer & Kretschmer, 1986; Moeller, Osberger, & Eccarius, 1986; Yoshinaga-Itano & Downey, 1996; Yoshinaga-Itano, Snyder, & Mayberry, 1996).

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The recent rise in the use of visual tools in the general education classroom (Meyer, 1995) and in the classroom with students with learning disabilities (LD; James, Abbott, & Greenwood, 2001; Lenz, Alley, & Schumaker, 1987; Lenz, Bulgren, Schumaker, Deshler, & Boudah, 1994) suggests that pictorial instruction and representation may provide learners who are DHH with an alternative to support the acquisition of written language. However, there is limited empirical evidence to support the use of visual tools with students who are DHH beyond what we have learned from populations with other disabilities.

This article presents a single-subject-design study of a small classroom of adolescents with hearing loss who were taught to use a visual tool to increase their use of descriptive written language. We describe procedures for instruction as well as student outcomes.

# **REVIEW OF THE LITERATURE**

Most of the available literature describes the acquisition of writing skills in either the general population or the population of students with disabilities other than hearing loss. This review will discuss the basis for written language use by students with normal hearing and why this written language is problematic for deaf or hard of hearing students for students with hearing loss. Finally, it will describe the use of visual tools in supporting written language development.

### Acquisition of Writing Skills in Individuals With Normal Hearing

Writing is a critical skill necessary for academic and vocational achievement (Hirsch, 1987). Active participation in most cultural groups is contingent upon literacy, as are financial independence and success (Gillam, Pena, & Miller, 1999). Written language facility is dependent upon the existence of a language base (Graves, 1984). Comprehension of spoken language is a skill that is picked up naturally in the environment, whereas writing must be formally taught. Students with normal hearing can learn to write by pulling from their already learned spoken-language base, as both communication systems operate from the same set of rules. When the relationship between spoken and written language becomes clear to the child, both forms of the language build and expand upon each other (Owens, 1996). Children apply their prior knowledge of the phonetic base of the language to receiving (reading), and expressing (writing) the language because all writing systems are based upon the spoken language code (Perfetti & Sandak, 2000). Thus, with some exceptions, most children with normal hearing and no disabilities are able to benefit from formal instruction in the use of the written form of the language.

While the acquisition of spoken language is a universal phenomenon, the acquisition of written communication must be taught formally (Romaine, 1984). The communicative purpose of writing must be made clear to both teachers and students. Yet, students often learn from instruction that writing is merely a process of stringing words together comprehensibly, spelling words correctly, or making sure all punctuation is correct and in the right place (McAnally, Rose, & Quigley, 1994). However, instruction should clearly emphasize that writing is a way of communicating information, ideas, or feelings to an audience, which will receive and react to the content (Hillerich, 1985). Currently, teachers are placing more emphasis on the process of writing (e.g., developing a first draft, editing, collaborating, publishing, etc.) than on the product of writing (e.g., ideation, formulation, mechanics, etc.)(Graham, Harris, & MacArthur, 2006; Strassman & McGlinn, 2004). The process approach to acquiring skill in writing allows the student to recognize that reaching an audience can be a rewarding experience (McAnally et al., 1994). Theoretically, if the teacher focuses on the process, then the product will take care of itself (Brooks-Harper & Shelton, 2003).

# Acquisition of Writing Skills in Individuals With Hearing Loss

Children who are deaf and hard of hearing do not have the same access to the rules of spoken language as do children with normal hearing. Similarly, they are delayed in the development of a signed language (Marschark, Schick, & Spencer, 2006). Thus, the relationship between spoken or signed language and written language is limited in this population, resulting in written language acquisition that is both delayed and incomplete (Everhart & Marschark, 1988). The difficulties children with educationally significant hearing loss have in acquiring receptive and expressive language skills are well documented (Ewoldt, 1985; Marschark, Mouradian, & Halas, 1994; Moeller, Osberger, & Eccarius, 1986; Osberger, Moeller, Eccarius, Robbins, & Johnson, 1986; Weiss & Johnson, 1993; Yoshinaga-Itano & Downey, 1996). Many have written persuasively about the benefits of bilingual approaches to teaching reading and writing skills, where American Sign Language (ASL) is incorporated as both a language and a tool for teaching written language (Wilbur, 2000; Prinz et al., 1996).

Considering the limited language input that the child with hearing loss is able to access, as well as the limitations in technology developed for the deaf, it is not surprising that such a child's language output should reflect these limitations. The average child who is deaf or hard of hearing graduates from high school functionally illiterate, reading and writing on a third- or fourth-grade level (Allen, 1986; Waters & Doehring, 1990). Students who are deaf and hard of hearing have considerable delays and variances in written language (Ivimey & Lachterman, 1980; Kretschmer & Kretschmer, 1986; Mayer, 1998, 1999; Moores & Sweet, 1990), expressed in their writing through the use of too many nouns, verbs, and determiners relative to too few adverbs, conjunctions (McAnally, Rose, & Quigley, 1994; Simmons, 1962), auxiliaries, (McAnally, Rose, & Quigley, 1994), pronouns, prepositions, and adjectives (Simmons, 1962). This stagnation in language development is reflected in research reporting that students with hearing loss often use the same descriptors for item explanation (e.g., general number and size) at age 18 as they did at age 10 (McCombs & McCombs, 1969).

Children who are deaf or hard of hearing also have a limited short-term memory to draw upon while writing (Kelly, 1990; Marschark & Mayer, 1998). Instead of focusing on content, such students tie up their short-term memory with noncritical functions such as spelling, grammar, and punctuation. When the working memory is being used in this manner, there is little space for semantics in the writing process (Kelly, 1989). A skilled writer would worry about semantics first and return to the composition later to correct noncritical errors (Kalgren, 1992).

Lane, Hoffmeister, and Bahan (1996, p. 116) use the term *visual people* to describe DHH learners. Students who are deaf and hard of hearing communicate and learn best via visual strategies (Luckner & Humphries, 1992; McIntosh, 1995; Nover & Andrews, 1998; Reeves, Wollenhaupt, & Caccamise, 1995; Waldron, Diebold, & Rose, 1985). Therefore, teachers of the deaf and hard of hearing have begun to incorporate more visual tools into their instruction. However, while there are articles addressing implementation of visual tools in the classroom for students who are deaf and hard of hearing (James, Abbott, & Greenwood, 2001; Kalgren, 1992; Luckner, Bowen, & Carter, 2001; Luckner & Humphries, 1992; McIntosh, 1995), there is no empirical research to support this practice.

# Use of Visual Tools to Support Written Language Development

A visual tool is a strategy used to represent organized thoughts and concepts graphically (Heimlich & Pittelman, 1986). Visual tools are also known as visual organizers, cognitive maps, cognitive organizers (Ekhaml, 1998; Hyerle, 2000), information networks, concept maps, visual–spatial displays (Luckner & Humphries, 1992), semantic maps (Kalgren, 1992; McIntosh, 1995), or semantic webs (Kalgren 1992; Luckner & Humphries, 1992). Clarke (1991) defined a graphic organizer as the "presumed structure of relationships among ideas" (p. 30) rather than the linear format of conventional sentence writing. Students remember this visual representation of ideas more easily than extended linear text (Bromley, Irwin-DeVitis, & Modlo, 1995; Dye, 2000).

Visual tools arise from schema theory, which tries to explain how people integrate new information with old information. Students using visual tools are building on old schemata and constructing new schemata, networking old and new information (Kalgren, 1992), and using a framework making the processes of thinking and organizing visible (Tarquin & Walker, 1997). Kalgren (1992) noted that all students, both normal-hearing and DHH, tend to exhibit some of the same difficulties with generating ideas and organizing them into written products that are clear and on topic. All students need some structure within which to arrange their understanding of new vocabulary and newly realized relationships among words, phrases, and concepts (Kalgren, 1992).

Abundant research focusing on the use of visual tools in teaching reading and understanding content in general education, or as teacher-made tools in presenting information, supports their use (Dye, 2000; Egan, 1999; Ekhaml, 1998). Typically, the tools are used to enable the student to "see" the relationships in content areas. Research showing that the use of visual tools achieves statistically significant success in helping students focus on the process of writing is sparse in general education. Some popular trade magazines support the use of visual tool strategies in writing instruction and production, but few empirically based research journals have reported the results of visual tool use in classroom process writing. Meyer (1995) reported on the use of a visual toola graphic organizer-by third-grade students with normal hearing and no learning difficulties in prewriting, drafting, revising, and publishing. These students outperformed students in a control group in holistic scoring and in scores on the Fry Readability Formula. And James, Abbott, and Greenwood (2001) showed that fourth-grade students with normal hearing and LD made tremendous gains in writing ability after instruction in the use of graphic organizers, writers' workshop sessions, and encouragement in using six techniques used by good writers-more so than students without learning disabilities.

Research on the use of visual tools with deaf and hardof-hearing students is less available. Luckner and Humphries (1992) described using hierarchical, comparison and contrast, and chronological information visual tools, and Luckner, Bowen, and Carter (2001) described using hierarchical, conceptual, sequential, and cyclical pattern visual tool representations in presenting and representing content information for students who are DHH. Kalgren (1992) and McIntosh (1995) reported using a semantic map for students' brainstorming writing ideas. Two articles (Luckner, Bowen, & Carter, 2001; Luckner & Humphries, 1992) discussed teacherdriven content presentation via visual tools, while the two remaining articles (Kalgren, 1992; McIntosh, 1995) discussed student-driven thinking and writing processing via visual tool use.

McIntosh (1995) indicated that the use of semantic maps with students who are DHH supports a teaching philosophy considered highly effective by educators and researchers, *conceptual learning*. While teachers of the DHH use visual tools as a teaching strategy in content presentation, and as a sometime writing support tool, research still remains to be completed supporting the use of visual tools in the writing process by students who are DHH. Helping teachers to use strategies validated by research in teaching composition is entirely practicable, but remains a challenge (Abbott, Walton, Tapia, & Greenwood, 1999). Kalgren (1992) and McIntosh (1995) used brainstorming webs in supporting the process writing of students who are DHH but do not cite research supporting the effectiveness or the efficiency of this instructional method. As teachers of the D/HH are already utilizing this method in instruction, research is needed to support or refute the practice of a visual tool in scaffolding the writing of students who are DHH.

#### METHOD

#### **Participants**

Three students who are DHH and attended a day school for students who are deaf and hard of hearing participated in this study. Two participants were male and one was female. Each student's mother reported that the etiology of her child's hearing loss was unknown, consistent with the 52% unknown etiology reported by the Gallaudet Research Institute's Annual Survey of America's Deaf and Hard of Hearing Survey (2005). Each student was in the same self-contained class with one teacher, who was also the primary investigator. Permission to conduct research was obtained from the school and the parents prior to initiating investigation.

Participant 1, to whom we give the pseudonym "Ada," was a 17-year-old Hispanic girl. She had severe to profound hearing loss and wore one hearing aid consistently. In an academic setting, she vocalized only to get others' attention, but with her family and close friends who know Spanish she did use some spoken Spanish and speech reading. In her educational placement, she was provided with a deaf teacher of the deaf who used a manual Pidgin-English-ASL approach to instruction. (Lack of consistent use of ASL is not uncommon among teachers of the deaf [LaSasso & Lollis, 2003].) The participant passed a vision screening within 1 year before beginning research. The primary language in her home was spoken Spanish, with minimal English or sign support. Her preferred mode of communication at school was a Pidgin sign language or ASL signs, depending on context-that is, she benefited instructionally from both ASL and Pidgin, but expressed herself via ASL word strings heavily dependent on context. A new conversationalist "blind" to her circumstances but fluent in ASL would have struggled to communicate with her due to temporal and locative omissions or vague linguistic output. A review of her files revealed no report of learning or behavior problems.

Participant 2, to whom we give the pseudonym "Alan," was an 18-year-old White boy. He had severe to profound hearing loss and wore two hearing aids consistently. He vocalized only to get others' attention in the academic setting, and did not use his voice for communicative exchanges; in his educational placement, he was provided with a deaf teacher of the deaf who used a manual Pidgin–English–ASL approach to instruction. His wore glasses consistently. The primary language in his home was spoken English, with minimal finger spelling, writing, and English sign support. His preferred mode of communication at school was a Pidgin sign language, with ASL signs dependent upon context—that is, he benefited instructionally from both ASL and Pidgin, but expressed himself via ASL signs approximating English word order. A new conversationalist "blind" to his circumstances but fluent in ASL would have been able to converse with him about basic events and processes. A review of his files revealed no report of learning or behavior problems.

Participant 3, to whom we give the pseudonym "Carl," was an 18-year-old African American-Korean boy. He had severe to profound hearing loss and wore one hearing aid consistently. He vocalized only to get others' attention in the academic setting, and did not use his voice for communicative exchanges; in his educational placement, he was provided with a deaf teacher of the deaf who used a manual Pidgin-English-ASL approach to instruction. Carl wore glasses inconsistently. The primary language in his home was spoken English, with minimal finger spelling, writing, and English sign support. His preferred mode of communication at school was a Pidgin sign language. He benefited instructionally from both ASL and English, but expressed himself via ASL word strings heavily dependent on context. A new conversationalist "blind" to his circumstances but fluent in ASL would have struggled to make sense of the selected words he chose to put together in a conversational setting. A review of his files revealed no report of learning or behavior problems.

All participants were able to write five sentences with a prompt, as established by more than 15 writing samples collected by the teacher during the first half of the school year, from August to November 2001. A minimal sentence was defined as a noun plus a verb. The initial recruitment criterion was a five-sentence response to an age-appropriate picture culled from current newspapers and magazines. Five sentences were deemed necessary for the writing sample to provide enough information to analyze.

#### Procedure

Design. Experimental testing procedures were conducted in the students' natural classroom setting. This setting was quiet, free of distractions, amply lit, and had desks for all three students plus the researcher. All experimental procedures were conducted by the participants' classroom teacher, also the researcher. The experimental procedures took about 30 min or less each day. The procedures were carried out individually with each student during the traditional guided writing time established in the classroom. The primary independent variable was the use of the visual tool (see Figure 1). The dependent variable was the number of adjectives included in the written product.

**Baseline**. Baseline data were collected on each student before implementation of the procedures (Alberto & Troutman, 2005). Students were asked to write an independent paragraph response to an age-appropriate picture. Baseline data were collected until the number of adjectives in each paragraph reached stability, defined as 80% of data within 20% of the mean (Alberto & Troutman, 2005). The length of time re-



FIGURE 1. Example of visual tool used in intervention.

quired to reach stability was 10 weeks for Alan and Carl and 2 weeks for Ada.

Instruction. After stability was reached, instruction began. Instruction consisted of a week of modeled (1 day), shared (3 days), and guided (1 day) writing with the scaffold of the visual tool and a list of questions, described below. Data were not collected during the instructional period. Instruction included an introduction to the visual tool and two examples of modeled writing by the teacher using the tool in writing a paragraph response to an age-appropriate picture. Further instruction consisted of the students' and teacher's completing a visual tool together with the list of questions to use in writing a shared paragraph response to the same two pictures used in first instruction. Additional instruction consisted of the students' and teacher's sharing writing, again with the scaffolds of the visual tool and question list but this time in response to a picture not seen before. Final instruction before implementation of the intervention included a guided writing experience with the teacher supporting the students' attempts to use

the visual tool and question list in response to two pictures not previously seen. Thus, the students experienced the visual tool scaffold in writing a paragraph response to a picture a total of six times (twice modeled, twice shared using the same prompts from the model, once shared with a novel prompt, and once guided with another novel picture prompt) before intervention data were collected. The intervention phase ran for 1 month for Alan and Carl, and 1 month and 1 week for Ada. The Appendix provides a transcript of an example interaction between the teacher and the students.

Intervention. After this initial instructional period, the first intervention phase began. We used a changing-criterion design (Alberto & Troutman, 2005) in which the goal was to increase the number of adjectives used by each student in writing a paragraph to 50% above the baseline mean while fading out the teacher's support. Intervention in the second and third phases consisted of 5 data points. In the second phase, each student was given a modeled writing experience using the visual tool and list of questions in generating a paragraph re-

sponse to a picture, before being asked to complete this activity independently (see the Appendix). Data were not collected on modeled writing responses. In the third phase, each student shared writing with the teacher and was then asked to generate an independent response. Thus, data collection points from the first two intervention phases are representative of independent attempts at writing paragraphs in response to picture prompts immediately following a modeled or shared writing experience with the teacher. In Phases 4 and 5, a guided writing experience was implemented and teacher input was faded, but the criterion remained an increase in the number of adjectives by 50% from baseline. In the fourth phase (the third intervention phase) three data points were collected. The first and third data points were collected after guided writing experiences, while the second data point in this phase was collected without one. In the fifth phase (the fourth intervention phase) a guided writing experience was provided before collection of data only on the third attempt. The first, second, fourth, and fifth data points from this phase are representative of independent attempts without prior guided writing experience with the teacher. The teacher was faded out once in the third phase of intervention and four times in the last phase of intervention.

Visual Tool. The visual tool used was a sheet of paper with five sets of two lines down the left side and five circles in a row after each set (Flynn, 1995, p. 55; see Figure 1). The teacher modeled twice. She looked at two different pictures, developed a list of five major nouns from the pictures, wrote the nouns on the left-hand side of the visual tool, then used a list of questions (How many? How does it feel? What kind? How old? What size? What color? What does it look like?) to describe each of the five nouns. The teacher wrote the adjectives (the words developed in response to the questions) in the five circles on the righthand side of the visual tool opposite their respective nouns. The teacher and her assistant culled age-appropriate color and black-and-white action pictures of assorted sizes from current local and national newspapers and magazines. The pictures showed a variety of situations, including a teacher leading a group of young children in raising their arms toward the sky, three police officers arresting a scared and surprised man in a convenience store, a matador whipping his red cape to the side of a charging bull, a little girl drawing with chalk on her driveway while her mother and brother watch, a soldier in camouflage kissing his bride outdoors while being observed by other soldiers, and several men rowing frantically in kayaks on a river.

Data Analysis. Independently written responses to picture prompts were gathered from each participant. Once the responses were collected, the researcher transcribed them to protect the anonymity of the participants and for ease of scoring by sentence. While both scorers knew the participants, the second scorer was unaware of which paper belonged to whom. First the primary researcher, and then the researcher's assistant, conducted a manual count of the number of adjectives included in the written product, and discrepancies were resolved. Upon completing the adjectives count, the numerical data were plotted.

Interrater Reliability. The researcher's assistant was trained in the scoring procedure to 100% reliability, that is, to 100% agreement on the number of adjectives in written samples of other deaf and hard-of-hearing students with similar writing skills. Both the researcher and the researcher's assistant independently scored the transcript of each written product, then convened to discuss scores and resolve discrepancies, using a point-by-point system. Of 18 attempts by Alan, there were initial disagreements about 3, for 84% reliability. Of these 3 disagreements, 2 consisted of one-word discrepancies and one of a two-word discrepancy. Of 18 attempts by Carl, there were initial disagreements about 6, for 67% reliability. Of these disagreements, 3 consisted of one-word discrepancies and the other 3 of four-word discrepancies. Of 18 attempts by Ada, there were initial disagreements about 1, for 95% reliability. This was a one-word disagreement. Altogether, for 54 attempts, there were 10 disagreements, for an overall 81% reliability, with 6 disagreements of one word (60%), 1 disagreement of two words (10%), and 3 disagreements of four words (30%). All discrepancies were resolved to 100% agreement based on a discussion of word function and intent, dictionary reference to its part of speech, and reference to the Concise Encyclopedia of Grammatical Categories (Brown & Miller, 1999).

Intrarater Reliability. To assess intrarater reliability, 10% of the total written products were randomly selected by someone not initially involved in analysis and scored again by the primary investigator without reference to the original scoring. One-hundred-percent agreement was present.

**Social Validity**. Both pre- and posttest social validity protocols were completed by the participants, five teachers at the school (one highschool math, two highschool English, one middle school, and one highschool special needs; three hearing and two deaf), two supervisors (highschool supervisor and schoolwide behavior specialist; one hearing and one deaf), and each of the participants' mothers (all hearing).

Ada, Alan, and Carl responded to 10 questions with answers ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Students were encouraged to read the statements on their own but needed the teacher-researcher to explain each statement to them. Students were provided with a sample visual tool partially completed. Mean scores were as follow: "I like to write": 4.3. "Writing clearly is important": 3.7. "I want to improve my writing": 4.7. "Writing is a waste of time": 1.7. "I use writing to communicate": 4.3. "I will use writing to communicate after I graduate": 4.7. "Writing frustrates me": 2.7. "A visual tool will help me write better": 4.0. "I want others to understand my writing": 4.7. "I don't care if others understand my writing": 1.3.

Ada, Alan, and Carl also completed a poststudy social validity survey consisting of nine statements, with the same rating scale as above. Students had continuous access to a graphic representation of the number of adjectives they used over time, from baseline through intervention. Mean scores were as follows: "I enjoyed using the visual tool": 4.3. "I would use the visual tool again": 4.3. "The visual tool helped me write better": 4. "I would like to share this visual tool with other students who are deaf/hard of hearing": 3.3. "I would like to learn more about visual tools": 4. "This visual tool is worthless": 3. "I don't like using a visual tool when I write": 3. "I will never use a visual tool again": 1.3. "This visual tool did not affect my writing": 2.

The participants' mothers completed an 11-question prestudy social validity survey. Mothers were provided with a sample visual tool partially completed. Mean scores were as follows: "Writing frustrates my child": 3.0. "My child would rather do math than write": 3.7. "My child would rather read than write": 4.3. "My child writes well": 2.0. "My child needs to improve his writing": 3.7. "My child uses writing to communicate": 3.7. "I understand my child's writing": 2.7. "I want my child's writing to improve": 5.0. "This visual tool will help my child's writing to improve": 4.7. "I would use this visual tool at home to help my child write": 4.7. "I would like to see this visual tool introduced to other students who are deaf/ hard of hearing": 5.0.

The participants' mothers also completed a 9-question poststudy social validity survey to which their children's results were attached in a graphic format along with a sample completed visual tool. Mean scores were as follows: "My child enjoyed using this visual tool": 4.7. "I saw an increase in my child's adjectives": 5.0. "I want my child to continue using this visual tool": 5.0. "I want other students who are deaf and hard of hearing to use this tool": 5.0. "I would use this visual tool at home with my child": 4.7. "This visual tool helped my child improve his writing": 4.7. "I don't want other students who are deaf and hard of hearing to use this visual tool": 1.0. "I don't want my child to use this visual tool": 1.0. "I will not use this at home with my child": 1.0.

Seven faculty members at the school completed a prestudy social validity survey consisting of 10 questions with the same ratings as described above. They were provided with a sample visual tool partially completed. Mean scores were as follows: "Writing by students who are deaf and hard of hearing is typically flat and lifeless": 4.0. "Students who are deaf and hard of hearing have excellent writing": 2.1. "Students who are deaf and hard of hearing enjoy writing": 2.2. "Students who are deaf and hard of hearing hate writing": 3.1. "Students who are deaf and hard of hearing would rather do math than write": 4.1. "Students who are deaf and hard of hearing will benefit from using this visual tool": 4.3. "This visual tool will provide students who are deaf and hard of hearing with greater access to adjectives": 3.7. "This visual tool is a waste of time": 1.9. "I want to learn more about visual tools": 3.6. "I want to introduce visual tools to other students who are deaf and hard of hearing": 3.7.

These same faculty also completed a poststudy social validity survey consisting of nine statements with three graphs attached representing the three participants, who remained anonymous. Mean scores were as follows: "I saw an increase in students' adjectives": 4.7. "I would like to see these students continue to use this visual tool": 4.7. "I want to see other students who are deaf and hard of hearing use this visual tool": 4.7. "I don't want other students who are deaf and hard of hearing to use this visual tool": 1.4. "I don't want these students to use this visual tool again": 1.4. "This visual tool benefited the students' writing process": 4.7. "This visual tool benefited the students' writing process": 4.7. "This visual tool provides greater access to adjectives in the writing process": 4.6. "This visual tool is a waste of time": 1.3. "There are other students who are deaf and hard of hearing that I want introduced to this visual tool": 4.6.

# RESULTS

Figure 2 shows the total number of adjectives included in each product by Ada in the baseline and four subsequent intervention phases; Figure 3 show the same data for Alan, and Figure 4 for Carl. The criteria were number of required adjectives increased by 25% from baseline mean across Phase 2, and by 50% from baseline mean across Phase 3. In Phases 4 and 5, the teacher input was faded. The *x* axes represent the written products. The *y* axes show the total number of adjectives included in each written product across phases, by student. The goal was to increase Ada's total number of adjectives from 14 to 21, Alan's from 11 to 17, and Carl's from 8 to 12.

#### Baseline

The baseline consisted of five products generated by Ada in response to action picture stimuli as described above. Ada's baseline was stable, with 80% of data within 20% of the mean, 14. One outlier, 17, was present in the baseline from the first written product. Ada's baseline was completed in 2 weeks. Alan and Carl did not present with a stable baseline. The decision was made to move on to the intervention with 10 baseline data points for both Alan and Carl. Their baselines were stopped at 10 weeks.

# Phase 2

For Ada, the interim criterion for Phase 2 was 17, or an increase of approximately 25% from the baseline mean. Ada was able to meet criterion in Observation 9 and exceeded criterion in Observation 10; thus the decision was made to move on to the next phase, as she met criterion two times in a row. For Alan, the interim criterion for Phase 2 was 12, which he exceeded for Observations 11 through 15. Carl's interim criterion for Phase 2 was 13, which he exceeded in Observations



FIGURE 2. Number of adjectives included in Ada's paragraphs.



FIGURE 3. Number of adjectives included in Alan's paragraphs.

12 through 5. Thus, the decision was made to move each participant from Phase 2 to 3 of intervention.

## Phase 3

Ada's criterion in this phase was 21 adjectives per written product, a 50% increase over baseline mean. In this phase, Ada exceeded the minimum criterion in each of five observations, and was moved to Phase 4. Alan's criterion was 12 adjectives, which he exceeded in five consecutive observations. Carl's criterion was 17, which he met or exceeded in five consecutive opportunities. Each participant was moved from Phase 3 on to Phase 4.

#### Phase 4

In Ada's fourth phase, her criterion remained a minimum of 21 adjectives, but the intent was further to fade out the



FIGURE 4. Number of adjectives included in Carl's paragraphs.

teacher-researcher's input into shared writing. Ada exceeded criterion twice and was moved on to Phase 5. This phase was limited to three observations instead of the usual five as present in the remaining phases to show control by ensuring that the students were not just becoming accustomed to the data collection process (Richards, Taylor, Ramasamy, & Richards, 1999). Alan's criterion remained at 12, which he exceeded. Carl's criterion remained at 17, which he either met or exceeded. Each participant was moved on to Phase 5.

#### Phase 5

In Phase 5, Ada's criterion remained at 21 adjectives, but the intent was to fade the researcher-teacher's input further. Ada exceeded criterion in each observation. Alan's criterion remained at 12, which he exceeded in each attempt, and Carl's criterion remained at 17, which he exceeded in each attempt. Ada's intervention was 5 weeks, while Carl and Alan's interventions were 4 weeks. Figure 5 shows Ada's written samples from early baseline through later intervention.

#### Functional Relationship

We were able to demonstrate a functional relationship between use of a visual tool and increase in adjectives in written products by Ada, Alan, and Carl, as there was successful replication of Phase 3 across Phases 4 and 5 with varying phase lengths. In Phase 3, Ada was able to exceed criterion all five times. In Phase 4, she exceeded criterion two out of three times, and in Phase five, all five times. Alan was able to exceed criterion in each attempt in Phases 3, 4, and 5. Carl either met or exceeded criterion in Phases 3, 4, and 5. Control and replication effects are shown to be especially strong by the difference in length between Phase 4 and Phases 3 and 5. That students met or exceeded criterion in either two attempts out of three or five attempts out of five demonstrates a functional relationship between performance and use of visual tools.

#### Treatment Fidelity

A second assistant trained to an accuracy rating of 100% measured treatment fidelity in 20% of observations.

# DISCUSSION

The purpose of this study was to determine if the use of a visual tool would enhance written products produced by three DHH students with average intelligence by increasing the number of adjectives they used. As students with hearing loss typically present writing samples with low numbers of descriptors—adjectives (Simmons, 1962) and adverbs (Mc-Anally et al., 1994; Simmons, 1962)—it is crucial to find ways for their writing to become more descriptive, as they will most likely be using written language rather than spoken language to communicate with hearing persons in their chosen communities. For the three students in this study, use of a visual tool was effective in increasing the number of adjectives in their written products.

There is no previous empirical research indicating the effectiveness of visual tool use by students who are DHH in

# ADA-EARLY BASELINE

Mans was a Amry. mans work the war. People had many die. And building it a broken. And car had it a fire broken. This out mis is Awaful. People had few Army. mans all day work hard the war. mans had Boy. And woman not Girl. No. And mans had a hat, clother, jean that diffrent color. mans help carry go to hosphail or doctor. Mix was bad and smell was AwAful. mans was nice Help and scared for People under or die. mans was very hard work the war. And Floor was Rock and floor was fun same thing. I am made sure. The end.

# ADA-EARLY BASELINE

The plioce are hard work. Plioce had color clother, hat. And But man had robber drink or thing. Happen about name store gas. man was mad and more little fight. And 2 womans and 1 man had job. Plioce are Keep made sure and man is rest rest Best ok. Then take happen Why robber. and your manager. You go to Jial.

# ADA-LATE BASELINE

Mounstion had Tree and had dirty floor and gorcess. And mans scared for People happen die or live sick or something happen. Mans can Help you. She was fall of monustion. She has Broken leg or Body. mans Help she. mans Help go to doctor. Monustion are danger. I madder sure. "Think." Mans are nice Help all People. Show you on picture had paper. And I think had mounstion in anmal. Anmal are danger. "Careful." And you mans ok man had short yellow name Corey and other man short Black name Nicholas. She name Danielle. The end.

# ADA-LATE BASELINE

Amry had work war. Why people are mad like that Black. want like yellow. But still war try stop. And Amry Push to other People, Other people watch at Amry and fight are like war. And Amry near House ar Bliding and near work. But why fight and maybe war same mean? "Happen." People hate Black and as Black 'say' want with nice mexico or Eghish or all different mix nice friendly. But war like that No way Please. The end.

# ADA-EARLY INTERVENTION

Few four army have long sleeves, Jeans and small helmet. It are a Black and Green. The men was running fast. The one big helicopter and large. It is a Green. The sand are Tan dry. It have ball bushes. Cloud are brown mix. The Sky is Blue.

# ADA-EARLY INTERVENTION

The borth are young. She are Tan skin, there are thin and she are Half tall. There has yellow with Long sleeve jacket, as Red with Short Shirt is wet. The she talk fast and hard Homework and She are scared. The one room is big. The two are table. It is small, wood, gary and table is hard. And borad is white and Box on borad is brown. The end

# ADA-LATE INTERVENTION

The gouny one his father are sKin white. They are walk slow, friendly out Green tree and Lake small water is white and grass light Green, mix are brown. It is very big is Pertty And It is outside warn and outside have many have wood and havey Rock, thing. So father have hair gray and Shuit Blue, Jean tan. He Help Carry to Kid. He have his son have all short clother, Jean Red, tan. Boy is very Happy. Have have one line wood thin. The

# ADA-LATE INTERVENTION

The many are older Skin color diffrenet. They whats win this fight who win well mad or Happy for win. And They was Carefully Help to two fight fall. we Help hand keep? The one man are nice clother light Blue Long Sleeve and Long Black Black. The two fight are Skin drown, Both are stonrg and they have 4 red gloves. The Both was fall near People. The peoples are scared. The big are room. The small Box fight is hard and line is wet Blue, white, Red. They room in warm. And Box on floor is Green.

FIGURE 5. Ada's writing from baseline through intervention. All capitalization, spelling, and punctuation errors are her own errors.

their attempts to write clearly. While there is research indicating that visual tools are helpful in the classroom with students who are LD, this research tends to focus on teacher-made and teacher-presented visual tools for presentation of content (Lenz, Alley, & Schumaker, 1987) rather than visual tools used in a process such as writing. Little research is available indicating the success of visual tools with the student-driven process of writing. However, Meyer (1995) reported that students with normal achievement levels and normal hearing who used a visual tool in their writing process outperformed peer students who did not. In addition, James, Abbott, and Greenwood (2001) reported that visual tools were successful in increasing the quality of writing by students with LDs.

Again, much of the research with visual tools focuses on them as a method of presentation, not as a process. No research was found on the use of visual tools in the writing process by students who are DHH. This study attempted to begin filling the gap between common practice and researchsupported best practice. The results of this study support the hypothesis that visual tools enhance the written products of students who are deaf or hard of hearing. More research in this area is need to continue closing the gap between currently accepted practice and empirically based research suggestions for best practice.

A limitation of this study was that while pictures were current, newsworthy, age-appropriate, and full of action, students were not always familiar with or had limited experience with the action events depicted. Further research using pictures of the students themselves—rather than strangers engaged in action events might provide familiarity.

An unexpected result of this study was that while the use of adjectives increased, action and quality were lost, along with elements of story grammar. While students began to use more adjectives in their writing, they lost sight of the action and possible story in the picture and focused more on adjectives. Future research should attempt to account for the loss of one skill in the face of an increase in another. One might question whether there is an actual decline in old skills due to the use of these tools or if there is a developmental progression after which the old skills restabilize.

In summary, an analysis of the written products of three students who are DHH revealed a functional relationship between use of a visual tool and an increase in written adjectives. Students and their mothers said they enjoyed using the visual tool, would use it again, and would share it with other students. Faculty viewed visual tools as beneficial for use in helping students who are deaf or hard of hearing with their writing process. More research is needed to support this finding further and to provide more insights into the use of visual tools in the writing process by students who are DHH.

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# APPENDIX: TRANSCRIPT OF EXAMPLE INTERACTION BETWEEN TEACHER AND STUDENTS IN INTERVENTION STAGE

A sampling of instruction follows in English, but the teacher signed in the individual students' preferred receptive language. The picture depicted here is from the movie Black Hawk Down, where the soldiers have landed and are carrying an injured man on a stretcher.

Good morning. Let's look at this picture together. There is a helicopter that has crashed in the background. That will be my first noun. I'll write that in the left-hand column here. I'm writing the word *helicopter*. I will try to describe that word now using my question list.

What's my first question? It says, "How many are there?" There is one helicopter, so I'll write the number 1 in the first circle on the right-hand side.

The second question says, "How does it feel?" I would imagine it's pretty tough and it may be hot, too, like a car that has just been shut off. So I'll write two words, *tough* and *hot*, in the second circle.

The third question says, "What kind?" I'll write that it's a military helicopter, so I'll write down the word *military* in the third circle. It's probably old, so I'll also put down the word *old* in that circle, too, to talk about what kind of helicopter it is.

The fourth question says, "How old is it?" We really don't know the answer to that question, so we'll skip that one. We've already said it's old anyway.

The next question says, "What size is it?" I think it probably could hold about 20 men. It looks pretty big to me. I think I'll use the word *big* to describe the helicopter's size. I'll write down the word *big* in the fourth circle here.

Let's look at the next question. It says, "What color is it?" I think it's black, so I'll write down the word *black* to describe the helicopter in the fifth circle. We've used up all of our circles now.

Let's pick another thing in the picture to describe. How about the group of men in the front of the picture? Well, this group here is on their feet, but there's also another man on a stretcher. Let's talk about the group of men first and then we can talk about the injured man next. Okay, let's use the word *soldiers* for the noun in the left-hand column.

All right, look at our list of questions again. What's the first question? Oh, "How many are there?" Let's count. Oh, there are five soldiers. Okay, I'll write the word *five* in the first circle.

The next question says, "How do they feel?" Hmmm, that's a tough one to figure out. Let's try to put ourselves in their shoes and think about how we would feel in that situation, having crashed our helicopter and finding an injured man. What would I be feeling? I would be scared because I don't have a helicopter that works, and I can't get the injured man to a hospital fast. I would also feel nervous because I would be concerned that the enemy could see me and might shoot me. I would feel tired because I've been flying all day and have been cramped up in the helicopter with 19 other guys. That's enough for now. I will write the words *scared*, *nervous*, and *tired* in the second circle here.

Okay, next question: "What kind?" That's tough. I guess we could talk about what kind of men they are. I think they're brave for going into unfamiliar territory and trying to help people. We'll just leave it at that, brave. Let me write down the word *brave* in the third circle here.

The next question says, "How old?" They all look like they're in their mid-20s or so. Young adults, I guess. I'll put down the word *young* in the fourth circle here.

Okay, the next question says, "What size?" They're certainly not fat or short. But they're not really tall, either. I think they're just average, or medium. I'll put down the words *medium build* in the fifth circle.

We're out of circles, but we could also answer the question about color. They all have white skin and black uniforms. I'll draw some more circles here and just write the words *white* and *black* in this new circle.

Okay, let's talk about the injured man now. We'll write the noun *man* in the left-hand column. However, we don't want to confuse him with the soldiers. How about we call him an injured man instead of just a man? That's more specific and gets us another adjective as well. Okay, I'll write *injured man* in the left-hand column. Now let's develop some adjectives to describe him.

Okay, the first question says, "How many?" Well, there's only one injured man. I'll write down the word *one* in the first circle.

The next question says, "How does he feel?" I bet he doesn't feel very good right now. How can we describe how he's feeling right now? Hmmm, let's put ourselves in his shoes and think about how we would feel if we were in his position now. I would feel dizzy, maybe. Maybe I was doused with some sort of chemical weapon and it's affecting my thinking, so I'm pretty dizzy. Or maybe I've really been shot with a gun, I'm hurt, and the pain is nearly unbearable and I'm being all jostled about on the stretcher. I would be angry that I got shot, but I'd also be very grateful that my comrades came to get me out of the war zone. So I'll just speculate and write down the words *dizzy, hurt, angry*, and *grateful* to describe the injured man in the second circle.

The third question says, "What kind?" Well, we've really already addressed that by specifying that he's injured, so that's our adjective to describe what kind of man he is. We could say that he's also screaming from the pain, but we have to be careful not to make that into a verb. We'll just put a little asterisk there with the word *screaming* so that we don't accidentally use it as a verb instead of an adjective. We'll have to be careful with our sentences. We'll have to say "the screaming man" instead of "the man screamed." Okay, we'll put down the words *injured* and *screaming* to describe what kind of man he is in the third circle.

The next question says, "How old?" but it's really hard to tell. We could make up something and say he's young too, but we've already used that word. Let's think of another word to describe his age. How about *grown*? That means that he's finished growing for now. I'll write the word *grown* in the fourth circle to describe the injured man.

The fifth question says "What size?" but I think we've already used most of the size words that would apply to him, *medium* and *average*. So let's just skip that question for him and move on to the next question.

The next one says, "What color?" He's the same as the soldiers; he has white skin too. However, his uniform is pretty dirty looking. Instead of using a color word, let's use the word *dirty*. What colors would I use to describe dirty? I guess black or gray or brown. Let's use those words to talk about the injured man. We'll write those down in the fifth circle, *white*, *dirty*, *black*, *gray*, and *brown*.

Okay, we've finished describing three nouns. Let's pick two more, then we'll start writing. Okay? The next noun can be the stretcher itself. That's a pretty important part of the picture here. You have to pick the right nouns to describe so that your reader is able to visualize the picture when reading even if he doesn't have access to the picture itself. We're trying to make as clear a picture as possible for our reader by using as many adjectives as possible.

Okay, the next noun is *stretcher*. Let's put that down in the column. Now we'll think of some adjectives to describe it. How many stretchers are there? There's just one, so I'll write the word *one* in the first circle.

The next question says, "How does it feel?" Honestly, I don't know—I've never been carried on a stretcher—but I can imagine and try to put myself in his place. The stretcher feels kind of uncomfortable. I'll put down *uncomfortable* in the second circle here.

Let's see, the next question says, "What kind?" Hard to say, but I guess we could use the word *canvas* to talk about what kind of material it is made out of. I'll write the word *canvas* in the third circle.

The next question says, "How old is it?" but that really isn't a very good question for a stretcher, so we'll skip that question in this situation.

The next question says, "What size?" That's a tough one, too. I guess it's man-sized, but I've never known a stretcher to be any other size. We'll skip that one too.

How about the next question? It says, "What color?" It's white, but we've already used that word and I don't want to keep using the same words over and over again; that makes for a boring composition. We'll skip that too.

How about what it looks like. Well, what does it look like? It's shaped like a rectangle, so I'll write the word *rectangle* in the fourth circle. We still have a circle left to fill in for the stretcher, but that's okay. We'll just leave it at that.

Let's find another noun now. Remember, we want to pick out important nouns from the picture. We've already talked about the helicopter, the soldiers, the injured man, and the stretcher. What else could be important in this picture? The ground really takes up a lot of space in this picture, so let's talk about the ground. In addition, I think the topography of the ground is really going to affect how quickly they are going to be able to get out of the war zone, so we'll use that as our fifth noun. I'll write the word *ground* here in the left-hand column.

All right, back to our list of questions. Let's see, "How many are there?" We can't describe the ground in that way, so we'll have to skip that one.

However, we can talk about how it feels. It looks like it would feel kind of hard, rough, and gritty. I'll write those words in the first circle here to describe how the ground feels.

The next question says, "What kind is it?" So now we're thinking about what kind of ground it is. What is it made out of? I think it's made out of dirt, but we'll have to be careful not to use that word as a noun. We'll put an asterisk next to it too, so we don't forget that it's supposed to be used as an adjective and not a noun. Okay, let's write the word *dirt* in the second circle here.

The next question here says, "How old?" Well, we can't answer that question about the ground. Do you see how some of the questions don't always apply? You really have to think about what questions will help you to describe the exact thing that you are talking about.

The next one says, "What size?" Again, not a very good question.

How about the next one? It says, "What color?" I guess we could use the words *muddy*, *brown*, and *gray* to describe the colors of the ground. Okay, I'll write the words *muddy*, *brown*, and *gray* in the third circle here.

Now we are ready to write about this picture. Okay, I'll start by talking about the most important things first. I think the most important things are the man on the stretcher, the soldiers, and the crashed helicopter. I'll need a hook to get my reader's interest. How can I start? I'll start with the helicopter crashing. I'm going to write, "Sizzle . . . Psssshhhhh." That's the sound the helicopter is making. It's going to blow up soon because it has crashed and the gas tank is leaking. I'll write, "The *scared young* soldiers are running away from the crashed *military* helicopter before it explodes."

See, I've already used three adjectives. I can cross those out now. I've used *scared* and *young* to describe the soldiers carrying the stretcher, and I've used the word *military* to describe what kind of helicopter it is. Instead of just saying soldiers, you get a better picture of the soldiers themselves by using the adjectives to tell more about the soldiers: Not only are they young, but they're scared too.

Now I'm going to keep writing about the soldiers. "The *brave* soldiers look over their shoulders at the helicopter, up to the sky, and back again at the helicopter; they nervously say a silent prayer that it will hold until they get far enough away. AGE Publications on September 9, 2009 The leader of the soldiers is *nervous*, but in charge. He is screaming orders at his men, 'Move! Move now! Faster! Hurry!' His men are *tired* and move more slowly as the helicopter becomes smaller and smaller in the background as they move farther and farther away."

All right, I can cross out a few more adjectives now. What did I use? I used *brave*, *nervous*, and *tired*. See how those words tell me more about the soldiers? They are scared, nervous, brave, tired, and young. Doesn't that give you a different picture than an old soldier? Or an energetic soldier? Or a confident soldier?

Okay, let's see what else I can write. "The *five* soldiers stop running when they no longer hear the crick-crack of the sizzling *hot* helicopter far behind them. They lay the *injured* man in the *canvas* stretcher down on the *muddy*, *gritty* ground and turn to look back at the *big black* helicopter that had been their friend and comrade in battle for months. As they give a silent eulogy to their *old* friend, the *hard* ground shakes and gives way as he blows up in flames."

All right, I've used just about all of my adjectives from the helicopter and the soldiers. Let me mark out the rest of those. Okay, marking out *hard*, *old*, *big*, and *black*. I used those four words to describe the helicopter. Do you see the difference in your head between an old helicopter and a new helicopter? See how the picture is different in your head? Or how about the difference between a big or a little helicopter? Can you see the difference in your head? These are just some of the words we use to try to make the reader understand our writing better. Our picture is so much clearer when we use the words *big helicopter* rather than just using the word *helicopter*.

Okay, let's take a look at our patient. What can we say about him? We've just talked about how the injured man was laid on the ground. Let's see what's happening with him now. "Mmmmmm ... Ohhhhhhhhhhh ..." That's what he's saying. Let's write some more about him. Let's say, "The *hurt* soldier is attempting to lift his head, but drops his head back down onto the stretcher when he realizes he is *dizzy*. He starts crying, "Stop it! Stop it! Stop the sky! The sky! Stop!" His fellow soldiers look in shock at the *grown* man crying in front of them, but they understand. They nod at each other and the medic takes out his kit. He pulls out a syringe and pops it into the man's thigh. The *grateful* soldier looks up at the medic and states, "Tell Nora I loved her until the end." His eyes close and he is no longer *uncomfortable*. The soldiers look around at each other and nod that that they need to move out. They pick up the stretcher and jog off into the distance."

Okay, what adjectives did I use in my writing? Let's go back and mark them out. I used *hurt, dizzy, grown, grateful,* and *uncomfortable*. Let's talk about those. Can you see the difference between a man who is dizzy and one who is not? Can you show me how you would look around if you were dizzy? Or not dizzy? Okay, good. Okay, how about a man who is uncomfortable versus a man who is comfortable? Can you show me by your body language? Okay, good. All right, let's review our story. Let's see if it reads okay. Here we go.

"Sizzle... Psssshhhhh. The *scared young* soldiers are running away from the crashed *military* helicopter before it explodes. The *brave* soldiers look over their shoulders at the helicopter, up to the sky, and back again at the helicopter; they nervously say a silent prayer that it will hold until they get far enough away. The leader of the soldiers is *nervous*, but in charge. He is screaming orders at his men, 'Move! Move now! Faster! Hurry!' His men are *tired* and move more slowly as the helicopter becomes smaller and smaller in the background as they move further and further away.

"The five soldiers stop running when they no longer hear the crick-crack of the sizzling hot helicopter far behind them. They lay the *injured* man in the *canvas* stretcher down on the muddy, gritty ground and turn to look back at the big black helicopter that had been their friend and comrade in battle for months. As they give a silent eulogy to their *old* friend, the hard ground shakes and gives way as he blows up in flames. 'Mmmmmm... Ohhhhhhhhhh...' The hurt soldier is attempting to lift his head, but he drops his head back down onto the stretcher when he realizes he is dizzy. He starts crying, 'Stop it! Stop it! Stop the sky! The sky! Stop!' His fellow soldiers look in shock at the grown man crying in front of them, but understand. They nod at each other, and the medic takes out his kit. He pulls out a syringe and pops it into the man's thigh. The grateful soldier looks up at the medic and states, "Tell Nora I loved her until the end." His eyes close and he is no longer uncomfortable. The soldiers look around at each other and nod that that they need to move out. They pick up the stretcher and jog off into the distance."

Well, that's our story. What do you think? You like it? It's not perfect, and it could use some more work, but it's a rough, quick draft and it's pretty clear about the imagery.