

Transformer-Maze:

An Accessible Incremental Processing Measurement Tool

On crowd-sourcing platforms, **G**(rammatical)-**M**aze (Forester et al. 2009) is more effective than self-paced reading (SPR) (Mitchell & Green, 1978) at:

- Detecting differences in processing difficulty
- Localizing these differences

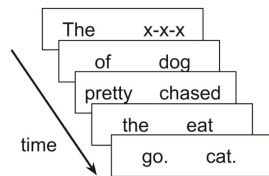


Figure from Boyce et al. (2010)

Problem:

Generating thousands of distractors well-matched to the experimental stimuli is time-consuming and difficult by hand.

→ **A**(uto)-**M**aze (Boyce et al., 2020) automates distractor generation using recurrent neural network (RNN) language models

Our solution:

T(ransformer)-**M**aze: automated distractor generation system using Transformer models instead of RNNs because:

- Transformers = Current NLP state-of-the-art
- Thousands of Transformers pretrained in hundreds of languages available online for free

Methods:

We replicated Boyce et al. (2020)'s validation experiment on Prolific (N=49) with T-Maze generated materials, comparing T-Maze vs in-lab G-Maze (Witzel et al., 2012) vs web G-Maze2 versions of A-Maze on 3 types of ambiguous sentence structures:

Relative clause - Low attachment:

(1a) The niece of the fisherman who got *himself* a sailboat learned to sail.

Relative clause - High attachment:

(1b) The niece of the fisherman who got *herself* a sailboat learned to sail.

Adverb clause - Low attachment:

(2a) Robert will meet the friend he phoned *yesterday*, but he doesn't want to.

Adverb clause - High attachment:

(2b) Robert will meet the friend he phoned *tomorrow*, but he doesn't want to.

Sentence vs noun phrase (S v NP) coordination - With comma:

(3a) The crowd cheered for the model, and the designer *took* a bow after the show

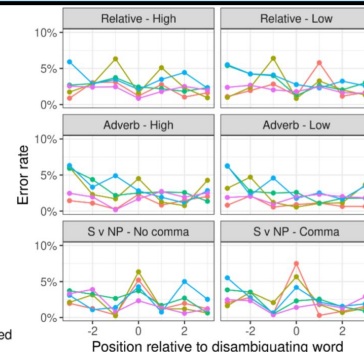
Sentence vs noun phrase (S v NP) coordination - No comma:

(3b) The crowd cheered for the model and the designer *took* a bow after the show.

Results:

T-Maze is **just as effective as** in-lab G-Maze and A-Maze.

- Lab G-maze
- Web G-maze
- Web A-maze Gulordava
- Web A-maze Jozefowicz
- Web T-maze bert-base-uncased



Penalty for high attachment or no comma conditions

