Researchers have recently become interested in studying individual differences in the attentional blink (AB). The AB is an impaired ability to report a target that follows within approximately 100-500 ms of a previously detected target; it is as though processing the first target causes attention to briefly "blink," thereby missing whatever occurs during the blink period. The AB is generally thought to reflect late stage attentional capacity limitations, which evidence suggests is linked to working memory capacity (e.g., Arrern et al., 2010). Not only do individuals vary in their AB magnitude (or how much they miss), the AB can be reduced by meditation (May et al., 2011; Slagter et al., 2007; Leeuwen et al., 2009). Understanding the sources of variability in the AB may therefore facilitate an understanding of attentional-induced neural changes and enable more targeted interventions to improve attentional and working memory capacity. We created a neural network model using MatLab to identify mechanisms underlying both individual variability and meditation-induced changes in the attentional blink.

The architecture of our neural network is depicted to the right. The activations of the Hidden Units (T1,D1&T2) and the Output Units are governed by the equation, y(t) = Wy(t-1) + Vx(t-1) where y is a vector of continuous valued outputs in the range [0,1.0) at discrete time t, W is a weight matrix for connections [-1.0,1.0] between Output Units and Hidden (recurrent and inhibitory connections, respectively); V is a weight matrix for connections [0.0,1.0] between Input Units and Output Units (feedforward connections), and x is an input vector of integers [0,1].

The first target (T1) was presented at t=1 on every trial by setting the T1 Input Unit to 1 (for t=1 only). The second target (T2) was presented at one of ten lags [1:10] from T1 by setting the T2 Input Unit to 1 for one or more time steps. The Attentional Set neuron was active in trials with distractors, boosting T1 and T2 inputs 100% over distractors.

For analysis, T1 and T2 Output Unit values were rounded to the nearest integer [0,1], representing failure to encode the target into working memory at a particular time step or successful consolidation, respectively.

References


