Eye movement of highly skilled and average readers: Differential effects of frequency and predictability (Ashby, Rayner & Clifton, 2007)

Abstract
- Eye movements of adult readers monitored while silently read sentences
- Ex 1- HF and LF target words embedded in sentence contexts
- Ex 2- same participants – read high and low freq target words that were either predictable or not embedded in highly constraining sentence contexts
- Average readers showed different effects of frequency and predictability to high skilled
- Reading skill can interact with predictability to affect the word recognition process in silent reading

Introduction
- Reading skill affects several aspects of EM- longer fixations, shorter saccades, more regressions – use similar processes just less efficiently
- HF and high predictability words read more quickly

General Methodology
- 4 students – native English speakers, not know (S.I.), naive to purpose of experiment - split into good/poor readers using Nelson-Denny Test
- Ex1 stimuli – 24 high and low frequency target words embedded in sentences
- Ex2 stimuli – 16 pairs of low and high frequency target words, each could occur in two sentences, one that predicted the word, and one that predicted a different word

Experiment 1
- Expect to observe effects of reading skill, e.g., highly skilled readers should have shorter fixation times than poor readers(Jared, 1999)
- Highly skilled readers should regress less often (Everatt & Underwood, 1994)
- Expect larger frequency effects among average readers (Haenggi & Perfetti,1994)
- Baseline observation of two groups reading processes as they occur in non-constraining contexts

Results
- FFD – high frequency words received shorter fixations than LF words, trend towards smaller effects for high skilled readers but only reached significance in the items analysis
- Gaze durations sig effect of skill and frequency, marginally significant interactive effects
- Spillover – main effect of group marginal in items not in participant analysis as with frequency. No interactive effects
Intro

- Baccino and Pynte (1994) – functional link between spatial coding and discourse model – readers able to code place for words or expressions, retrieving spatial locations
- Ex 1 - Aim to determine whether a change in perspective generates additional cognitive load for reader
- Ex 2 – used computer mouse to point to text items where perspective change took place, aimed at determining whether items and/or locations stored in memory

Experiment 1

- 20 texts telling various stories with or without titles. Seven lines long, 2 x 44 word paragraph
- 1st paragraph = vague description of place or time of main action, last sentence mentioned main paragraph
- Paragraph 2 - first sentence comprised an adverb, personal pronoun, verb and complement – used to manipulate perspective shift
- First paragraph always written from external point of view, either external or internal was used in 2nd paragraph (internal= perspective shift)

Results

- Perspective change disrupted integration process, especially for verb and pronoun (appeared to spread to other sections too affecting total reading time)

Experiment 2

- Texts displayed segment by segment (self-paced), preceding segment replaced with series of Xs
- At end of reading participants had to click on a cross, participants then asked to point mouse to specific phrase and click it (text visible)

Results

- During reading phase, trend of results similar to Ex1
- Pointing times faster for perspective shift only when cursor was in action
- Dispersion was lower when there was a perspective shift
- Suggests change in perspective causes reader to memorise location of change

Experiment 3

- Same as above apart from during pointing phase text was Xs

Results

- Perspective shift was more sensitive for synonyms (pointing times were faster
Reading as a Bayesian Inference

The utility modelling word identification from visual input within models of eye movements in reading (Bicknell & Levy, 2012)

Reading Isolated Words

Extraction of information to the left of the fixated word in reading (Binder, Pollatsek & Rayner, 1999)

Introduction

- If readers can read normally in a given window, it implies that no useful information is extracted from outside the window region.
- Two plausible regions why perceptual span is asymmetric
  - Right visual field is preferred- left cerebral hemisphere specialised for language function
  - Attention asymmetry manipulated by patterns of reading printed English. – supported by experiments in different languages e.g. Hebrew (Bolozky, Well, and Rayner, 1981)
- PS asymmetry switches
- Perceptual span doesn’t include information below line of text – reading is unaffected if all text below line is changed to XS, random letters or even different text (Pollatsek et al., 1993)
- Studies have shown virtually no information can be extracted beyond right limit (Rayner... , 1978) or when central letters are blocked and only info past this limit is available (Rayner & Bertera, 1979)
- Changes with variation of size of print, font and textual difficulty
- Moving window paradigm may not be powerful enough to pick up relatively small effect – conclusion that no info is extracted beyond these limits – based on averaging all fixations
  - Balota, Pollatsek & Rayner (1985) used boundary change technique- tested how fixation time on base word was affected by predictability, relation of preview.
    - Fix time shorter for more orthographically similar, semantic similarity of preview had little effect
    - If information outside of perceptual span

Method

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Experiment 2

- Reading times decreased across readings, however when only 10 of 350 words were visually discrepant there was no further repetition benefit on the fourth reading (could not be integrated with the representation)

Reading Ability and the Encoding of Item and Location information (Mason, 1980)

Abstract

- Link reading skills in adults to initial coding of location information
- Equal at identifying single letters at central fixation
- Highly skilled readers more accurate at identifying serial letter position
- When cued beforehand, equal across difficulties
- When location of letter had to be solved prior to identification, highly skilled more accurate
- Suggests role of perception in reading is underestimated, spatial location has been largely overlooked

Introduction

- Highly skilled readers make fewer fixations (Gilbert, 1959, Huey, 1908/1968, Taylor, 65)
- Don’t know whether they extract more visual information in a fixation or they just make more efficient use of the visual information
- Single-letter serial position constraints facilitate letter identification (Mason, 1975)
- Purpose – to investigate encoding of item and location information in regard to reading skill

Experiment 1

Method

- Nelson Denny reading tests to 300 undergrad psychology students 16 high skill and 16 low skill selected
- High skill (90-99th percentile), low skilled (11th-40th percentile)
- Single uppercase letter presented at central fixation point, mask of four $ signs

Results and Discussion

- Did not differ on single letter item perception task corroborates Jackson & McClelland (1975)
- Perception of location of letter - less skilled readers need more time to encode location information
- Could be that high skilled readers processed displays in a parallel fashion, and less skilled readers processed serially
- Could be due to less skilled readers being more susceptible to lateral masking