VPC-W: a Web-based visual paired comparison task for early detection of amnestic mild cognitive impairment

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Patients diagnosed with the amnestic subtype of mild cognitive impairment (aMCI) are at an increased risk for developing dementia, especially Alzheimer’s Disease (Crutcher et al., 2009). One highly promising method for early detection of aMCI is the Visual Paired Comparison (VPC) task (Zola et al. 2009). In this task, a novel picture and a recently presented picture are shown to the subject side-by-side, and the subject’s tendency to look at the novel picture is measured with infrared eye-tracking equipment. Normal subjects typically look at the novel picture about two-thirds of the time. Potential limitations in large-scale usage of VPC for clinical and research applications include the requirements for expensive eye-tracking equipment and trained personnel to administer the task. We present a web-based version of this task, the VPC-W, which allows subjects to be tested on any computer with internet access. VPC-W is structured identically to the original VPC task, but the subject is presented with a blurred view of the pictures and is instructed to move an oval-shaped “oculus” with a computer mouse or trackpad to view a part of the picture in sharp detail (simulating foveal vision). VPC-W tracks the “oculus” position, using it to estimate the subjects’ looking time on the novel picture. We report findings on administering VPC-W over the internet to 34 presumed normal control (NC) elderly subjects. The instructions to the subjects were simply to “view the images using the mouse to look at whatever interests you.” Two delay intervals were used between the initial viewing of a picture and the preferential looking phase of the task, i.e., 10 seconds, where there is little challenge to memory, and 1 minute, a delay interval that requires engagement of the hippocampus for normal performance (Zola et al., 2000). At the 10 second delay, 13 NC subjects (mean age=63) viewed the novel picture 65% of the time, which is significantly greater than chance (p<0.01) and is similar to novelty preference as assessed by eye tracking at a comparable delay (67%; Crutcher et al., 2009). At the 1-minute delay, 21 NC subjects (mean age=61) viewed the novel picture 69% of the time, which is significantly greater than chance (p<0.001), and similar to novelty preference as assessed by eye tracking at a comparable delay (68%; Crutcher et al., 2009). These findings show that VPC-W, administered over the internet without in-person supervision, elicits viewing behavior in normal elderly subjects (the target population for early aMCI detection) similar to the eye tracking-based VPC task administered in the clinic. An important next question is whether VPC-W can reliably identify patients with aMCI.