Clown vs. Dwarf:

Every little bit helps

Sara Sereno

Christopher Hand

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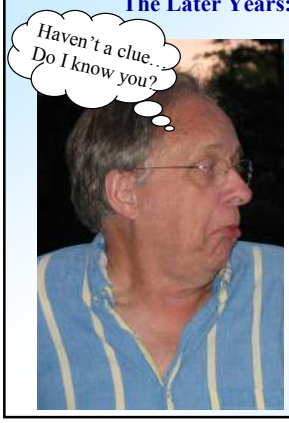
Glasgow Language Processing

The Early Years: Chuck Egolf Clifton, Junior

The Later Years: Forgetting Names



The Later Years: Forgetting Names

Leslie Arriola

The Later Years: Forgetting Names

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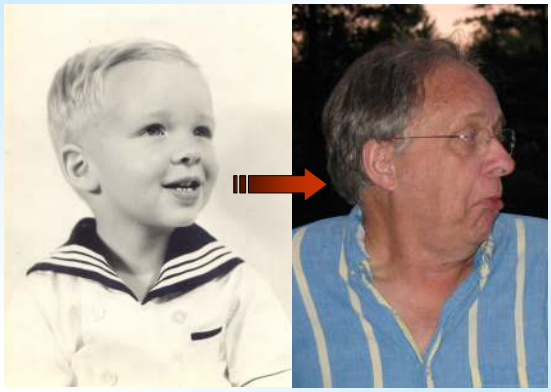
The Transition Years?



Clown vs. Dwarf:
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Clown vs. Dwarf: Who's more special?

- Do the beginnings of (written) words have a special status in reading?
  - Parafoveal preview (e.g., Rayner et al., 1982)
- Do word-initial **trigrams** help constrain the field of lexical candidates and, hence, facilitate access?
  - Cohort model (Marslen-Wilson & Welsh, 1978)
  - If so, then: High Constraint < Low Constraint

dwarf **clo**wn

The initial transgression against the dwarf: Lima & Inhoff (1985)

- High (*dwarf*) vs. Low (*clown*) Constraint targets
  - Targets equated for length and frequency
- Parafoveal preview manipulation
  - 1-word moving window
  - 2-word moving window
  - Full line of text (no moving window)
- Results
  - Parafoveal preview benefit (but, *dwarf* = *clown*)
  - Target effect of Constraint: *dwarf* > *clown*

Avenging the dwarf

- Target word frequency
  - Lima & Inhoff's targets were LF words
  - Instead, **use HF targets**
  - Increased parafoveal pre-processing of HF vs. LF words (Inhoff & Rayner, 1986)
- Contextual predictability
  - Lima & Inhoff's targets in neutral sentences:

The weary { *dwarf* / *clown* } *hated his job.*

  - Instead, **use biasing contexts**
  - Increased parafoveal pre-processing of predictable vs. less predictable words (Balota, Pollatsek, & Rayner, 1985)

Design & Materials

- 2 x 2 x 2 Constraint: Low-C, High-C
  Frequency: LF, HF
  Context: Neutral, Biasing
- All target words 5 letters long
- 22 sets of target word quadruples:

LF		HF	
Low-C	High-C	Low-C	High-C
dwarf	clown	train	girls

- 11 items per subject per condition

Stimulus Characteristics

Condition		Freq	#TrigramN 5-let	#TrigramN x-let	% of TN 5-let	% of TN x-let
LF	Low-C	8	19	187	5%	1%
	High-C	10	1	15	95%	39%
HF	Low-C	86	18	238	15%	5%
	High-C	90	4	44	96%	33%

Stimulus Characteristics

Condition		Pred Rating Neu	Pred Rating Bias	Cloze Prob Neu	Cloze Prob Bias
LF	Low-C	3.70	5.87	0.03	0.64
	High-C	3.43	5.76	0.04	0.60
HF	Low-C	4.21	6.01	0.04	0.64
	High-C	3.98	5.92	0.03	0.60

LF, Low-C

He had enjoyed being a **clown** but it was time to retire.

LF, High-C

In gym class, he felt like a **dwarf** next to his classmates.

HF, Low-C

He bought tickets for the **train** to Waterloo on the internet.

HF, High-C

She wanted to talk to the **girls** about the incident.

LF, Low-C

Pierre had entertained kids at the circus for fifty years.
He had enjoyed being a **clown** but it was time to retire.

LF, High-C

Jamie loved basketball but he was very short for his age.
In gym class, he felt like a **dwarf** next to his classmates.

HF, Low-C

Stuart did not want to travel to London by bus or plane.
He bought tickets for the **train** to Waterloo on the internet.

HF, High-C

At school, Miss Jones told only the boys to leave early.
She wanted to talk to the **girls** about the incident.

Counterbalancing

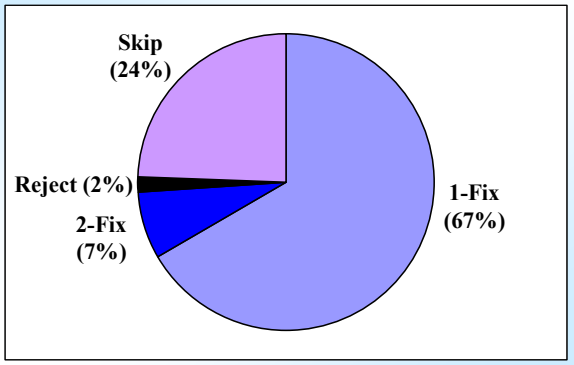
	Neutral				Biasing			
	LF		HF		LF		HF	
	Lo-C	Hi-C	Lo-C	Hi-C	Lo-C	Hi-C	Lo-C	Hi-C
Gp1	clown	dwarf	train	girls	c o n t e x t + shiny	dusty	heavy	happy
Gp2	shiny	dusty	heavy	happy	c o n t e x t + clown	dwarf	train	girls

====== Block 1 ====== ====== Block 2 ======

Method

- Participants
  - 48 (age=23; 30F, 18M)
- Apparatus
  - SR Research Desktop Mount Eyelink 2K (1000 Hz)
  - 14-point Bit Stream Vera Sans Mono font (non-proportional)
  - Approx. 4 characters per 1° of visual angle

Data Profile



Analysis

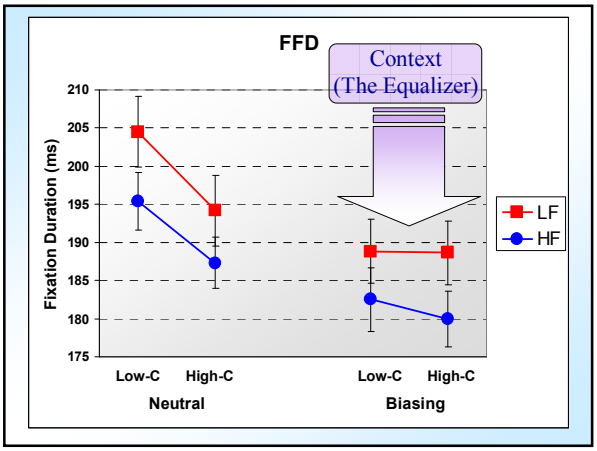
- First Fixation Duration (FFD)
  - duration of the first instance a word is fixated
- Single Fixation Duration (SFD)
  - duration of first-and-only fixations (majority of cases)
- Gaze Duration (GD)
  - summed duration of successive fixations on a word
- Total Time (TT)
  - GD plus any returning fixations

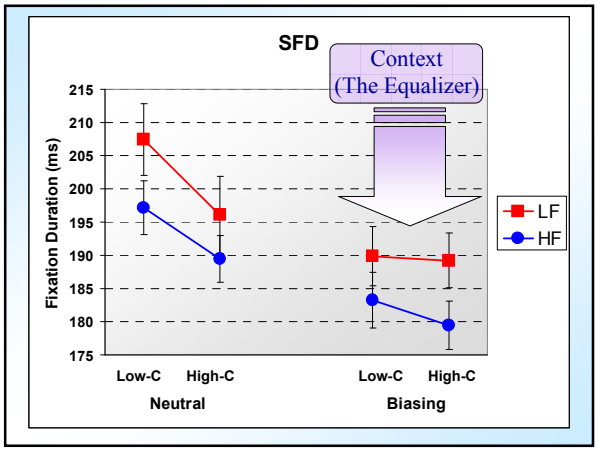
Effects

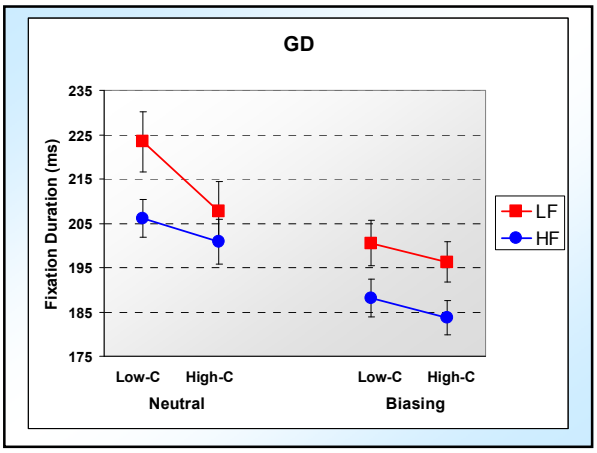
	FFD	SFD	GD	TT
Constraint	5 ms [.01, .05]	6 ms [.01, .05]	7 ms [.001, .05]	14 ms [.001, .001]
Frequency	8 ms [.001, .01]	8 ms [.001, .01]	12 ms [.001, .01]	13 ms [.01, .01]
Context	10 ms [.001, .001]	12 ms [.001, .001]	17 ms [.001, .001]	33 ms [.001, .001]
Cstr x Ctxt	[.05, .05]	[.07, .05]	[n.s., n.s.]	[n.s., n.s.]

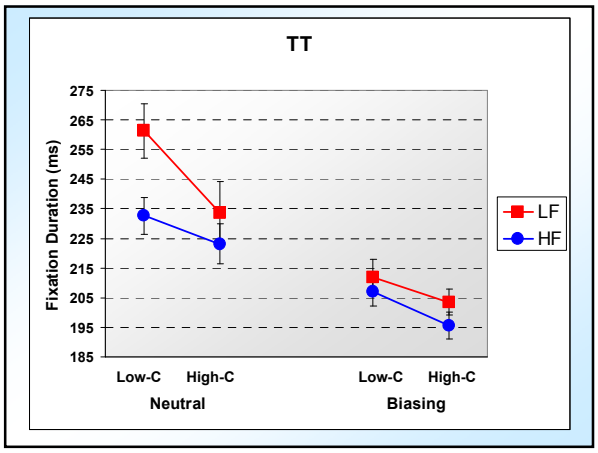
Revenge of the dwarf? Tears of a clown?

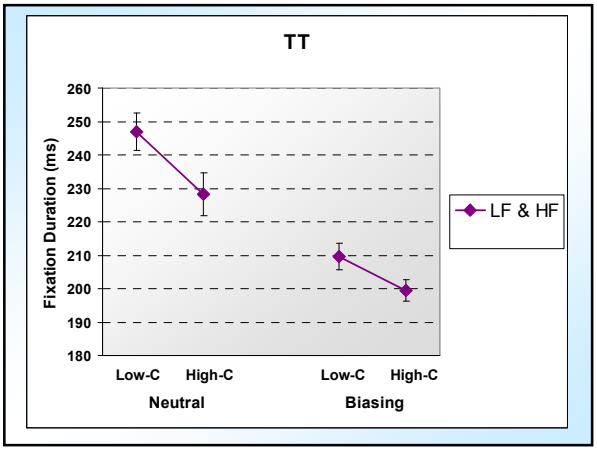
- **Context**
  targets/Biasing < targets/Neutral
- **Frequency**
  HF < LF
- **Constraint**
  High-C < Low-C
  (*dwarf*) < (*clown*)

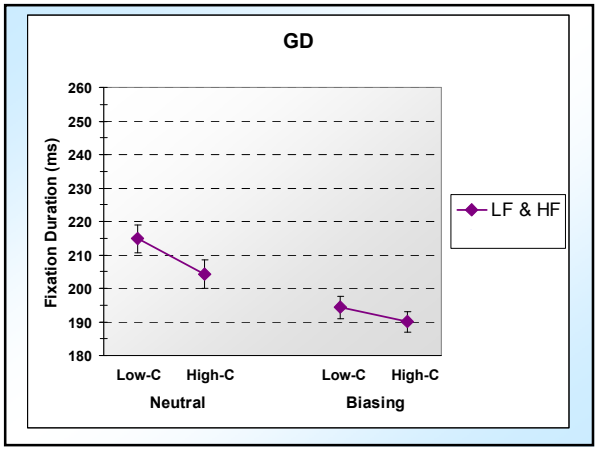


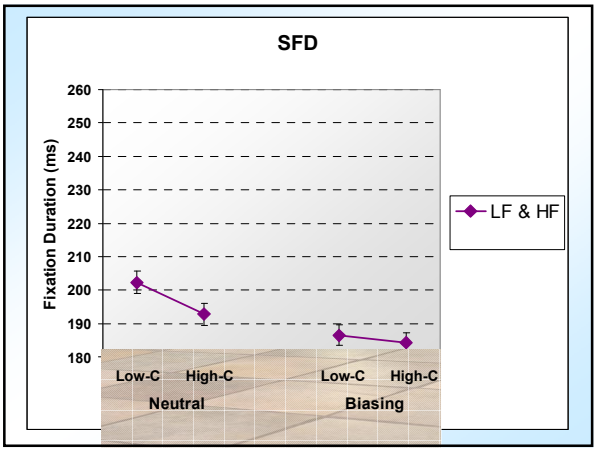


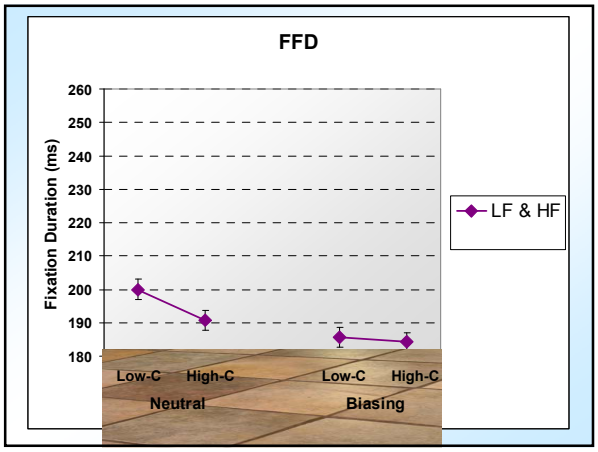

GD
Fixation Duration (ms)
235
225
215
205
195
185
175
LF
HF
Low-C
High-C
Low-C
High-C
Neutral
Biasing


TT
Fixation Duration (ms)
275
265
255
245
235
225
215
205
195
185
LF
HF
Low-C
High-C
Low-C
High-C
Neutral
Biasing


TT
Fixation Duration (ms)
260
250
240
230
220
210
200
190
180
LF & HF
Low-C
High-C
Low-C
High-C
Neutral
Biasing


GD
Fixation Duration (ms)
260
250
240
230
220
210
200
190
180
LF & HF
Low-C
High-C
Low-C
High-C
Neutral
Biasing


SFD
Fixation Duration (ms)
260
250
240
230
220
210
200
190
180
LF & HF
Low-C
High-C
Low-C
High-C
Neutral
Biasing

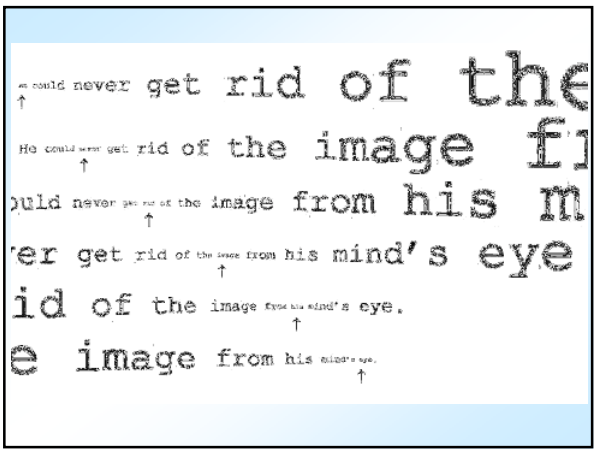

FFD
Fixation Duration (ms)
260
250
240
230
220
210
200
190
180
LF & HF
Low-C
High-C
Low-C
High-C
Neutral
Biasing

Old vs. Spankin' new dwarf

	Old	New
#Sub	18	48
Design	2 x 3	2 x 2 x 2
#Item/sub/cond	7	11
#Data points (McConkie's *N*)	756	4224
Font	dot-matrix (pixelated)	clear (intrepid)

Dwarf: The next generation?

- Parafoveal Magnification
  - Miellet, O'Donnell, & Sereno (submitted)
  - Compensate for acuity drop-off as a function of retinal eccentricity
  - On each fixation and in real time, parafoveal text is magnified to functionally equalize its perceptual impact with concurrent foveal text.



Bottom Line

- Lexical access in reading – as indexed by FFD, the most immediate measure of processing – is facilitated when a word:
  - appears in a Biasing context
  - is of higher Frequency
  - is of high Constraint, with few trigram neighbors
- In sum, every little bit helps.

Target words (1)

LF		HF	
Low-C	High-C	Low-C	High-C
scary	itchy	ships	dirty
spade	foggy	bread	knife
clown	acorn	rough	uncle
steak	dizzy	theme	smoke
pearl	dwarf	grass	agent
spoon	ivory	sharp	teeth
thief	ankle	track	video
chalk	lemon	speed	joint
salad	fibre	stone	royal
stamp	piano	story	hands
brass	album	words	light

Target words (2)

LF		HF	
Low-C	High-C	Low-C	High-C
froth	yolks	clock	dying
scalp	foxes	proud	lists
stale	muddy	chest	guard
claws	dusty	plate	rugby
stain	veins	crowd	sugar
stack	lions	train	armed
shiny	elbow	plant	image
tribe	skull	heavy	girls
beard	faded	stand	happy
sweat	punch	start	music
faint	fence	white	large

Comparison of Studies: Constraint

Condition	Study	#TrigramN 5-let	x-let
Low-C	L & I	1	5
	ours	2	30
High-C	L & I	9	80
	ours	19	213

Comparison of Studies: LF targets in Neutral contexts

	FFD		GD	
	dwarf	*clown*	*dwarf*	*clown*
Study	Hi-C	Lo-C	Hi-C	Lo-C
L & I (full-line)	231 >	219	256 >	249
Ours	194 <	204	208 <	223
Fix Time Diff:	26 ms		37 ms	

Comparison of Studies: Frequency

Study		Freq	Log-based
L&I:	Exp1	11	5
	Exp2	95	18
Ours:	LF	9	7
	HF	88	66

Postscript…

Ode to Chuck