

Keeping an eye on the truth: Pupil size, recognition memory and malingering

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Background: Estimates of the incidence of malingering in patient populations vary from 1 to 12%, rising to ~25% in patients seeking financial compensation. Malingering is particularly difficult to detect when patients feign poor performance on neuropsychological tests (see Hutchinson, 2001). One strategy to detect malingering has been to identify psychophysiological markers associated with deception. Tardif, Barry, Fox and Johnstone (2000) used electroencephalogram (EEG) recording to measure event related potentials (ERPs) during a standard recognition memory test. Previous research has documented an ERP “old/new effect” – late positive parietal ERPs are larger when participants view old, learned words compared to new words during recognition. Tardif et al. reasoned that if this effect is not under conscious control, then it should be equally detectable in people feigning amnesia as in participants performing to their best ability. As predicted, they found no difference in the magnitude and topography of the old/new ERP effect between participants who were asked to feign amnesia whilst performing the test and those asked to perform to their best ability. Whilst this approach shows some promise, EEG is comparatively time consuming and expensive. Previous research has shown that during recognition memory tests, participants' pupils dilate more when they view old items compared to new items (Otero, Weeks, and Hutton, 2006; Vo et al., 2008). This pupil “old/new effect” may present a simpler means by which to establish whether participants are feigning amnesia.

Method: We used video-based oculography to compare changes in pupil size during a recognition memory test when participants were given standard recognition memory instructions, instructions to feign amnesia and instructions to report all items as new. Due to constant fluctuation in pupil size over time, and variation between individuals, a pupil dilation ratio (PDR) was calculated that represented the maximum pupil size during the trial as a proportion of the maximum during baseline.

Results: Participants' pupils dilated more to old items compared to new items under all three instruction conditions ($F(1.25) = 47.02$, $MSE < 0.001$, $p < .001$, $\eta_p^2 = .65$). There were no significant differences between baseline pupil size ($F(1.63, 40.76) = 1.90$, $p = .17$, ns).

Conclusions: The finding that under standard recognition memory instructions, participants' relative increase in pupil size is greater when they view old items compared to new items replicates previous research documenting the pupil old/new effect. That the effect persists, even when participants give erroneous responses during recognition, suggests that the “pupil old/new effect” is not under conscious control and may therefore have potential use in clinical settings as a simple means with which to detect whether patients are feigning amnesia.

References

Hutchinson, L. (2001). *Disorders of simulation*. Madison, US: Psychosocial Press.

Otero, S., Weeks, B., & Hutton, S. (2006). A novel association between pupil size and recollective experience during recognition memory. Abstract presented at The Second Biennial Conference on Cognitive Science, St Petersburg, Russia.

Tardif, H.P., Barry, R.J., Fox, A.M., & Johnstone, S.J. (2000). Detection of feigned recognition memory impairment using the old/new effect of the event-related potential. *International Journal of Psychophysiology*, 36, 1-9.

Vo, M.L.H., Jacobs, A.M., Kuchinke, L., Hofmann, M., Conrad, M., Schacht, A., Hutzler, F. (2008). The coupling of emotion and cognition in the eye: Introducing the pupil old/new effect. *Psychophysiology*, 45 (1), 130-140.

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