

Both methylphenidate and acetyl-L-carnitine reduce impulsivity in adolescent SHRs, an animal model of ADHD

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Attention-deficit/Hyperactivity Disorder (ADHD) can affect human infants and adolescents. Two important features of this disorder are intolerance to reward delay and impulsivity. The present study assessed the ability of methylphenidate (MPH, 0 or 3 mg/kg ip twice daily) or Acetyl-L-carnitine (ALC, 0 or 100 mg/kg sc once daily plus 50 mg/kg orally) to reduce impulsivity in food-restricted Spontaneously-Hypertensive-Rats (SHR), a validated animal model for ADHD. Separate sets of animals were tested during adolescence (postnatal days, pnd, 30 to 45) in operant chambers with two nose-poking holes, delivering one food pellet immediately, or five pellets after a delay, respectively. Delay length was increased over days (from 0 to 100 sec). Individual differences in the preference-to-delay curve allowed the identification of two distinct subpopulations, i.e. the "non-impulsive" with a flat slope and the "impulsive" with a very steep slope. The reduced self-control, shown by saline-injected impulsive subjects, was consistently reduced by MPH and by ALC administration. Impulsive rats exhibited a lower metabolite/serotonin (5HIAA/5HT) ratio in the medial frontal cortex (MFC) and lower noradrenaline (NA) levels in the cingulate cortex (CC) when compared to the non-impulsive group. The ALC treatment increased the 5HIAA/5HT ratio in the MFC and NA levels in the CC. Present data extend the beneficial effects for the treatment of ADHD children to drugs devoid of psychostimulant properties.