IN BRIEF...

Syntaxin 1a and Amphetamine Fun

F Binda, C Dipace, **E Bowton**, **SD Robertson**, **BJ Lute**, JU Fog, M Zhang, N Sen, RJ Colbran, ME Gnegy, U Gether, JA Javitch, K Erreger and A Galli (2008). Syntaxin 1A Interaction with the Dopamine Transporter Promotes Amphetamine-Induced Dopamine Efflux. *Mol. Pharmacol*. **74** (4): 1101-1108.

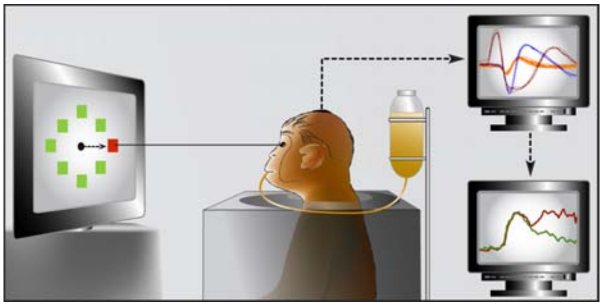
Amphetamine (AMPH) is a psychostimulant with rewarding properties as a drug of abuse. AMPH works on the dopamine transporter (DAT) by causing dopamine efflux through the transporter. In this study, the authors demonstrated that AMPH-induced activation of CaMKII causes syntaxin 1a, a protein critical in mediating vesicle fusion to the plasma membrane, to bind to the DAT N-terminus with greater affinity and increase AMPH-induced dopamine efflux. These results offer insight into the mechanism by which AMPH works as a drug of abuse, and may suggest the target for treatment of AMPH-related drug addiction.

Increased SERT activity and Autism

HC Prasad, **JA Steiner**, JS Sutcliffe and RD Blakely (2009). Enhanced activity of human serotonin transporter variants associated with autism. *Phil. Trans. R. Soc. B*. **364**: 163-173.

This study elaborates on findings of two previous studies (Prasad *et al*. 2005. *PNAS USA*. **102**: 11545-11550; Sutcliffe et al. 2005. *Am. J. Hum. Genet*. **77**: 265-279) showing highly significant linkage between the human serotonin transporter (hSERT) gene (*SLC6A4*) and autism spectrum disorders (ASD). In this study, the authors demonstrated that three variants in hSERT result in a gain-of-function. This increase in transporter activity may contribute to the developmentally atypical aspects of ASD, and may suggest the mechanism by which serotonin plays a role in autism.

Focus among distraction



One of the most widely studied topics in neuroscience is the cognitive process of attention, the process of focusing on one feature of the environment while ignoring all else. Progressing a long way since the early years of relying on introspection as primary methodology, today scientists are investigating the mechanisms that underlie the neural basis of attention. Fundamental to theories of visual attention is the phenomenon that increasing the number of distractors in the environment increases the length of time it takes to select a target due to capacity limitations within the visual system. In their recent report in the *Journal of Neurophysiology*, Cohen and colleagues have investigated the neural basis of this observation.

Macaque monkeys were given the visual task of making a saccade to a target (**T** or **L**) in an array of distractors (**L** or **T**). The task was made more difficult by increasing the number of distractors (1, 3, or 7) in the visual array. Electrophysiological recordings were taken from microelectrodes in the frontal eye field (FEF), a key structure in the visual search network. Both the reaction time, the amount of time it takes a monkey to saccade, and the selection time, the time it takes a neuron to distinguish between target and distractor, were recorded.

The increase in the number of distractors resulted in an increase in the reaction time for both monkeys. The selection time, both across and within individual neurons, was significantly longer with 7 distractors than with 3 or 1. For one of the monkeys, there was also a (across neuron) significant increase in the selection time for 3 distractors vs. 1 distractor. To measure the relationship between the reaction time and the selection time, the investigators fit a linear regression and found that for trials with 7 distractors the regression reached significance. This means that during trials with the most distractors, the selection time of FEF neurons accounts for a significant portion of the variance in the reaction time.

The researchers also found that as the number of distractors increased the peak firing rate of FEF neurons decreased. This decrease in discharge makes it harder to distinguish between target and distractors (signal and noise), possibly accounting for the longer selection times.

This study demonstrates that with increasingly complex visual search tasks, with an increasing number of distractors, FEF neurons fire at a decreased rate and increased selection time, leading to an increase in the amount of time it takes to complete the task. The authors contribute to the theories of visual attention by suggesting a neural mechanism for the limited capacity of the visual system to attend to all inputs within the visual array.

Original Research Article:
JY Cohen, RP Heitz, GF Woodman and JD Schall (2009). Neural Basis of the Set-Size Effect in Frontal Eye Field: Timing of Attention During Visual Search. *J Neurophysiol*. **101**: 1699-1704.