

Measuring Guided Search Parameters in Ecological Context with Mobile Eye-Tracking

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Humans routinely look for specific objects among other objects, most of which are irrelevant to the task at hand. This process is known as visual search and is found in various settings such as assembling IKEA® furniture and looking for suspicious objects in airport security scanners.

A common theory of this process known as guided search (Wolfe, 2015) asserts that attentional deployment is “guided” by features of targets together with expectations about likely locations of objects in a scene. One of the models of guided search where several targets are simultaneously searched among a large number of distractors (as in assembling LEGO® figures) is hybrid foraging search (Wolfe, Aizenman, Boettcher & Cain, 2016), where foraging refers to the fact that many instances of targets held in memory could be present simultaneously. This model assumes an involvement of working memory (Drew, Boettcher & Wolfe, 2016) and establishes a relationship between how many objects are held in memory (memory set size, MSS), how many distractors are present (visual set size, VSS), and reaction time (RT), such that RT is linearly related to VSS and to logarithm of MSS.

Experimental paradigms in the study of visual search usually involve stimuli presentation on a computer screen, with key-press- or mouse-click-based measurement of reaction time. The present study is an attempt to measure such reaction times in an ecological context of a real sensorimotor task—assembling simple LEGO® figures—where visual search theory predicts that search behaviour at the stage of looking for correct blocks will exhibit hybrid foraging characteristics.

12 participants wearing a Tobii® Pro Glasses 2 mobile eye tracker assembled LEGO® figures in a within-participant setup. Each participant assembled three figures of eight assembly steps each, with figures arranged in a Latin Square. For each step in assembly, the participants rotated on a swivelling chair between three different stations: instruction screen (presented on a laptop computer), search patch (tray with target and distractor blocks), and assembly desk (where figure was built). Search patch was shuffled between steps. Participants’ gaze was tracked at 60 Hz sampling rate.

RT was extracted from gaze overlay videos, with trial start defined as first fixation on the LEGO® blocks in the search patch tray as the participant proceeded with assembly steps. In this presentation we discuss the applicability, validity and robustness of three different RT measures with respect to establishing visual search model parameters: (1) start of first fixation on a target when it is followed by picking up the target; (2) end of first fixation on a target; (3) first touch of the target. We discuss model differences in terms of how these measures reflect different concepts of guided search termination.

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