Picture Naming Variability: A Methodological Consideration of Inconsistent Naming Responses in Fluent and Nonfluent Aphasia

Donald B. Freed, Robert C. Marshall, and Elizabeth A. Chuhlantseff

Most naming treatment studies are designed to measure the effects of an experimental training procedure on aphasic subjects' verbal labeling performance (Howard, Patterson, Franklin, Orchard-Lisle, and Morton, 1985a, 1985b; Marshall, Pound, White-Thomson, and Pring, 1990; Patterson, Purell, and Morton, 1983). Many of these studies used a first attempt naming procedure to choose the experimental visual stimuli. In this first attempt procedure, the visual stimuli are selected by having the subjects name a series of pictures until a desired number of unnamed items are obtained. The selected items are then used as visual stimuli without further assessment of the subjects' ability to name them correctly. While this procedure is simple and efficient, it fails to control for aphasic subjects' variable naming performance.

While all human behaviors are inconsistent to some degree, it is a common clinical observation that aphasic individuals often complain of marked variations in their day-to-day performance on a variety of tasks. One of these tasks is picture naming accuracy (Schuell, Jenkins, and Jimenez-Pabon, 1964). Aphasic subjects may name a picture of a screwdriver correctly during one session but say "pliers" or fail completely during the next session. These variations in naming accuracy can usually be attributed to the severity of the subjects' language impairment and to differing levels of fatigue, anxiety, or frustration. In addition, such factors as word frequency (Rochford and Williams, 1965; Williams and Canter, 1982), physical characteristics of the stimuli (Benton, Smith, and Lang, 1972; Faber and Aten, 1979; Gardner, 1973), and stimulus presentation time (Brookshire, 1971) can also affect naming accuracy.

Because inconsistent naming accuracy may be present in aphasic subjects' performance on experimental labeling tasks, naming treatment studies that employ the first attempt naming procedure risk the chance of using invalid visual stimuli. This is because the stimulus pool will include items that the subjects are sometimes able to name correctly, even without treatment. The results from such study consequently would be confounded.

The current study calculated the number of target pictures aphasic subjects named consistently and inconsistently over a 5-day period. The primary focus of the investigation was on those items named incorrectly on the first labeling attempt but named accurately on one or more of the subsequent attempts. Through an analysis of the responses, this study sought to determine if the first attempt picture naming procedure was a valid method of choosing target stimuli in naming treatment studies.

METHOD

Subjects

Five adults with chronic aphasia participated in the study. Two were diagnosed as having fluent aphasia (subjects 1 and 2) and three as having nonfluent aphasia (subjects 3, 4, and 5). The subjects were aphasic as the result of a single left hemisphere thromboembolic (subjects 1–4) or hemorrhagic (subject 5) stroke. Site of lesion was determined by MRI/CAT scans and past neurological examinations. All subjects exhibited frequent instances of circumlocutions, hesitations, self-corrections, and semantic substitutions in their conversational speech. Although the subjects were relatively young when their strokes occurred, their performance on such assessment instruments as The Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1983) and The Minnesota Test for Differential Diagnosis of Aphasia (Schuell, 1972) suggested that their language deficits were very similar to those of older aphasic individuals. See Table 1 for complete subject data.

Stimuli

One hundred target items were randomly selected from the Snodgrass and Vanderwart (1980) standardized set of 260 black-and-white line drawings. Based on the norms provided by Snodgrass and Vanderwart, the 100 selected items had mean ratings of 0.40 for name agreement [range 0.00 ("tree") to 1.57 ("toes")], 3.82 for image agreement [range 2.20 ("clock") to 4.79 ("hanger")], 3.50 for familiarity [range 1.52 ("ostrich") to 4.85 ("key")],

Table 1. Subject Data

	Subjects				
	1	*2*	*3*	*4*	*5*
PICA OA %ile	87	71	68	52	64
PICA Verbal	74	58	59	59	49
Token	36/62	10/62	49/62	42/62	47/62
WMS–R Gen Mem	76	70	85	80	75
WMS–R Verb Mem	57	49	67	71	52
Age	52	42	54	59	56
Site of Lesion	Posterior	Posterior	Anterior	Anterior	Anterior
MPO	84	22	38	54	100+

Note: PICA OA%ile = Overall percentile on the *Parch Index of Communicative Ability* (PICA); PICA Verbal = Verbal percentile on PICA; Token = Number correct on the 62-item *Token Test* (Boller and Vignolo, 1966), WMS–R Gen Mem = General memory index score on the *Wechsler Memory Scale - Revised;* WMS–R Verb Mem = Verbal memory index score on the WMS–R; Age = Subject age in years; MPO = Months post onset.

and 2.86 for visual complexity [range 1.05 ("star") to 4.65 ("giraffe")]. Appendix A lists the 100 target words.

Before beginning the naming trials with the aphasic subjects, six adults with no history of previous brain damage labeled each of the 100 target items to obtain local norms for name agreement. These six non–brain-damaged individuals were native speakers of English, had 12th grade educations or higher, and ranged in age from 39 to 68 years ($\underline{M}$ = 57.5; $\underline{SD}$ = 11.26). They named 96 of the pictures identically. They used common synonyms such as "trousers" and "pants" for the remaining 4 items.

Procedures

Five naming trials were conducted over 5 consecutive days, one trial per day. All 100 pictures were presented to the subjects during a session. Although the picture order was randomized from trial to trial,

each trial's sequence was the same for all subjects. The subjects were asked to name each picture as it was presented. The examiner provided no training or specific feedback regarding the accuracy of the responses. Only general encouragement was given. The responses were scored as correct or incorrect with notations made for delays and semantically related responses. Commonly accepted synonyms such as "trash can" for "garbage can" were scored as correct, based on the responses of the non-brain-damaged subjects. Self-corrections were scored as correct but delayed.

Reliability

All naming sessions were recorded on audiotape while the experimenter scored the subject responses on-line. One hundred percent of the recorded responses were scored by a second examiner as a measure of interexaminer reliability. Point-to-point agreement for correct and incorrect judgments was 98%.

RESULTS

The first analysis of the data examined the number of correct items per trial to determine if a practice effect were present. If it were, a gradual increase in naming accuracy would be evident as the study progressed. A visual analysis of Figure 1 suggests that the percentage of correct responses remained stable from session to session for all subjects except for a moderate increase by subject 2.

For the analysis of naming variability, the subjects' responses were divided into four categories (Figure 2):

1. The first was for pictures named correctly on every trial. These items ranged from 47% to 90% of the total 100 pictures across subjects.

2. The second was for pictures named incorrectly on every trial. These ranged from 0% to 14% of the totals.

3. The third was for pictures named correctly on the first trial but named incorrectly on at least one of the subsequent trials. These items ranged from 3% to 22% of the totals.

4. The final category was for pictures named incorrectly on the first trial but named correctly on at least one of the following attempts. These ranged from 6% to 24% of the totals.
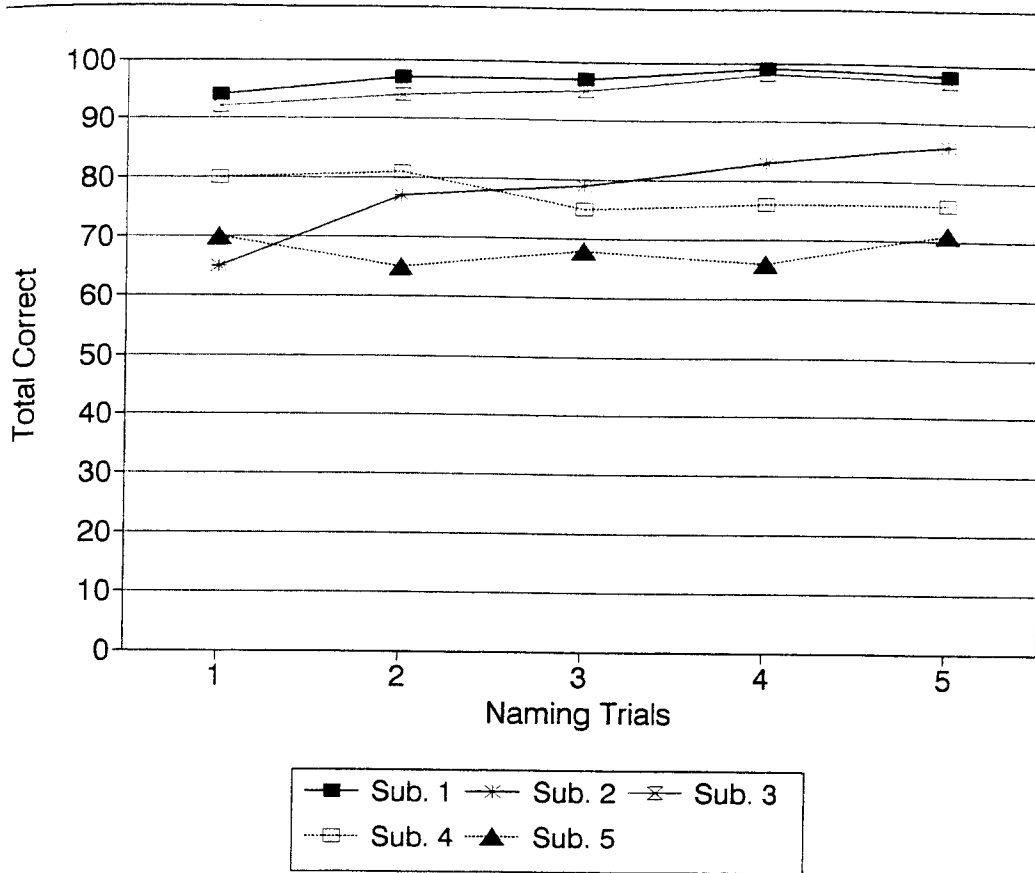
Figure 1. Total number of the subjects' correct responses per trial.

The data most pertinent to this study's research question were obtained by taking all the pictures named incorrectly on the first trial and determining how many of them were named correctly on at least one of the following trials. (Table 2 lists the subjects' trial-by-trial responses on these items.) The analysis found that 5% to 100% of the pictures were named correctly on one or more of the subsequent trials. This indicates that if the subjects' first naming attempts had been used to select the stimuli for a hypothetical naming treatment study, a very significant number of those items would have been named correctly at least once even without the experimental intervention.

In looking at the subjects' performance in this study, it might be argued that subjects 1 and 3 were too high functioning to be adequately challenged by the Snodgrass and Vanderwart stimuli. While their naming attempts were certainly more accurate than those of the other three subjects, their results were included in the data analysis for several reasons. First, they did demonstrate variable naming accuracy over the five naming trials. They were either (a) correct on the first naming attempt but incorrect on at least
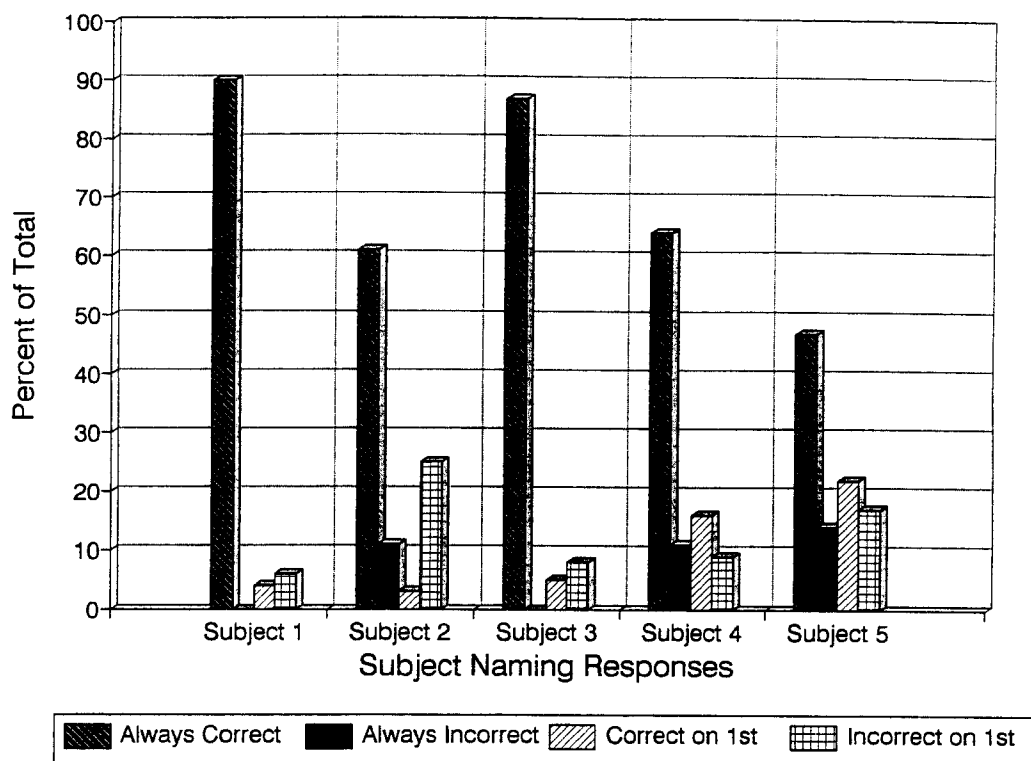
Figure 2. Percentage of subject naming responses that were (a) correct on every trial; (b) incorrect on every trial; (c) correct on the first attempt but incorrect on one or more following trials; and (d) incorrect on the first attempt but correct on one or more following trials.

one later trial, or (b) incorrect on the first attempt and correct during a following trial on 10% (subject 1) and 13% (subject 3) of the total pictures. Furthermore, the two subjects exhibited prolonged hesitations and self-corrections throughout the five naming sessions (see Table 2 for examples), even on many of the items that were scored as correct. These pauses and revisions suggest that the naming task did, indeed, tax their word-finding abilities.

DISCUSSION

This study found that a first attempt naming procedure is a questionable method of choosing experimental stimuli for naming treatment studies with aphasic subjects. Of the pictures that were labeled incorrectly on the first attempt, the subjects named 45% to 100% of them correctly on one or

Table 2. Listing of Subject Responses for the Items Named Incorrectly on the First Trial but Named Correctly on a Later Trial

| | Naming Trials | | | | |
	1	2	3	4	5
Subject 1					
Target Item					
1. Hanger	−	+	+	+	+
2. Desk	"Table"	+	+	+	+
3. Ant	−	"Beetle"	−	"Bug"	+
4. Turtle	−	+ (D)	+ (D)	+ (D)	+ (D)
5. Thimble	−	+	+ (D)	+ (D)	−
6. Ironing board	−	+	+	+	+ (D)
Subject 2					
1. Refrigerator	−	+ (D)	−	+ (D)	−
2. Mushroom	−	+ (D)	+	+	+ (D)
3. Hanger	"Hanging"	+	+	+	+
4. Garbage can	"Gas can"	−	"Ashtray"	+	"Trash"
5. Carrot	−	+ (D)	+	+	+ (D)
6. Iron	−	−	+	+	+
7. Desk	"Bench"	−	−	−	+ (D)
8. Screwdriver	−	+ (D)	+	+	+
9. Paintbrush	"Paint"	+	+	+	+
10. Wagon	−	+ (D)	+ (D)	+ (D)	+
11. Pliers	−	+	+	+	+ (D)
12. Zebra	"Giraffe"	−	+	+	+
13. Helicopter	−	+ (D)	+	+ (D)	+
14. Envelope	"Mail"	+	−	−	−
15. Baseball bat	−	+ (D)	+	+	+
16. Belt	−	+	−	−	+
17. Ironing board	−	−	−	−	+
18. Chain	−	−	+ (D)	+	+
19. Light bulb	−	+ (D)	+	+	+
20. Clouds	−	+	+ (D)	+ (D)	+ (D)
21. Tennis racquet	"Tennis"	"Tennis"	"Tennis"	"Tennis"	+
22. Snail	−	−	−	−	+
23. Watch	−	+ (D)	+	+ (D)	+
24. Anchor	−	−	+ (D)	+	+

(Continued)

Table 2. Listing of Subject Responses for the Items Named Incorrectly on the First Trial but Named Correctly on a Later Trial (continued)

	Naming Trials				
	1	2	3	4	5
Subject 1					
Target Item					
Subject 3					
1. Harp	−	−	−	+	+
2. Sled	"Sleigh"	+	"Sleigh"	"Sleigh"	+
3. Pitcher	−	"Jug"	+ (D)	+ (D)	+
4. Boot	"Shoe"	+ (D)	+ (D)	+ (D)	−
5. Paintbrush	"Painter"	+	+ (D)	−	+
6. Wagon	"Cart"	+	"Wheelbarrow"	+	+
7. Envelope	"Letter"	"Letter"	"Mail"	+	+
8. Ironing board	−	+	+	+	+
Subject 4					
1. Screwdriver	−	+	−	+	+ (D)
2. Wagon	"Trike"	−	+	+	"Trike"
3. Needle	−	−	−	−	+
4. Raccoon	−	+ (D)	−	−	−
5. Turtle	−	−	+ (D)	−	−
6. Thimble	−	−	−	+ (D)	−
7. Table	"Desk"	+ (D)	"Desk"	+ (D)	+ (D)
8. Toes	−	+	+ (D)	−	+ (D)
9. Bread	−	+	+	+	+
Subject 5					
1. Garbage can	−	+ (D)	"Can"	−	−
2. Vest	−	−	+	+	+
3. Stool	"Chair"	+	+	+	−
4. Pitcher	−	+ (D)	"Jugs"	"Drinking"	+ (D)
5. Umbrella	−	+ (D)	+	+	+
6. Carrot	−	"Onions"	−	−	+
7. Iron	−	−	+	+	+ (D)
8. Wagon	−	−	−	+ (D)	+
9. Axe	"Hammer"	"Hammer"	+ (D)	+ (D)	−
10. Thimble	−	+	−	+	+
11. Coat	"Winter"	"Clothing"	+	−	+
12. Suitcase	−	+	+	+	+
13. Frying pan	"Frying"	+ (D)	−	+	+
14. Monkey	−	−	−	"Kangaroo"	+
15. Cake	"Pie"	"Pie"	"Pie"	"Pie"	+ (D)
16. Fork	"Spoon"	+ (D)	+ (D)	"Spoon"	−
17. Anchor	−	−	−	−	+ (D)

Note: + = Correct; − = No response, IDK, or unintelligible; (D) = Delayed response;

more of the subsequent trials. This indicates that the first attempt naming procedure allows many *sometimes nameable* items into a potential stimulus pool.

There are at least three alternatives to using the first attempt naming procedure to select experimental visual stimuli, although each is problematic in its own right. Naturally, one option would be to use multiple naming trials spaced over time to determine which of the stimulus items could not be named by the subjects. The optimal number of trials would probably vary with the subject population and the difficulty of the potential stimuli. This study found that 71% to 83% of the pictures named incorrectly on the first attempt but named accurately on at least one of the following trials were identified as such by the third trial. These numbers rose from 76% to 100% by the fourth trial.

The primary drawback of repeated trials is, of course, the time requirements. In addition, there is the possibility that repeated exposure to the stimuli can result in a practice effect as noted with subject 2. Moreover, there is no guarantee that enough unnamed items will be obtained at the end of a repeated trial sequence when employing a traditional set of pictured stimuli. This occurred in the current study, which found that relatively few of the target pictures were named incorrectly on every trial. For subjects 1 and 3, the number was 0%. For the most impaired subject (subject 5), it was only 14% of the total.

A second alternative to the first attempt procedure is to use novel symbols as the experimental visual stimuli. This technique randomly pairs words to abstract designs that have no obvious visual associations with the words. For a number of reasons, novel symbols lend themselves to naming studies that compare the effectiveness of two or more experimental treatment procedures (Marshall, Neuburger, and Phillips, 1992). First, the effect of prior learning is negligible since each symbol is an original image for every subject. Consequently, all subjects can be trained on exactly the same stimuli. Second, the unfamiliar appearance of the symbols ensures that a consistent baseline of labeling performance is quickly obtained or all subjects. Lastly, the novel symbol procedure is versatile. It can be used with many different training methods since the technique is simply to teach an association between the stimulus word and the symbol. The problem with novel symbols is that any procedure using them is focusing on new learning by the subjects. The recall of newly learned novel symbol names is not precisely the same cognitive process as retrieving previously learned names (Schwartz and Reisberg, 1991). Consequently, the results of naming treatment studies using these symbols should be interpreted cautiously. The direct clinical application of such a study's findings would not be recommended because of this tenuous cognitive relationship between learning the labels of symbols and actually naming realistic stimuli.

A third alternative also lends itself to naming studies that compare different treatment procedures. Here, the stimuli are pictures of actual items that are somewhat familiar to the subjects but still beyond their daily experiences. For example, photographs of different dog breeds, flowers, or other such categories might be used as the experimental visual stimuli. By ensuring that the stimulus pool includes both common and obscure items within a category (such as dogs ranging from collie to Hungarian puli), it is possible to select training stimuli that the subjects have had some exposure to in the past yet are definitely unable to name. In other words, the subjects recognize the items as being real but do not know them well enough to name. The disadvantage in using this type of visual stimuli is that it is still a new learning task for the more unfamiliar items, although probably not to the same degree as with novel symbols.

In conclusion, this study demonstrates the importance of carefully selecting visual stimuli for experimental purposes. The findings show that employing a first naming attempt to select visual stimuli can result in the use of target pictures that the subjects are capable of naming correctly without any treatment during later trials, often on a majority of the attempts.

REFERENCES

Benton, A. L., Smith, K. C., & Lang, M. (1972). Stimulus characteristics and object naming in aphasic patients. *Journal of Communication Disorders, 5,* 19–24.

Boller, F., & Vignold, L. A. (1966). Latent sensory aphasia in hemisphere-damaged patients: An experimental study with the token test. *Brain, 89,* 815–831.

Brookshire, R. H. (1971). Effects of trial time and inter-trial interval on naming by aphasic subjects. *Journal of Communication Disorders, 3,* 289–301.

Faber, M. M., & Aten, J. L. (1979). Verbal performance in aphasic patients in response to intact and altered pictorial stimuli. In R. Brookshire (Ed.), *Proceedings of the conference on of clinical aphasiology,* (pp. 177–186). Minneapolis: BRK Publishers.

Gardner, H. (1973). The contribution of operativity to naming capacity in aphasic patients. *Neuropsychologica, 11,* 213–220.

Goodglass, H., & Kaplan, E. (1983). *The Boston Diagnostic Aphasia Examination.* Boston: Lea & Febiger.

Howard, D., Patterson, K., Franklin, S., Orchard-Lisle, V., & Morton, J. (1985a). The facilitation of picture naming in aphasia. *Cognitive Neuropsychology, 2,* 49–80.

Howard, D., Patterson, K., Franklin, S., Orchard-Lisle, V., & Morton, J. (1985b). Treatment of word retrieval deficits in aphasia. *Brain, 108,* 817–829.

Marshall, J., Pound, C., White-Thomson, M., & Pring, T. (1990). The use of picture/word matching tasks to assist word retrieval in aphasic patients. *Aphasiology, 4,* 167–184.

Marshall, R. C., Neuburger, S. I., & Phillips, D. S. (1992). Effects of facilitation and cueing on labeling of "novel" stimuli by aphasic subjects. *Aphasiology, 6,* 567–583.

Patterson, K., Purell, C., & Morton, J. (1983). Facilitation of word retrieval in aphasia. In C. Code, and D. Muller (Eds.), *Aphasia therapy,* (pp. 76–87). London: Edward Arnold.

Rochford, G., & Williams, M. (1965). Studies in the development and breakdown of the use of names: IV. The effects of word frequency. *Journal of Neurology, Neurosurgery, and Psychiatry, 28,* 407–413.

Schuell, H. (1972). *The Minnesota Test for Differential Diagnosis of Aphasia.* Minneapolis: University of Minnesota Press.

Schuell, H., Jenkins, J., & Jimenez-Pabon, E. (1964). *Aphasia in adults: Diagnosis, prognosis, and treatment.* New York: Hoeber.

Schwartz, B., & Reisberg, D. (1991). *Learning and memory.* New York: Norton & Co.

Snodgrass, J., & Vanderwart, M. (1980). A standardized set of 260 pictures: Norms for name agreement, image agreement, familiarity, and visual complexity. *Journal of Experimental Psychology: Human Learning and Memory, 6,* 174–215.

Williams, S., and Canter, G. (1982). The influence of situational context on naming performance in aphasic syndromes. *Brain and Language, 17,* 92–106.

APPENDIX A:
THE 100 TARGET PICTURES USED
IN THE STUDY

1. Refrigerator	26. Dog	51. Ant
2. Seal	27. Shirt	52. Raccoon
3. Cup	28. Rabbit	53. Phone
4. Truck	29. Pitcher	54. Axe
5. Fish	30. Bus	55. Pliers
6. Ostrich	31. Umbrella	56. Barn
7. Barrel	32. Kite	57. Hat
8. Mushroom	33. Carrot	58. Spoon
9. Hanger	34. Cat	59. Shoes
10. Harp	35. Bed	60. Comb
11. Asparagus	36. Boot	61. Ashtray
12. Sled	37. Pig	62. Corn
13. Ladder	38. Scissors	63. Grapes
14. Leaf	39. Pineapple	64. Star
15. Bear	40. Tree	65. Giraffe
16. Clock	41. Drum	66. Turtle
17. Garbage can	42. Pipe	67. Hair
18. Pumpkin	43. Car	68. Thimble
19. Vest	44. Iron	69. Duck
20. Glass	45. Stove	70. Zebra
21. Stool	46. Desk	71. House
22. Pants	47. Screwdriver	72. Helicopter
23. Whistle	48. Paint brush	73. Bike
24. Sandwich	49. Wagon	74. Coat
25. Key	50. Needle	75. Suitcase

76. Envelope
77. Lion
78. Bowl
79. Frying pan
80. Baseball bat
81. Belt
82. Ironing board
83. Saw
84. Chain

85. Mouse
86. Gloves
87. Television
88. Monkey
89. Cake
90. Light bulb
91. Watch
92. Clouds
93. Anchor

94. Table
95. Snail
96. Ear
97. Toes
98. Fork
99. Bread
100. Tennis racquet