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A computerized Tool for predicting future reading abilities in Pre-Readers Children

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INTRODUCTION

Oculomotor and visuo-attentional skills in reading

Saccades and fixations

- Necessary to overcome **anatomy-functional constraints of the eye**
Crowding effect and ↘ visual acuity with eccentricity [Leibnitz & al., 2016](#)
- Importance of where the eyes first land in a word
A left-centered initial landing position = optimal for reading [Rayner, 1979](#)

Visual attention

- Making the letters salient in **foveal vision**
for identification of the word N
- Length of upcoming words in **parafoveal vision**
for saccade computation
- Involved in **directing the eyes** to a peripheral target
to guide eye movements

Oculomotor behavior and visuo-attentional skills undergo substantial changes during reading development
Their improvement directly affect the reading skill (↗ of the accuracy and the speed).

Prerequisites for learning to read

Phonological skills [Sprengr-Charolles & Colé, 2013](#)

As well as

Visuo-attentional skills [Franceschini & al., 2012](#)

Visuo-perceptual and visuo-motor skills [Bellocchi & al., 2017](#)

Oculomotor skills [Vernet & al., 2018](#)

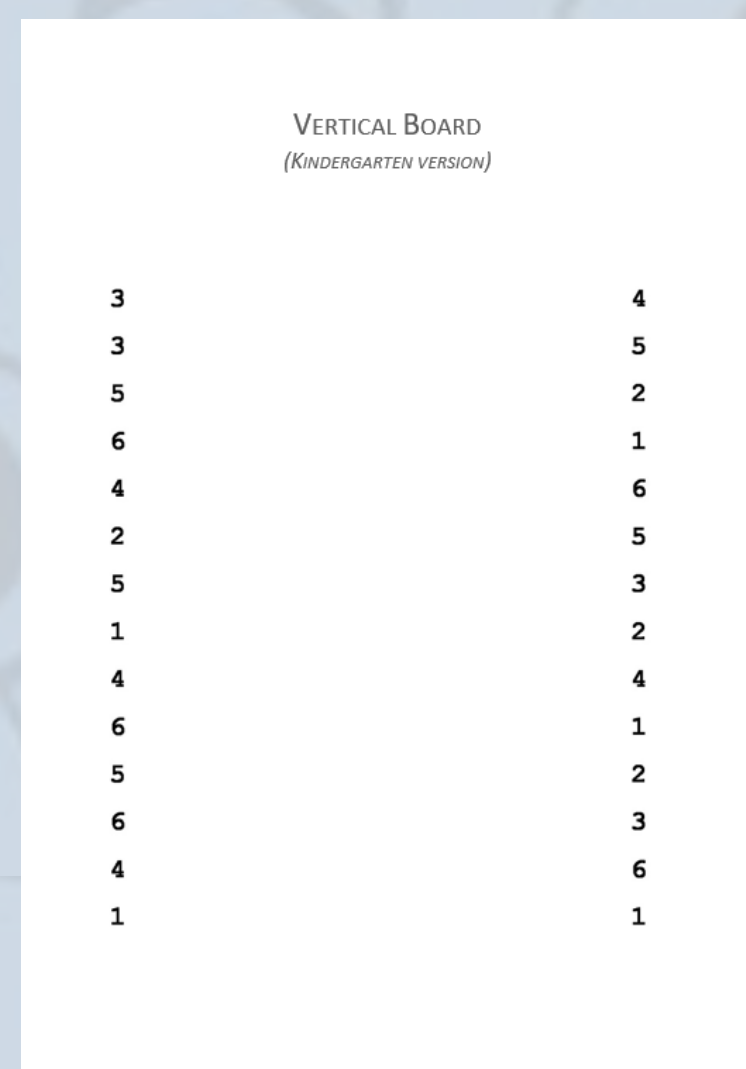
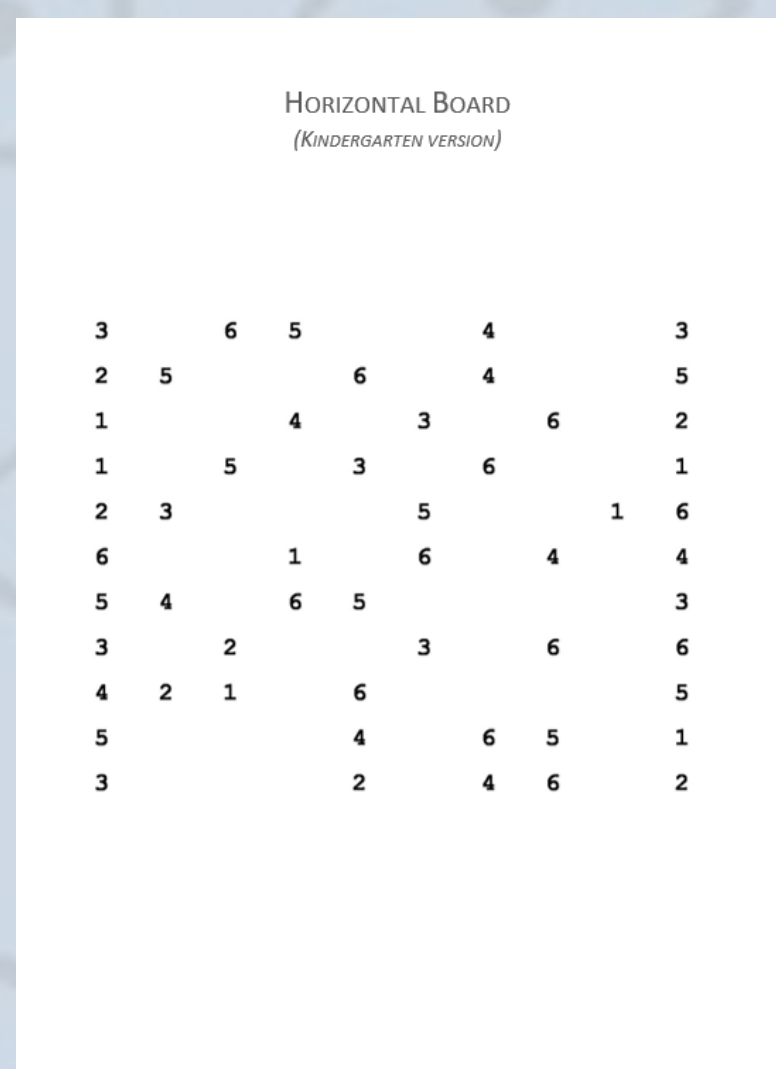
These preliteracy skills are crucial for future reading skills from kindergarten onwards.

AIM OF THE STUDY: Using a **longitudinal study**, the aim was to **improve screening** for future **reading difficulties** in **preschool children**

MATERIAL

DIAGLECT Module 1

A new software module
Inspired by the DEM test [Richman & Garzia, 1987](#)

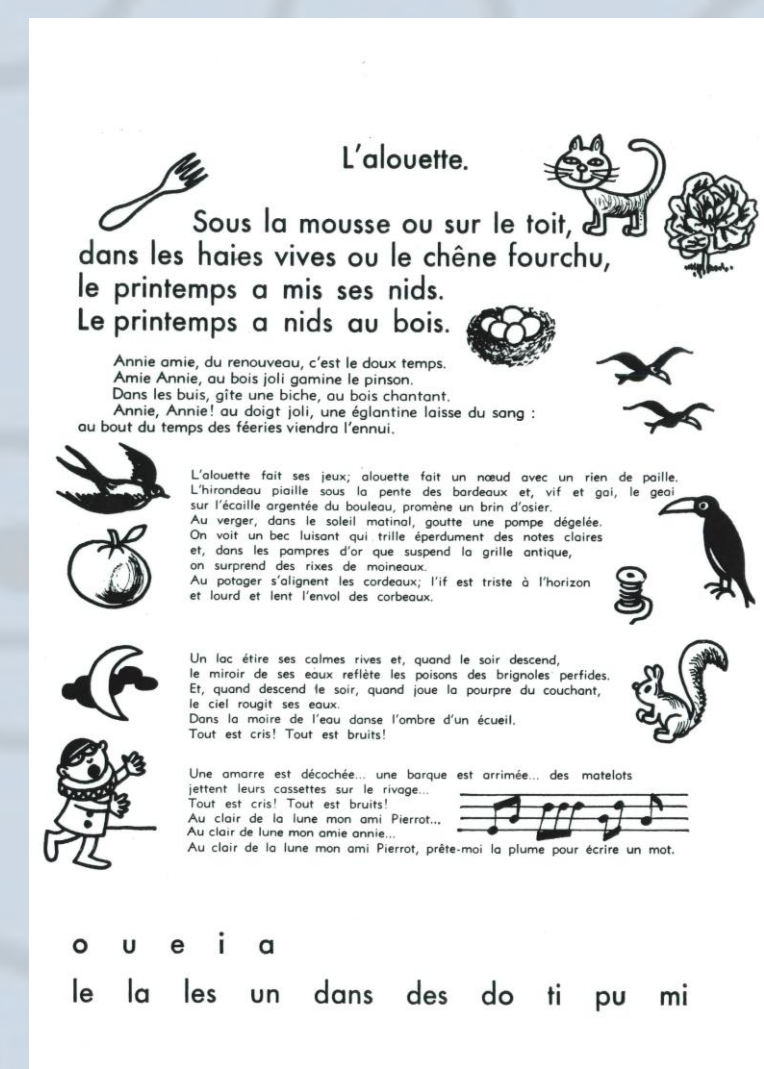


Oculomotor skills and number naming

VT – Vertical naming time HE – Horizontal errors
HT – Horizontal naming time HTaj – Horizontal adjusted time

Alouette test

[Lefavrais, 2005](#)



Reading skills

CM – Reading accuracy
CTL – Reading speed

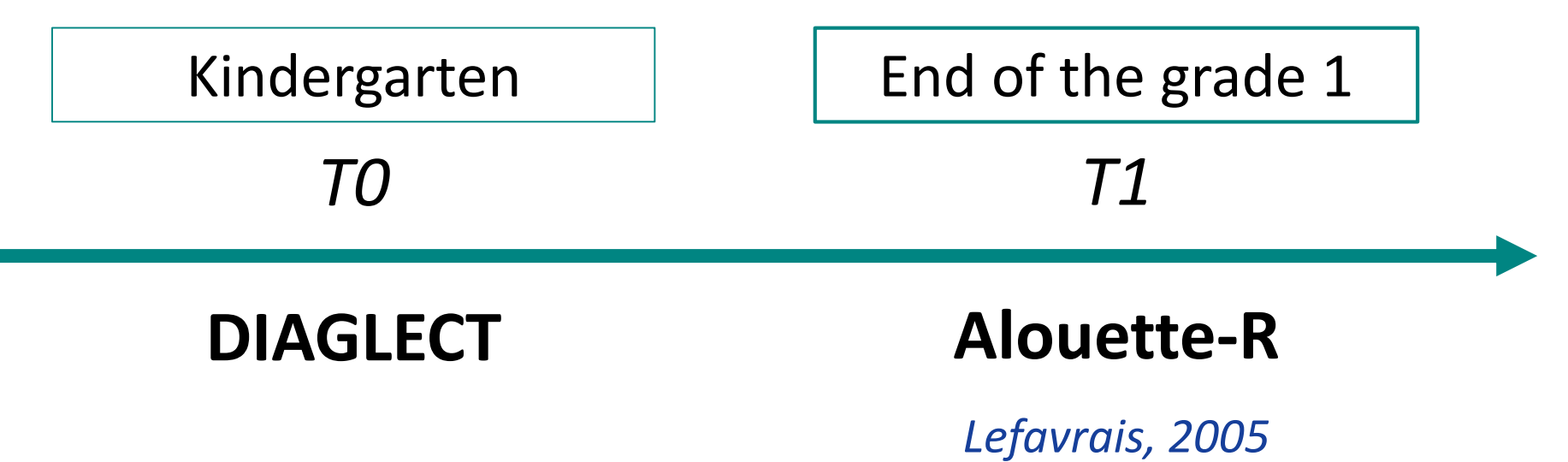
METHOD

Participants

138 children from different French public schools
→ Normal or corrected-to-normal vision

	Time 0	Time 1
Mean of age (years;months)	6;0	6;9
Grade	Kindergarten	1st Grade

Procedure



RESULTS

Normative data

	Kindergarten			
	VT ms	HT ms	HE errors	HTaj ms
Mean	67 287	92 624	12	98 558
Standard deviation	19 031	38 837	11	38 153

Correlation matrix

	CM - T1	CTL - T1
CTL - T1	0.641***	—
VTn - T0	-0.407***	-0.543***
HTn - T0	-0.414***	-0.386***
HTajn - T0	-0.440***	-0.403***
HEn - T0	-0.224**	-0.139

READING ACCURACY

All the **DIAGLECT indexes** are correlated with **CM**.

READING SPEED

All the **time indexes** are correlated with **CTL**.

Regression analysis

Reading speed

	SIMPLE MODEL		
	CTL – Raw score		
	R ²	β	t
VT Raw score	0,295	-0,002	-7,513***
Htaj Raw score	0,162	-6,714e-4	-5,116***

- VT predicted 29,5 % of reading speed
- Htaj predicted 16 % of reading speed

Multiple linear models do not better explain the variability of **CM** and **CTL** at grade 1

Reading accuracy

	SIMPLE MODEL		
	CM – Raw score		
	R ²	β	t
VT Raw score	0,165	-2,780e-4	-5,174***
Htaj Raw score	0,194	-1,476e-4	-5,698***
HE Raw score	0,050	-0,258	-2,674**

- Htaj predicted 19,4 % of the CM index
- VT predicted 16,5 % of the CM index
- HE predicted 5 % of the CM index

CONCLUSION AND PERSPECTIVES

- DIAGLECT = easy-to-use software to early identify children at risk to develop reading difficulties
- Normative data from a large sample of French kindergarten children

RESEARCH PROSPECTS

- Check the **sensitivity and specificity** of the test in the context of learning disabilities (e.g., **dyslexia, developmental coordination disorder**)
- Study the **neuropsychological profile** of children with difficulties in DIAGLECT software modules
- Develop **rehabilitation modules** according to the difficulties identified using the tool

CLINICAL IMPLICATIONS

- Early **identification and care** for future reading difficulties in preschool children
- Early implementation in schools, more precisely in kindergarten, of **oculomotor skills training**