

Humpty Dumpty had a great ... banana? Children's sentence completions on a working memory reading task.

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The report is based on research funded by the Economic and Social Research Council, grant number R000236113. The present report provides subsidiary analyses of an experiment on children's working memory (reading) span. Details of the subjects, span scores, and the variation in span performance across experimental manipulations is described elsewhere (Towse, Hitch, & Hutton, in prep.). We are grateful to the staff and pupils at St. Nicholas school, Shepperton, for their cooperation in this study.

Overview

Sixty five children were asked to complete a series of sentences as part of working memory reading span test. Data are provided on the words used to complete the 180 stimulus sentences. It is hoped that providing the sentences and the subjects' response patterns to them may be useful to other researchers attempting to construct similar experimental materials.

Experimental subjects, design and method

In order to provide a measure of children's 'reading span' (a measure of immediate or working memory), we asked children to read to themselves a (varying-length) set of sentences and supply the missing (final) word. Sixty-five children participated; the mean age of all children was 9 years 4 months, ranging 7;10 to 10;8.

Sentences were presented in large type (48 point font) as 'cards' on the screen of a Apple Powerbook 5300c computer. Concurrent with this sentence task, children were asked to remember the words which they supplied for a subsequent recall exercise. Initially, two sentences would be presented to the subject, after which recall of both sentence-terminal words was requested. If children were able to remember all the words (in their correct serial order) on 2 out of 3 occasions at this or subsequent levels, then span length was increased by 1 and testing was continued. Where children failed to reach this criterion, testing was terminated for that experimental condition. Therefore, the number of sentences presented to children varied as a function of children's proficiency at remembering the set of target words they had produced.

If a subject had encountered an identical sentence on more than one occasion, then it is somewhat doubtful that it would be read in the same way, making interpretation of performance difficult. Accordingly, it was felt necessary to ensure that during testing, sentences were sampled without replacement from the stimulus pool. However, this in turn meant that a substantial corpus of sentences was required. It was also important that these sentences could be understood even by young readers (around 8 years of age). An additional constraint was that the target (missing) word was relatively predetermined, in order that subjects could be said to be holding the same information in memory following sentence presentation. Some sentences were available from previous research studies (e.g. Leather and Henry, 1994), but this experiment required a larger stimulus set, and some of the sentences required adaptation.

Finally, because the experiment involved the presentation of two forms of some sentences (a short or quick-to-read sentence and a long or slow-to-read sentence), both of which yielded the same target word, a subset of the sentences were constructed which took a short and long form. Because of the constraint that sentences should not repeat across trials in the experiment, presentation of the short or long form of these sentences precluded the alternative version from being used elsewhere as a test sentence for that subject.

Likewise this non-repetition criterion meant that some candidate sentences were not included in this corpus. Thus, "Ben is the name of my teddy... bear" was originally considered as an appropriate sentence (but see sentences 45 and 94), as was "If you shut your eyes you can't... see" (but which was homophonic with a target word "sea" in sentences 19 and 164). Because of their neighbours in the stimulus pool, such sentences were not included.

The reading task was introduced using three practice sentences written on paper cards and presented prior to computer administration of the task. The three sentences (and the target words in parentheses) were:

“An insect that buzzes is called a...” (bee)

“The cat sat on the...” (mat)

“The cow jumped over the...” (moon)

Children invariably understood these practice sentences and produced the expected target word.

Results

As the tabled information illustrates, the sentences as a whole were very successful in generating the predicted target word from subjects (this occurred on 90.7% of trials). Some sentences were found to generate alternative answers which were quite acceptable (e.g. sentence 164, where “water” was often used instead of “sea”). Occasionally, children failed to produce a word at all, and this is entered as a “---” response. There were only a few examples where subjects produced bizarre words, such as “Humpty Dumpty had a great banana”, where it is not obvious that the subject had properly read or comprehended the sentence. Overall, however, target word responses were elicited. Given this high level of target word production, we conclude that subjects were able to read the sentences appropriately, and we take this as evidence that the level of sentence complexity level was acceptable.

References

Leather, C. V., & Henry, L. A. (1994). Working memory span and phonological awareness tasks as predictors of early reading ability. Journal of Experimental Child Psychology, 58, 88-111.

Towse, J. N., Hitch, G. J., & Hutton, U. (in prep.). On mechanisms underlying working memory capacity in children. Manuscript in preparation

Sentence sets

1. 'Choo-choo' goes the train

Target answers: 12

Non target answers: 1 (kettle)

2. 'quack quack' said the duck

Target answers: 21

Non target answers: 0

3. A baby dog is called a puppy

Target answers: 12

Non target answers: 0

4. A bicycle has two round wheels

Target answers: 7

Non target answers: 3 (tyres)

5. A clown always has a big smile on his.... face

Target answers: 22

Non target answers: 0

6. A clown has a happy face

Target answers: 9

Non target answers: 3 (clown x 2, person)

7. A cow eats grass

Target answers: 28

Non target answers: 3 (food, hay, meat)

8. A cow lives in a field and eats the long green.... grass

Target answers: 13

Non target answers: 0

9. A dog and a cat and a mouse all walk on four.... legs

Target answers: 21

Non target answers: 5 (feet x 2, miles, paws)

10. A fire feels very... hot

Target answers: 26

Non target answers: 0

11. A giraffe has a long.... neck

Target answers: 15

Non target answers: 0

12. A giraffe is a tall animal with a great long.... neck

Target answers: 12

Non target answers: 1 (tail)

13. A joke makes me.... laugh

Target answers: 17

Non target answers: 1 (giggle)

14. A kitten grows up to be a.... cat

Target answers: 15

Non target answers: 0

15. A man wearing a crown is called.... king

Target answers: 5

Non target answers: 0

16. A postbox is coloured.... red

Target answers: 13

Non target answers: 0

17. A snail takes a long time to move because it is very.... slow

Target answers: 17

Non target answers: 3 (fat, heavy, slimy)

18. A square has four straight.... sides

Target answers: 6

Non target answers: 4 (lines x 3, edges)

19. A whale swims in the.... sea

Target answers: 3

Non target answers: 2 (water)

20. A window is made of.... glass

Target answers: 11

Non target answers: 0

21. A woman wearing a crown is called.... queen

Target answers: 7

Non target answers: 0

22. Add some sugar and then stir the tea with a tea.... spoon

Target answers: 8

Non target answers: 4 (bag x 3, cup)

23. After the number one is two and after the number two is.... three

Target answers: 8

Non target answers: 0

24. After winter comes the.... spring

Target answers: 8

Non target answers: 4 (summer x 4)

25. An elephant is very big and has two great big.... ears

Target answers: 10

Non target answers: 6 (feet, horns, husks, legs x 2, trunks)

26. Ann always likes to eat a big bowl of strawberries and.... cream

Target answers: 15

Non target answers: 4 (berries, ice cream, sugar x 2)

27. Ann likes stawberries and.... cream

Target answers: 6

Non target answers: 4 (apples, bananas, cherries, ice cream)

28. At night I go to bed and fall.... asleep

Target answers: 8

Non target answers: 0

29. At school we were told how to sing a.... song

Target answers: 8

Non target answers: 2 (carol, hymn)

30. At the end of my hand I have four fingers and one.... thumb

Target answers: 14

Non target answers: 0

31. Ben clapped his.... hands

Target answers: 7

Non target answers: 0

32. Ben ran fast and won the.... race

Target answers: 16

Non target answers: 3 (cup, medal x 2)

33. Ben ran faster and faster so he could try and win the.... race

Target answers: 6

Non target answers: 0

34. Birds flap and flap their wings and.... fly

Target answers: 11

Non target answers: 0

35. Birds use wings to.... fly

Target answers: 13

Non target answers: 0

36. Cars drive on the.... road

Target answers: 14

Non target answers: 2 (wheels)

37. Chris drank his orange.... juice

Target answers: 15

Non target answers: 3 (drink, squash, ----)

38. Chris squeezed some oranges and had some orange.... juice

Target answers: 13

Non target answers: 1 (left)

39. Do you think Mark likes to drink a glass of coca.... cola

Target answers: 10

Non target answers: 4 (chocolate x 2, milk, pops)

40. Eight and one makes.... nine

Target answers: 21

Non target answers: 0

41. Every day I comb my.... hair

Target answers: 27

Non target answers: 1 (day)

42. Every day in the morning I comb and brush my.... hair

Target answers: 9

Non target answers: 2 (teeth x 2)

43. Every week we go to the library to read a.... book

Target answers: 9

Non target answers: 0

44. Four and one makes.... five

Target answers: 5

Non target answers: 1 (cakes)

45. Goldilocks and the three.... bears

Target answers: 11

Non target answers: 0

46. Grass is coloured.... green

Target answers: 10

Non target answers: 0

47. He crossed the river in a rowing.... boat

Target answers: 12

Non target answers: 1 (---)

48. He went to the disco for a.... dance

Target answers: 6

Non target answers: 6 (night x 2, party x 4)

49. Humpty Dumpty had a great.... fall

Target answers: 13

Non target answers: 1 (banana)

50. I am going to drive a.... car

Target answers: 11

Non target answers: 3 (lesson, mile, motorbike)

51. I am thirsty and I want a.... drink

Target answers: 7

Non target answers: 0

52. I am tired at the end of the.... day

Target answers: 11

Non target answers: 3 (game, race, week)

53. I can find a post box - a post box is coloured.... red

Target answers: 13

Non target answers: 0

54. I can fly in a.... plane

Target answers: 5

Non target answers: 2 (sky x 2)

55. I can look around and see things with my.... eyes

Target answers: 9

Non target answers: 0

56. I can tell what time it is when I look at my wrist.... watch

Target answers: 12

Non target answers: 0

57. cut my food with a.... knife

Target answers: 9

Non target answers: 0

58. I don't have a coat so when it rains I will get.... wet

Target answers: 12

Non target answers: 0

59. I drink tea from a tea.... cup

Target answers: 10

Non target answers: 2 (bag, pot)

60. I eat with a knife and.... fork

Target answers: 17

Non target answers: 0

61. I go to sleep in my.... bed

Target answers: 7

Non target answers: 0

62. I go to the cinema and watch a funny.... film

Target answers: 11

Non target answers: 1 (movie)

63. I have a tooth brush and some tooth paste to clean my.... teeth

Target answers: 18

Non target answers: 0

64. I have a tooth brush to clean my.... teeth

Target answers: 9

Non target answers: 0

65. I have four fingers and one.... thumb

Target answers: 3

Non target answers: 1 (hand)

66. I hear with my.... ears

Target answers: 7

Non target answers: 2 (friend, mum)

67. I like to paint on paper with a paint.... brush

Target answers: 13

Non target answers: 0

68. I like to play hide and.... seek

Target answers: 17

Non target answers: 1 (seat)

69. I like to read a.... book

Target answers: 12

Non target answers: 1 (comic)

70. I put a hat on my.... head

Target answers: 8

Non target answers: 0

71. I see with my.... eyes

Target answers: 8

Non target answers: 0

72. I sit down and eat my dinner with a knife and.... fork

Target answers: 10

Non target answers: 0

73. I smell with my.... nose

Target answers: 9

Non target answers: 0

74. I tell the time with a wrist.... watch

Target answers: 14

Non target answers: 0

75. I wave goodbye with my.... hand

Target answers: 15

Non target answers: 1 (mum)

76. I wear socks on my.... feet

Target answers: 11

Non target answers: 0

77. If I hear a funny joke it makes me smile and.... laugh

Target answers: 14

Non target answers: 1 (fire)

78. If it rains I will get.... wet

Target answers: 7

Non target answers: 0

79. If my hands are cold I wear my.... gloves

Target answers: 14

Non target answers: 0

80. If the sun is hot and bright I put a hat on my.... head

Target answers: 14

Non target answers: 2 (forehead, hat)

81. If you eat too much you will get.... fat

Target answers: 4

Non target answers: 4 (ache, sick x 3)

82. In the middle of the fire it feels very.... hot

Target answers: 9

Non target answers: 1 (scared)

83. In the sky I can see the moon come out at.... night

Target answers: 11

Non target answers: 1 (dark)

84. In the spring leaves start growing on the big high.... trees

Target answers: 13

Non target answers: 1 (hill)

85. In winter we wear a coat because it is so.... cold

Target answers: 5

Non target answers: 1 (---)

86. Jack and Jill went up the.... hill

Target answers: 15

Non target answers: 0

87. Jane skips with a skipping.... rope

Target answers: 14

Non target answers: 0

88. Jane went to the baker and he then made a loaf of.... bread

Target answers: 14

Non target answers: 1 (mess)

89. Jim likes to eat fish and.... chips

Target answers: 27

Non target answers: 1 (trout)

90. Just in time the football team scored the winning.... goal

Target answers: 2

Non target answers: 1 (team)

91. Leaves blow in the.... wind

Target answers: 7

Non target answers: 2 (air, tree)

92. Leaves grow on the big.... trees

Target answers: 7

Non target answers: 0

93. Mark drinks coca.... cola

Target answers: 17

Non target answers: 1 (---)

94. Mark heard the story of Goldilocks and the three.... bears

Target answers: 17

Non target answers: 0

95. Mark put the lights on the Christmas.... tree

Target answers: 15

Non target answers: 3 (cake x 2, day)

96. Mary unlocks the door with her.... key

Target answers: 16

Non target answers: 1 (hand)

97. Mum sat down in an arm.... chair

Target answers: 20

Non target answers: 0

98. My dog wags his.... tail

Target answers: 7

Non target answers: 0

99. My feet are at the end of my.... legs

Target answers: 3

Non target answers: 0

100. My hand is at the end of my.... arm

Target answers: 8

Non target answers: 0

101. My pet barks - it is a.... dog

Target answers: 8

Non target answers: 0

102. My teeth are in my.... mouth

Target answers: 14

Non target answers: 0

103. On a bright sunny day the sky is coloured.... blue

Target answers: 15

Non target answers: 0

104. One game for friends to play is hide and.... seek

Target answers: 13

Non target answers: 1 (play)

105. Pam put on her socks and.... shoes

Target answers: 9

Non target answers: 5 (coat, dress, scarf, ---- x 2)

106. Pam was happy and put on her bright new socks and.... shoes

Target answers: 15

Non target answers: 3 (dress, pants, trousers)

107. Paul's dog can run very.... fast

Target answers: 14

Non target answers: 0

108. Paul's dog plays in the park and it can run very.... fast

Target answers: 12

Non target answers: 1 (muddy)

109. People with lots of money are called.... rich

Target answers: 12

Non target answers: 4 (king, millionaires x 3)

110. Robert spent his money at the sweet.... shop

Target answers: 13

Non target answers: 0

111. Seven days make a.... week

Target answers: 15

Non target answers: 1 (cake)

112. Sometimes I go to a swimming.... pool

Target answers: 13

Non target answers: 3 (class, club, session)

113. Sometimes we go out and eat some fish and.... chips

Target answers: 18

Non target answers: 0

114. Stir the tea with a tea.... spoon

Target answers: 15

Non target answers: 4 (bag x 4)

115. Sue has her own little room in a great big.... house

Target answers: 11

Non target answers: 4 (bed, bedroom x 2, mess, room)

116. Sue lives in a.... house

Target answers: 9

Non target answers: 1 (flat)

117. Teacher told the class a.... story

Target answers: 9

Non target answers: 3 (lesson, poem, sum)

118. That shiny new bike in the bike shop has two round.... wheels

Target answers: 4

Non target answers: 1 (tyres)

119. The baker made a loaf of.... bread

Target answers: 13

Non target answers: 0

120. The cinema shows a.... film

Target answers: 9

Non target answers: 4 (movie, picture x 2, play)

121. The colour of a banana is.... yellow

Target answers: 6

Non target answers: 0

122. The dog wagged his.... tail

Target answers: 9

Non target answers: 0

123. The dog was very happy and so he wagged his.... tail

Target answers: 13

Non target answers: 0

124. The farmer lives on a.... farm

Target answers: 28

Non target answers: 2 (field, hill)

125. The farmer look after his animals down on his.... farm

Target answers: 9

Non target answers: 0

126. The fire engine came and the fire man put out the.... fire

Target answers: 13

Non target answers: 1 (smoke)

127. The fire man put out the.... fire

Target answers: 7

Non target answers: 0

128. The football team scored a.... goal

Target answers: 16

Non target answers: 0

129. The hammer hit the.... nail

Target answers: 17

Non target answers: 3 (door x 2, wall)

130. The leaves on the trees are coloured.... green

Target answers: 7

Non target answers: 2 (brown x 2)

131. The magician waves his magic.... wand

Target answers: 7

Non target answers: 1 (flag)

132. The moon comes out at.... night

Target answers: 15

Non target answers: 1 (dark)

133. The next number after one and two and three is.... four

Target answers: 19

Non target answers: 0

134. The number which always comes after seven and eight is.... nine

Target answers: 14

Non target answers: 2 (head, two)

135. The number which always comes after three and four is.... five

Target answers: 14

Non target answers: 1 (four)

136. The opposite of bad is.... good

Target answers: 10

Non target answers: 0

137. The opposite of black is.... white

Target answers: 13

Non target answers: 0

138. The opposite of dark is.... light

Target answers: 12

Non target answers: 1 (on)

139. The opposite of fat is.... thin

Target answers: 9

Non target answers: 0

140. The opposite of hot is.... cold

Target answers: 15

Non target answers: 0

141. The opposite of long is.... short

Target answers: 11

Non target answers: 1 (small)

142. The pirate found silver and.... gold

Target answers: 12

Non target answers: 0

143. The rabbit ran down his rabbit.... hole

Target answers: 5

Non target answers: 2 (burrow, pen)

144. The rocket left earth and went up and up into outer.... space

Target answers: 30

Non target answers: 0

145. The rocket went up into outer.... space

Target answers: 15

Non target answers: 0

146. The rubbish goes in a rubbish.... bin

Target answers: 9

Non target answers: 1 (bag)

147. The sky is coloured.... blue

Target answers: 8

Non target answers: 0

148. The speed of a snail is.... slow

Target answers: 9

Non target answers: 0

149. The sun shines in the.... sky

Target answers: 3

Non target answers: 3 (house, north, window)

150. There are 7 days in a.... week

Target answers: 13

Non target answers: 0

151. There are 12 months in a.... year

Target answers: 18

Non target answers: 2 (week)

152. There are 60 minutes in an.... hour

Target answers: 12

Non target answers: 0

153. They played football with a foot.... ball

Target answers: 11

Non target answers: 0

154. They washed the dirty dog until he was.... clean

Target answers: 15

Non target answers: 0

155. Three and one makes.... four

Target answers: 12

Non target answers: 0

156. To fetch some water, Jack and Jill went up the.... hill

Target answers: 14

Non target answers: 0

157. To finish the story I turned the last.... page

Target answers: 6

Non target answers: 1 (----)

158. To make a snowman you need.... snow

Target answers: 18

Non target answers: 0

159. To make the trick work the magician waves his magic... wand

Target answers: 13

Non target answers: 0

160. Twinkle twinkle little.... star

Target answers: 9

Non target answers: 0

161. Two and one makes.... three

Target answers: 9

Non target answers: 1 (four)

162. We all sat down and the teacher told the class a funny.... story

Target answers: 4

Non target answers: 6 (class, joke x 4, trick)

163. We live on the planet.... earth

Target answers: 5

Non target answers: 1 (mars)

164. We went to the beach and we had a swim in the cold... sea

Target answers: 9

Non target answers: 13 (beach, water x 12)

165. When babies are hungry they.... cry

Target answers: 13

Non target answers: 3 (eat x 3)

166. When David cleans he sweeps the.... floor

Target answers: 8

Non target answers: 2 (dust, kitchen)

167. When I have a cold I have to blow my.... nose

Target answers: 19

Non target answers: 2 (face, ----)

168. When I wake up I open my eyes and get out of.... bed

Target answers: 16

Non target answers: 0

169. When it snows every thing turns the colour.... white

Target answers: 9

Non target answers: 0

170. When Mary got home she unlocked the door with her.... key

Target answers: 16

Non target answers: 0

171. When Mum is tired she likes to sit down in an arm.... chair

Target answers: 3

Non target answers: 0

172. When you want to see in the dark you can turn on a.... light

Target answers: 12

Non target answers: 1 (torch)

173. While sleeping I had a strange.... dream

Target answers: 8

Non target answers: 0

174. Wool comes from.... sheep

Target answers: 17

Non target answers: 0

175. Worms live under the.... ground

Target answers: 15

Non target answers: 2 (earth, soil)

176. You can build a house with.... bricks

Target answers: 11

Non target answers: 0

177. You can see my white teeth when I open my.... mouth

Target answers: 11

Non target answers: 0

178. You can see through a window when it is made of.... glass

Target answers: 16

Non target answers: 0

179. You get hungry if you have no.... food

Target answers: 10

Non target answers: 1 (dinner)

180. You paint with a paint.... brush

Target answers: 18

Non target answers: 1 (pot)