ABSTRACT

Standardized confrontation naming tasks for objects and actions are widely understood as a measure of word retrieval impairment in persons with aphasia (PWAs). However, less is known about the interdependence between these scores and the abilities of PWAs to use nouns and verbs in discourse production tasks such as storytelling. Using the AphasiaBank database (MacWhinney et al., 2011), this study examined correlations between the use of nouns and verbs in standardized naming tests and five discourse tasks. Preliminary data suggest that nouns were strongly correlated across tasks. Verbs, as suspected, are another story.

BACKGROUND

Storytelling closely resembles many aspects of daily human communication exchanges. Although more time intensive to analyze than typical standardized measures of aphasia, such as confrontation naming, discourse such as that elicited by picture description, narrative, and procedural discourse may provide a more accurate measure of the functional communication abilities of persons with aphasia (PWAs). Several methods have been developed to evaluate the quality or effectiveness of discourse produced by PWAs, including but not limited to the analysis of content units (Yorkston & Beukelman, 1980), correct information units (Nicholas & Brookshire, 1993), main ideas (Nicholas & Brookshire, 1995), and lexical diversity (Fergadiotis & Wright, 2011). Due to the labor-intensive nature of analyzing and coding aphasic discourse, however, it has received less attention than single word-level aphasic speech production.

With the recent development of a shared online multimedia database of a standardized protocol that includes discourse samples, naming and other aphasia test results, and extensive demographic information on PWAs and control subjects (AphasiaBank; MacWhinney, et al. 2011), our understanding of communication in aphasia has the potential to be significantly broadened. Transcripts in the database have been linked to original video clips, transcribed in CHAT format (MacWhinney, 2000) and checked by at least two trained transcribers. Transcripts contain a variety of lexical information, including error productions at the word and sentence levels, as well as standardized descriptions of gestures and facial expressions used by speakers. MacWhinney and colleagues (2010) demonstrated that CHAT and Computerized Language Analysis programs (CLAN; MacWhinney, 2000) may be utilized to determine the most frequently used nouns and verbs in narrative transcripts of the "Cinderella" story, as well as showing the many and varied uses of CLAN tools. Despite the immense potential presented by this relatively large sample of aphasic discourse, no published studies, to date, have analyzed the transcripts with respect to traditional measures such as content units or main ideas, or even tested the relationship between nouns and verbs elicited during the various discourse production tasks and those elicited by the same subjects during confrontation naming tasks.

The purpose of the current study was to compare the production of nouns and verbs elicited across various tasks in the database (picture description, picture series, storytelling, procedural discourse) to confrontation naming scores in a large sample of fluent and non-fluent PWAs, as well as to the most frequent production of nouns and verbs utilized by control subjects during the same narrative production tasks. It is hoped that this study will provide a foundation for future investigations examining treatment-induced changes in narrative discourse.

METHODS

Participants
The 142 control participants in this study (n=73 female; mean age=65.4; SD=16.7; range=23.0-87.8) originated from the Capilouto and Wright samples. Of these, 130 contributed a picture description (Cat Rescue; Nicholas & Brookshire, 1993), 138 a procedural discourse sample, i.e., how to make a peanut butter and jelly sandwich (Sandwich), and 139 told the Cinderella tale after perusing a wordless paperback picture book (Cinderella). All 142 participants contributed picture descriptions of two illustrated picture series, one showing a boy refusing an umbrella and getting caught in the rain (Refused Umbrella) and the other showing a boy kicking a ball into the window of a man's living room (Broken Window).

The 68 participants with aphasia (n=10 females; mean age=56.8; SD=11.2; range=30.3-80.9) were comprised of three groups according to aphasia type as indicated by Western Aphasia Battery-Revised (WAB-R; Kertész, 2007) AQ scores: Broca's (n=34; mean MPO=75.1), Conduction (n=22; mean MPO=68.3), and Wernicke's (n=12; mean MPO=79.8). Standardized scores were also available on the Boston Naming Test-Second Edition (BNT-2; Kaplan, Goodglass & Weintraub, 2001) and the Verb Naming Test (VNT) from the Northwestern Assessment of Verbs and Sentences-Revised (NAVS-R; Thompson, 2010). All 68 contributed Cat, Refused Umbrella, and Broken Window samples, while fewer contributed Sandwich (n=46) and Cinderella (n=59) samples.

Analyses
All control transcripts were analyzed with CLAN programs (MacWhinney, 2001). First, all side/tangential comments that a transcriber labeled to "exclude" were removed from the transcripts (for example, "That's funny"). Next, a command line was used to generate "gems" (i.e., isolated narratives, e.g., Sandwich) from every control transcript. Each of the five groups of gems was analyzed and lists of nouns and verbs used by at least 10% of the controls were made for each gem (Cat, Cinderella, Umbrella, Window, and Sandwich). Discourse samples by PWAs were then analyzed using CLAN programs to see whether and to what extent each PWA group used the nouns and verbs from the control 10% lists at least once. Side comments labeled "exclude," repetitions, revisions, and error productions were omitted from the count. Lists were made of all ambiguous nouns and verbs (e.g., "dress" may be used as a noun or a verb). These were located in all of the transcripts, reviewed in the context of the discourse in which they were embedded, and appropriate adjustments to tallies of nouns and verbs were made. Pearson's *r* was calculated in SPSS 19 to describe the linear interdependence between nouns and verbs produced during picture description and storytelling tasks vs. those produced during confrontation naming tasks.

RESULTS

Tables 1 and 2 list the top 15-20 nouns and verbs, respectively, that were produced at least once by at least 10% of the control participants for each of the five narrative discourse samples. It is noteworthy that the ten most frequently occurring Cinderella nouns and verbs produced by both

aphasic and non-aphasic participants are similar, but not the same, as those reported in the smaller sample utilized in MacWhinney et al. (2011).

Number of nouns that were accurately produced by all aphasic participants during the five narrative discourse tasks were all strongly positively correlated with BNT scores; however, number of verbs that were accurately produced by the same participants were not as likely to be significantly correlated with VNT scores (Table 3). The strongest correlations, and the highest numbers of nouns and verbs produced, were in the Cinderella and Cat Rescue narratives. A scatter plot of the strongest correlation, between Cinderella and BNT noun counts for Broca cases (Pearson's $r = .801$; significant at 0.01 level, 2-tailed), demonstrates this strength (Fig. 1).

DISCUSSION

The current study adds to a growing body of literature supporting the use of the AphasiaBank database for improving our understanding of narrative discourse in aphasia. Results of this study suggest that elicitation of narrative discourse in this manner may ultimately be a more efficient way of acquiring information regarding noun retrieval in aphasia, particularly through use of the two "richer" stories, i.e., Cinderella and Cat Rescue. Verbs, of course, are another story, perhaps in part due to the preponderance of light/weak verbs, verbs indicating mental state, and use of modals/auxiliaries in storytelling – which is different from an action confrontation naming task.

Investigation into errors and a pseudo-measure of transactional success (Ramsberger & Rende, 2002) is ongoing, by examining the occurrences of transcriber "intended target labels", i.e., targets assigned to error productions by transcribers. The results also suggest rich possibilities for further investigations, such as an in-depth examination of the transcripts of outliers (e.g., participant #32 in Figure 1); exploration of the noun/verb differences across aphasia types; or development of a method of tagging content units and main ideas using automated computer analysis methods.

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Table 1. Top 15-20 nouns produced at least once by (#; min. 10%) of control participants

#	Cinderella Nouns	#	Cat Rescue Nouns	#	Umbrella Nouns	#	Window Nouns	#	Sandwich Nouns
135	Cinderella	130	tree	142	MOM	141	window	138	bread
133	prince	123	cat	142	umbrella	138	ball	138	butter
122	fairy	115	dog	111	school	123	soccer	137	peanut
121	slipper	114	ladder	93	boy	100	boy	128	jelly
120	ball	110	DAD [1]	87	rain	90	lamp	83	slice
117	godmother	101	girl	41	house	72	man	80	piece
102	midnight	85	fire	40	way	60	house	78	knife
100	pumpkin	76	department	37	backpack	48	chair	58	sandwich
96	dress	63	fireman	30	time	47	DAD	56	jar
96	glass	43	bird	23	head	37	neighbor	47	side
92	time	41	man	23	puddle	29	lap	45	top
89	stepmother	36	tricycle	21	clothes	29	yard	41	half
88	daughter	27	branch	21	door	27	glass	36	plate
88	house	26	rescue	17	day	27	kick	29	refrigerator
84	stepsister	25	KITTEN	17	hand	21	room	16	counter
75	horse	24	limb			21	time	15	drawer
71	carriage	17	way			18	son	15	jam
71	foot	15	BIKE			16	day	15	loaf
71	mouse	15	daughter			16	gentleman		
68	mother	14	ground			16	picture		

[1] Capitalized nouns include synonyms, plurals, possessives, for example, DAD includes dad, daddy, father, dad's, daddies, etc.

Table 2. Top 15-20 verbs produced at least once by (#; min. 10%) of control participants

#	Cinderella Verbs	#	Cat Rescue Verbs	#	Umbrella Verbs	#	Window Verbs	#	Sandwich Verbs
137	BE [2]	128	**BE**	141	**BE**	142	**BE**	123	**PUT**
135	HAVE	120	**GET**	131	**GO**	125	KICK	100	**GET**
135	GO	113	**COME**	123	**DO**	113	LOOK	91	SPREAD
123	DO	87	CALL	122	**GET**	112	**GO**	90	**TAKE**
123	GET	86	**HAVE**	108	RAIN	89	sit	59	**HAVE**
117	FIND	83	CLIMB	107	**TAKE**	79	BREAK	58	**BE**
111	(WILL)	67	BARK	97	START	75	PLAY	57	(WILL)
110	COME	62	FALL	93	SAY	68	**HAVE**	52	CUT
110	LIVE	62	(CAN/ COULD)	74	need	65	**COME**	46	**DO**
102	**MAKE**	54	go	71	**HAVE**	64	SEE	39	EAT
100	TRY	53	STICK	66	LOOK	61	KNOCK	37	OPEN
99	FIT	41	RESCUE	62	WALK	53	**DO**	35	**GO**
94	MARRY	39	HELP	60	RUN	53	**GET**	35	**MAKE**
89	RUN	38	TRY	52	**COME**	32	HIT	24	want
87	DANCE	37	(WILL)	51	SOAK	30	PRACTICE	22	USE
85	LOOK	34	**DO**	51	WANT	27	(WILL)	16	lay
84	WANT [2]	33	LOOK	48	**GIVE**	26	LAND	14	need
83	LEAVE	27	RIDE	47	TELL	23	KNOW		
83	TURN	26	CHASE	37	TURN	20	SAY		
82	SAY	26	SEE	37	(WILL)	20	STAND		

[1] CAPITALIZED verbs include infinitives, participles, etc., for example, HAVE includes have, has, had, having, etc.

[2] Verbs in **bold** are the so-called **weak** verbs that are also among the most frequent verbs

[3] *Italicized* verbs include verbs that indicate mental state

[4] Verbs in (parentheses) indicate modals and auxiliaries

Table 3. Correlations between Nouns and Verbs in Confrontation Naming vs. Discourse Tasks

		Cinderella Nouns	Cat Rescue Nouns	Umbrella Nouns	Window Nouns	Sandwich Nouns
BNT score: ALL cases	Pearson correlation	.560**	.718**	.408**	.422**	.505**
	Sig. (2-tailed)	0.000	0.000	0.001	0.000	0.000
	N	59	68	68	67	46
BNT score: Fluent cases	Pearson correlation	.500**	.763**	.465**	.438**	.530**
	Sig. (2-tailed)	0.005	0.000	0.006	0.010	0.006
	N	30	34	34	34	25
BNT score: Broca cases	Pearson correlation	.801**	.671**	.383*	.436*	.444*
	Sig. (2-tailed)	0.000	0.000	0.025	0.011	0.044
	N	29	34	34	33	21

		Cinderella Verbs	Cat Rescue Verbs	Umbrella Verbs	Window Verbs	Sandwich Verbs
VNT score: ALL cases	Pearson correlation	.262*	0.184	0.189	0.23	0.246
	Sig. (2-tailed)	0.045	0.133	0.123	0.057	0.099
	N	59	68	68	68	46
VNT score: Fluent cases	Pearson correlation	0.227	-0.103	0.162	0.134	0.38
	Sig. (2-tailed)	0.228	0.561	0.361	0.451	0.065
	N	30	34	34	34	25
VNT score: Broca cases	Pearson correlation	0.259	.421*	0.085	0.312	0.314
	Sig. (2-tailed)	0.174	0.013	0.632	0.072	0.165
	N	29	34	34	34	21

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Figure 1. Number of Nouns in Discourse vs. Naming in Broca Cases (n=29)