

The Role of Dopamine in Impulse Control: How Biology Influences Behaviour Hayley MacDonald^{1,2}

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Impulse control is the ability to withhold or cancel inappropriate behaviours and is heavily influenced by levels of dopamine in the brain. Variation in dopamine-regulating genes may influence impulse control by impacting tonic levels of central dopamine transmission. There are five key genes which can influence widespread dopamine neurotransmission – genes coding for the dopamine D1, D2 and D3 receptors, catechol-O-methyltransferase enzyme, and dopamine transporter protein. Central dopamine levels can be quantified with a dopamine genetic risk score (DGRS) that reflects the presence of mutations within these genes that alter function of the resulting proteins. A higher DGRS reflects higher overall levels of dopamine within an individual. I will present findings from young and older healthy adults, as well as Parkinson's disease patients, that demonstrate the DGRS is linked with impulse control behaviours, response to dopamine medication, and peripheral concentrations of dopamine metabolites. Specifically, that individuals with a higher DGRS have higher levels of the dopamine metabolite homovanillic acid in their blood, exhibit better impulse control and have a lower incidence of impulse control disorders, compared to individuals with a low DGRS. However, individuals with a higher DGRS are adversely affected when dopamine is increased via medication, showing impairments on impulse control tasks and a greater range of dysfunctional real-world impulse control behaviours compared to individuals with a lower DGRS. Collectively, our findings provide support for the DGRS being a valid and sensitive proxy for capturing individual differences in dopamine transmission and the implications this has for impulse control behaviour.