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MEETING ABSTRACT

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Sriatal dopamine D_{2/3} receptors and amphetamine-evoked dopamine release in impulsivity and novelty-seeking traits: a SPECT imaging study using [^{123}I]IBZM
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Impulsivity and novelty-seeking (NS) have been studied for their potential role in the vulnerability to drug abuse. Impulsivity has been linked to a decreased density of dopamine (DA) D_{2/3} receptors (D_{2/3}R) in striatum whereas studies trying to link D_{2/3}R to NS, which has an impulsive component, have provided mixed data. Clinical imaging studies have shown that D_{2/3}R binding and presynaptic DA release in striatum are lowered in addicted subjects. However, understanding whether those deficits are a cause or a consequence of addiction remains unclear. The aim of this study was to determine the relationships between NS and impulsivity on one hand, and D_{2/3}R density and DA release in striatum on the other hand.

We used the Roman low- and high-avoidance rat (RLA vs. RHA) lines, which show divergent phenotypes with regards to impulsivity and NS. RHAs (n = 15) and RLAs (n = 15) were tested for impulsivity using the 5-choice serial reaction time task (5-CSRTT) and for NS using the novelty-induced place preference (NIPP) test. Rats were scanned with SPECT using [^{123}I]IBZM to measure D_{2/3}R density and amphetamine (AMPH)-induced DA release in striatum. Binding potential (BP_{ND}) and gamma (γ) values were quantified as indexes of D_{2/3}R density and AMPH-induced DA release, respectively, using a single scan and the linearized simplified reference region model.

Compared to RLAs, RHAs were more impulsive as shown by a greater number of premature responses (p < 0.01) and more novelty seeker as shown by the time spent in a novel compartment (p < 0.05). In addition, RHAs showed lower BP_{ND} (p < 0.001) and released more striatal DA in response to AMPH (p < 0.01) than RLAs. Importantly, individual values of premature responding were negatively correlated (r = −0.65, p < 0.01) with BP_{ND}, but positively correlated with γ (r = 0.64, p < 0.01), while pilot data showed that NS scores correlated with γ (r = 0.41, p < 0.03) but not BP_{ND} (p < 0.05). Interestingly, individual BP_{ND} were negatively correlated with γ (r = −0.59, p < 0.01).

Our study confirms and extends previous data of an association between D_{2/3}R deficits in striatum and impulsivity by showing that presynaptic DA release could be important in underlying this personality trait. Furthermore, although NS has been associated to impulsivity, both personality traits may not share the exact same neurochemical substrates. Those findings provide further information on the mechanism by which altered transmission at D_{2/3}R may contribute to impulsive behaviours.

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