

Implicit learning abilities in children with SLI: A dissociation between sequence and spatial context learning?

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ABSTRACT

In a recent review of the SLI literature, it has been suggested that low language and grammatical abilities would be directly associated with poor learning abilities of nonverbal sequences (Tomblin et al., 2007). Therefore, one could hypothesize that a general purpose sequential pattern tracker could determine some aspects of language and grammar learning. In the present study, 15 children with SLI and 15 matched control children were compared on two implicit learning tasks: an alternating serial response time task in which sequential dependencies exist across non-adjacent elements, and a spatial context learning task in which the global configuration of a display cues the location of a searched target (Chun & Jiang, 1998). We predict that children with SLI will show impaired sequence learning and normal spatial context learning. The present study should contribute to better understand the language abilities, and in particular the grammatical difficulties, of individuals with specific language impairment.

METHODS

Participants

Experimental group:

- 15 children with SLI (6-14 years)
- Monolingual French speakers
- Nonverbal IQ (WISC IV) > 82
- Language skills below 1.25 SD from the mean in 2 or more of 5 language areas

Control group:

- 15 normal language controls (6-14 years)
- Monolingual French speakers
- Nonverbal IQ (WISC IV) > 86
- No history of language disabilities

The participants in the 2 groups are paired for:

- Chronological age
- Nonverbal IQ
- Gender

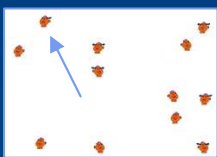
Experimental Tasks

Serial response time (SRT)



- 8 blocks including 64 trials
- Second Order Conditional sequence
- Eight stimuli: "4-2-1-3-2-4-3-1"
- Touch screen responding

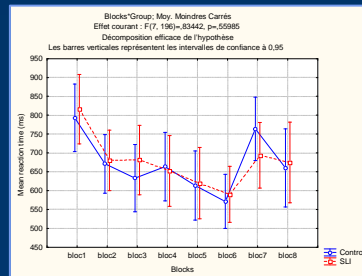
Spatial contextual cueing task (SCCT)



- 20 blocks of 24 trials (12 new and 12 repeated configurations)
- 12-element arrays of 11 distractors and a single target
- Epochs (1-5)

RESULTS

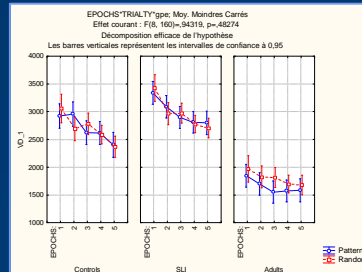
Serial response time (SRT)



- No significant Group effect, $F < 1$
- Significant Block effect
 $F(7, 196) = 12.92$; $p < .05$
- No Group x Block interaction

To summarize: sequence learning was observed in both groups, and performance of SLI children was similar than performance of control children.

Spatial context learning task (SCCT)



- Significant Group effect
 $F(1, 40) = 81.76$; $P < .05$
- Significant Epoch effect
 $F(4, 160) = 32.02$; $P < .05$
- No significant Trial Type effect
 $F(1, 28) = 3.40$; $P = .07$
- Epoch x Trial Type interaction
 $F(4, 160) = 4.88$; $P < .05$
- Epoch x Group interaction
 $F(4, 160) = 2.17$; $P < .05$
- Group x Trial Type interaction
 $F(4, 160) = 5.83$; $P < .05$

To summarize: there was no spatial context learning effect in neither the SLI nor the children group. On the other hand, a spatial context learning effect was observed in the adult group.

DISCUSSION

The first aim of this study was to investigate whether low language and grammatical abilities are directly associated with poor ability in learning regularities of non verbal sequences, as suggested by Tomblin et al. (2007). So, we tried to replicate the results obtained by Tomblin et al. (2007) by examining serial reaction time (SRT) learning in children with SLI. Another question was to determine whether this learning difficulty was specific to sequential material, or if SLI was characterized by a general implicit learning impairment that extends to implicit spatial context learning. Our first prediction was not confirmed: children with SLI have shown the same learning effect in the SRT task than typically developing children, a result challenging the conclusion of the Tomblin et al.'s (2007) study. Further studies will be necessary in order to determine whether the discrepancy between the two studies could be due to some slight methodological differences (notably regarding the length of the sequence used), and to better understand the extent of sequential implicit learning abilities of SLI children.

Regarding our second hypothesis, we did not observe, in both children groups, any significant learning effect in the implicit spatial context learning task. The observation of a significant learning effect in the adult group suggests that implicit learning of a spatial context could be immature in childhood (Vaidya et al., 2007).

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