The Effect of Distractor Presentation Frequency on Saccade Reaction Times & Curvature
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1. Background

- The frequency with which an irrelevant distractor appears may influence both saccade reaction times and curvature.

Saccade Reaction Times
- The appearance of an irrelevant stimulus 160 ms or more before the onset of a target has been shown to produce a decrease in saccade reaction times (Walker, Kenridge, & Findlay, 1995).
- Hermens & Walker (2010) found presenting a peripheral distractor 300 ms prior to the target on 75% of the trials produced faster saccade reaction times compared to no distractor trials.
- Irrelevant distractors may act as a temporal warning cue as a result of sufficient processing time (Hermens & Walker, 2010; Walker, et al., 1995), but frequency might also be a factor.

Saccade Curvature
- In Hermens & Walker (2010) faster saccade reaction times were accompanied with curvature away from the irrelevant cued location for a frequently presented distractor.
- Saccade curvature has been shown to differ based on the reaction time to execute the saccade (McSorley, Haggard, & Walker, 2006; 2009; Mulckhuyse, Van der Stigchel, & Theeuwes, 2009).
- Curvature away has been associated with suppression in FEF activity (McPeek, 2006) and is hypothesized to occur when the distractor can be strongly inhibited (McSorley, et al., 2006).

2. Current Research & Design

- The frequency with which an irrelevant distractor appears may influence both saccade reaction times and curvature.

Does frequency modulate saccade reaction time?
- Distractor-frequency and distractor-presence are predicted to interact
- High frequency will produce the fastest saccade reaction times.

Does frequency affect saccade curvature?
- Frequency is predicted to influence curvature by decreasing the curvature away from high present trials.

3. Results

**Saccade Reaction Times**
- A main effect of distractor-presence: $F(1,24) = 96.79, p < .001, \eta_p^2 = .801$
- No main effect of distractor-frequency: $F(1,24) = 1.066, p = .312, \eta_p^2 = .043$
- An interaction between distractor-presence and distractor-frequency:
  - $F(1,24) = 74.664, p < .001, \eta_p^2 = .757$
- High frequency distractor-present trials were faster than low frequency distractor present trials: $t(24) = -3.735, p = .001$

**Saccade Curvature**
- A main effect of distractor-presence: $F(1,24) = 7.957, p = .009, \eta_p^2 = .249$
- No main effect of distractor-frequency: $F < 1, \eta_p^2 = .23$
- No interaction of distractor-presence and distractor-frequency: $F < 1, \eta_p^2 = .001$

4. Discussion

- With frequent presentation and time, distractors can act as temporal warning cues for saccade preparation.

Does frequency modulate saccade reaction times?
- Yes, saccade reaction times were faster when the distractor appeared often. It appears the activation of the distractor on the saccade motor map is short lived when the distractor appears frequently.

Does frequency affect saccade curvature?
- No, however curvature away in the high frequency condition suggests there was still suppression of the distractor in the oculomotor system.