**Dopamine and motivation. ADD and ADHD**

“Motivation is transforming a rewarding stimulus into a stimulus that commands attention, induces approach and cause it to be sought out.” This is regulated through the mesocorticolimbic projection by dopamine and to a lesser extent noradrenaline. Simplified this is the brain stem to cortex nerve pathways that modulates motivation.

Addiction is a dysregulation of this system. But apart from addiction what about other less severe dysregulation of this system. A well-functioning natural system has good homeostasis.

It is the dysregulation of this system that is a core characteristic of ADD and ADHD. The person with ADD has little motivation to do anything. They know they should but don't. We all suffer from low motivation at times such as when tired or after a few drinks.

If the system is too up regulated, then the person may become addicted. It is unusual to have a child with ADHD, (hyper), who is not addicted to computer games. They can play for hours or even days often severely delaying sleep. When there is a strong incentive or stimulus, usually of the visual kind that is constantly changing, the motivational pathways become over stimulated in susceptible people. (Poker machines) Addictive behaviour is when these pathways are over activated by stimulii that results in negative outcomes.

Ideally our motivational pathways will always be activated to the right level resulting in optimal behaviour for all circumstances. An impossible hope.

It is instructive when dealing with poor behaviour to view it from the perspective of poorly regulated motivation. Motivational dysregulation is the defining feature of ADD and ADHD. Once you known what a person with ADD/ADHD behaves like it is an easy condition to diagnose but hard to describe. This is like describing the difference between a cat and a dog, easy to pick but hard to define. Dysregulation is why paradoxical behaviour i.e. no motivation for schoolwork, domestic work, organisation, social situations contrast with the intense focused striving of people with ADHD. This intense focus can be negative such as with visual computer games or positive with a job for which there is intense commitment and energy. Unfortunately, this focus can be to the detriment of other aspects of their lives.

Dopamine is central to motivation. Stimulants, especially methylphenidate have the effect of modulating dopamine. It can increase dopamine, thus improving motivation. Also, via negative feedback to the basal ganglion will reduce over stimulation.

That is why methylphenidate can both help ADD, with low dopamine and motivation and modulate ADHD, with inappropriately high dopamine.

**Medication dosages and Paradoxical effects**

Psychotropic medications have so many unexpected and paradoxical side-effects. Effective dosages are wide, often being an order of magnitude, 10 X. This makes dosage titration vital to avoid side-effects or for the medication to even have an effect.

These complicating issues are more obvious with psychotropic medication because the brain has many feedback loops that either amplify or suppress an intervention. For example, some serotonin receptors stimulate, others suppress, even where the receptors are on the nerve will result in different effects. “Serotonin binds to auto-receptors on the presynaptic neuron to regulate the synthesis and release of serotonin.”

Homeostasis is vital and most psychiatric conditions are when there is an imbalance. Giving medication is an attempt to either change the brains set points or modify the feedback loops.

Negative feedback stabilises, positive feedback amplifies. Too much negative feedback results in less or minimal effect. Too much positive feedback results in unexpected impact or even an ever increasing out of control effect, like a screaming microphone. That is why you should expect the unexpected. By understanding what is happening you can explain why either a low dose or a very high dose may work best for an individual. When you get an unexpected outcome think about why this could be happening and use the insight to plan future management.

**Smoking Nicotine and ADHD**

Have you ever wondered why people smoke.? Why we are seeing more adult ADHD?

Nicotine stimulates dopamine release in the brain, thus having a similar effect as the stimulants. Many people smoke as they cannot function without smoking. Just ask a mother of an ADHD child what they are like prior to medication. Many studies have confirmed this connection. Just Google ADHD Nicotine. With the success of the anti smoking campaign, adult ADHD sufferers who previously self medicated are no longer in control. It is either stimulant medication or nicotine to function. Don’t blame the tobacco addict, blame the medical profession for not recognising the real problem and then treating rather than letting people kill themselves by smoking.

Tobacco companies realised this years ago. The advertisements below could have been for stimulants or anxiety medications.

<https://adhdrollercoaster.org/myth-busting/adhd-nicotine-historical-ads/>

Dr Donald L Butler

60 Cecil Ave,

Castle Hill NSW 2154