The Turkish Listening Span Test: A methodological developmental study on Turkish children

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Abstract

Complex working memory capacity in children can be measured with the Listening Span Test (LST) in which both storing and active processing of information is required. In the LST, children are required to listen to sequences of simple sentences like "Apples are red" and decide on the truthfulness of the sentence. At the end of each sentence, the last word has to be recalled. At the end of each sequence, all last words have to be recalled. The sequences increase in the number of sentences until the child fails to recall them correctly. In this study, the LST was adapted for Turkish, from the original test of Pickering and Gathercole (2001). There were many challenges during the adaptation from English to Turkish, in particular word-order (verb-final) and the rich concatenative morphology. 101 participants were recruited from two primary schools in a rural area in Yozgat, in the Central Anatolia Region of Turkey (age range: 6-12 years). Performance in the LST increased significantly with grade. The increase in test performance was stepwise, between the 1st and the 2nd grade and the 3rd and the 4th grade. The stepwise development is consistent with the literature and may reflect the fact that working memory resources are exploited in more efficient ways as children grow older, possibly due to maturation of frontal brain regions. The Turkish LST is now available for further use by developmentalists working with Turkish children.

Research Question

How does the performance in the Turkish Listening Span Test develop in Turkish children?

Sample

	N	Mean age	S.D.
Grade 1	20	6, 711	,125
Grade 2	24	7, 591	,092
Grade 3	16	8,691	,178
Grade 4	22	9,504	,087
Grade 5	19	10,486	,143

Sample sentences

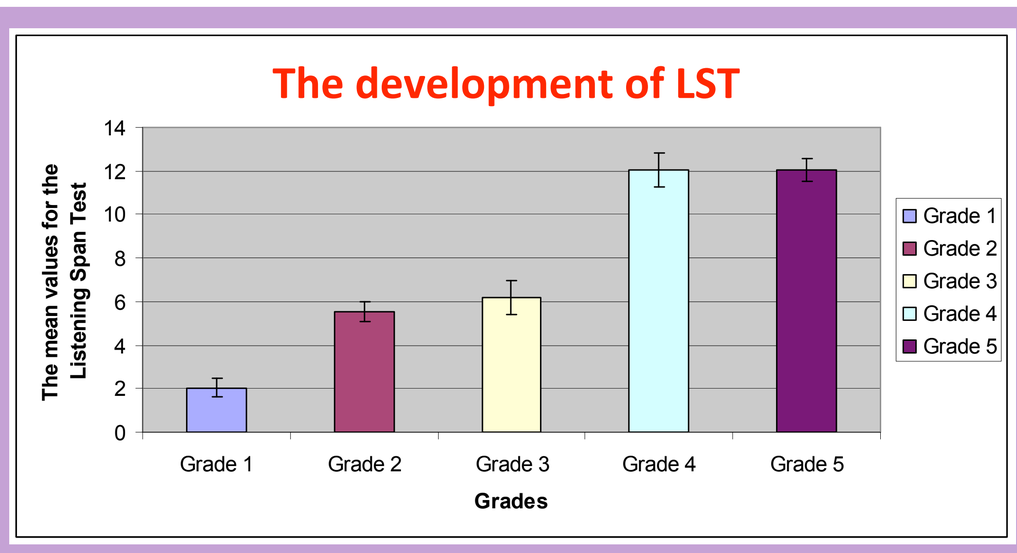
3-sentence set (V=verb; N=noun; A=adjective)

1. Muzlar bisiklete <u>biner</u>. (V,3 words,8 syllables)
2. Elimiz beş <u>parmaklıdır</u>. (N/A,3 w,8 syll)
3. Soğan <u>acıdır</u>. (A,2 w, 5 syll)

4-sentence set

1. Zürafalar uzun <u>boyludur</u>. (N/A,3 w,9 syll)
2. Çiçekler pasta <u>sever</u>. (V,3 w,7 syll)
3. Portakallar <u>kulaklıdır</u>. (N/A,2 w,8 syll)
4. Öğretmenler okulda <u>çalışır</u>. (V,3 w,10 syll)

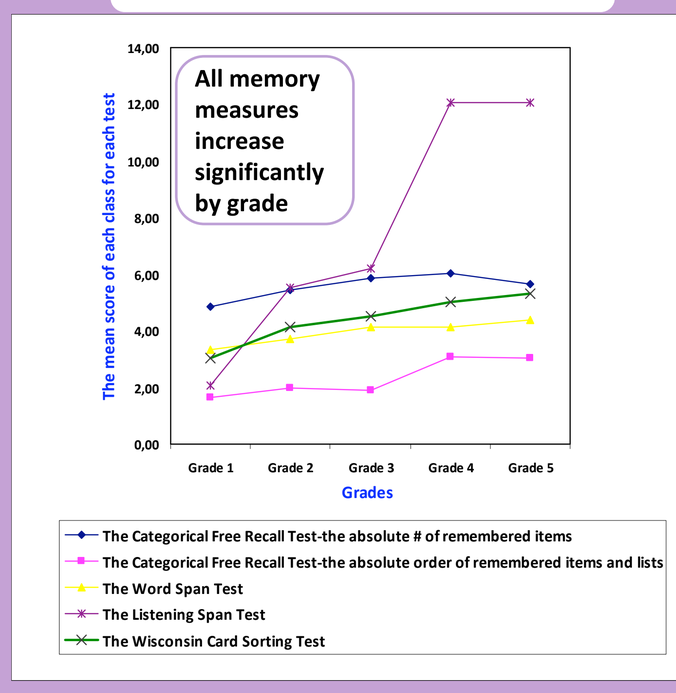
The development of LST



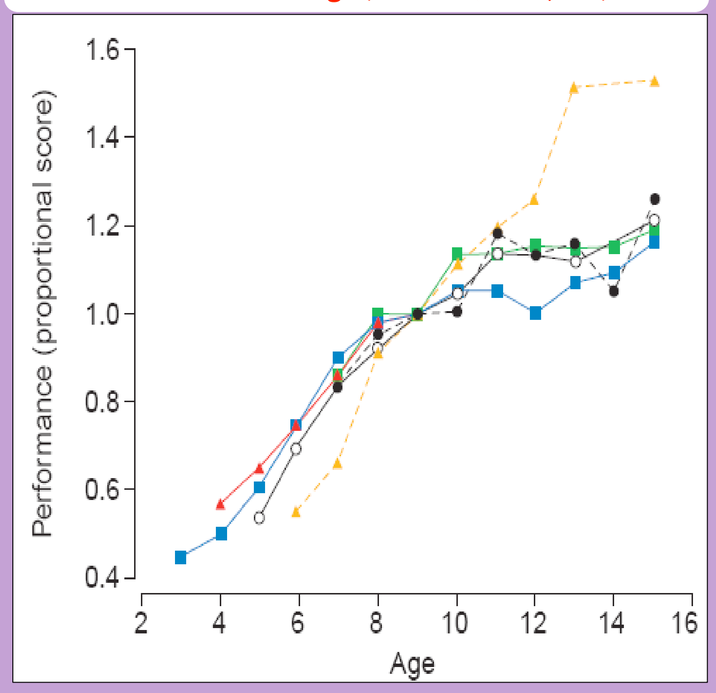
Procedure

In the experiment, subjects listen to the sentences and then are required to answer "Yes"or "No" according to the best of their knowledge. For example, when they listen to the sentence "İnekler uçar" (Cows can fly), they should say "Hayır, uçar" (No, fly). The set size of the test increases with the performance of the subject.

The Listening Span Test- in relation to the other WM tasks



Performance on measures of short-term memory as a function of age (Gathercole, 1999: p.411)



Challenges for the Turkish adaptation

- Word-order (verb final)
- Rich concatenative morphology on nouns, verbs, adj's
- Culture specific consideration ("Pigs have curly tails")
- Gender specific considerations ("Fathers are men")
- Balancing the # of syllables & words of the sentences

Relation of the LST with other memory tasks

- Correlation for Word Span Test (WST – LST)
  - Pearson's r=.504, Spearman's r = .539 ($p < .001$)
- Correlation for Wisconsin Card Sorting Test (WCST – LST)
  - Pearson's r=.548, Spearman's r = .568 ($p < .001$)
- Regression: LST predicts # of words recalled in correct serial order

Results

- The Listening Span Test is significantly affected by the grade (Kruskal-Wallis Test, χ^2 (4) = 74.71, $p < .001$). There are 2 steps in the development: between grade 1 and 2 & 3 and between 2 & 3 and 4 & 5.
- No significant effect for gender in any grade for the Listening Span Test ($F(1, 101) = 1.093$, $p = .299$) nor any grade*gender interaction.
- The LST is positively correlated with measures of verbal WM (WST) and executive WM (WCST). It predicts memory for items in serial order.

Discussion and Conclusion

Overall, there is a step-wise increase in the development of the Listening Span Test across grades. While other working memory measures level off at early ages, the listening span still develops (Gathercole, 1999). This later development might be due to brain development. Working memory resources may be exploited in more efficient ways abruptly as children grow older. Alternatively, brain development that supports the Listening Span Test performance is non-linear. Performance in the Listening Span Test has been related to the development of Prefrontal Cortex which has a particular onset in later childhood. The Turkish adaptation of the LST had to accommodate the typological peculiarities of Turkish: word-order, distribution of grammatical classes, and rich concatenative morphology. Furthermore, the number of words and syllables in the sentences was kept constant. Moreover, in the experiment younger children did not understand what "the last word of a sentence" means. Thus, at the beginning of the experiment they had to be trained on this problem. The Turkish version of the LST can now be used by researchers in cognitive development of Turkish children.

References

Pickering, S.J. and Gathercole, S.E. (2001): Working Memory Test Battery for Children. London_ Psychological Corporation UK.
Gathercole, Susan E. (1999): Cognitive approaches to the development of short-term memory. Trends in Cognitive Sciences, 3, 410-419.

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