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Design for retrospective timing and dyslexia

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Introduction

Recent research at Kempenhaeghe focuses on the relation of some classes of cognitive and learning disorders with the (dis)ability to process the concept of time. Some specific conditions being studied are dyslexia, dyscalculia and ADHD[1, 2].

It is the strong ambition in the TU/e-Kempenhaeghe collaboration to design tools for the interaction with cognitively impaired people about time related phenomena. We envision mixed reality systems to diagnose the absence of proper time perception, and eventually to train people in time-related tasks.

The work presented here can be seen as a preliminary study of how designed settings can be deployed for diagnostic tools related to this research area.

Retrospective timing in dyslexia

One aspect of time perception is the retrospective estimation of time. This normally relates to temporal order judgements, auditory functions and temporal tasks[3]. Early studies[4] from 1951 already indicate that dyslexic children perform worse than normal in tasks were they have to reproduce a rhythmic tapping sequence. The relation between reading and reproducing rhythms can be understood by noticing that children with dyslexia do not primarily have problems with the perception of characters, but more with the translation from phonology to words.

Design proposition

A time interaction tool was designed for studying the ability of dyslexic and non-dyslexic children to memorise audio-visual patterns for a short time, and to reproduce them.

| Dyslexic impairment	Terminology	Design
AaBbCcDd	Perception	
Phenome	Phonology	
Understand	Meaning	Action

Translation of dyslexic impairment to design

Results

Tests were performed with twenty sixth-graders (age 9-11) of which eight had an official dyslexia statement. The hypotheses under test was whether the interaction tool could quantify that dyslexic children:

1. have a larger mean error in the timing of the repetition task
2. show more wrong button pushes
3. show a stronger learning curve over the 20 min. course of the experiment

Although the statistical significance of the N=20 group is too low for accepting or rejecting the hypotheses, the experiment showed that we can see differences and trends on all three aspects.
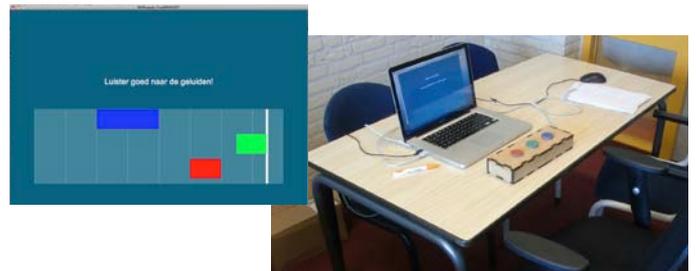
Representation of one sequence (left) and photo of test set-up (right)

References

[1]Hurks, Petra P. M. and Hendriksen, Jos G. M. (2010), *Retrospective and Prospective Time Deficits in Childhood ADHD: The Effects of Task Modality, Duration, and Symptom Dimensions*, Child Neuropsychology, 9 October 2010

[2]Hendriksen, J.G.M. and van der Kruijs, S.J.M. (2010), *Time orientation and sleep deficits in children with learning disabilities*, Kempenhaeghe internal note

[3]Grondin, S. (2010), *Timing and time perception: A review of recent behavioral and neuroscience findings and theoretical directions*, Attention, Perception & Psychophysics 72 (3): 561-582

[4]Stambak, M. (1951), *Le problème du rythme dans le développement de l'enfant et dans les dyslexies d'évolution*, Enfance, 5, 480-502

Acknowledgement