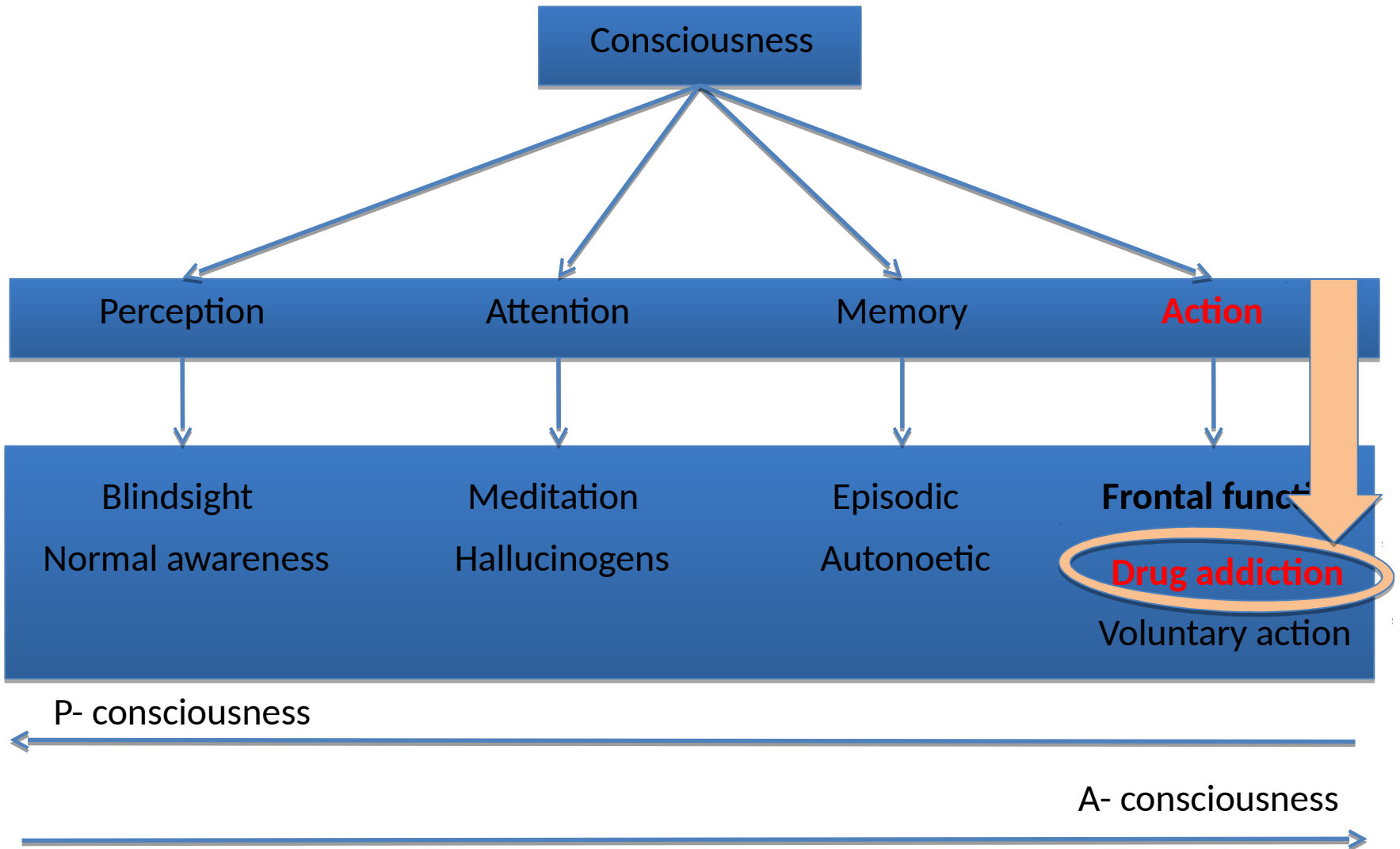


# Drug addiction

- Robinson, T. E. (2003). Addiction. *Annual Review of Psychology*, 54 , 25-53.

# Scientific study of consciousness

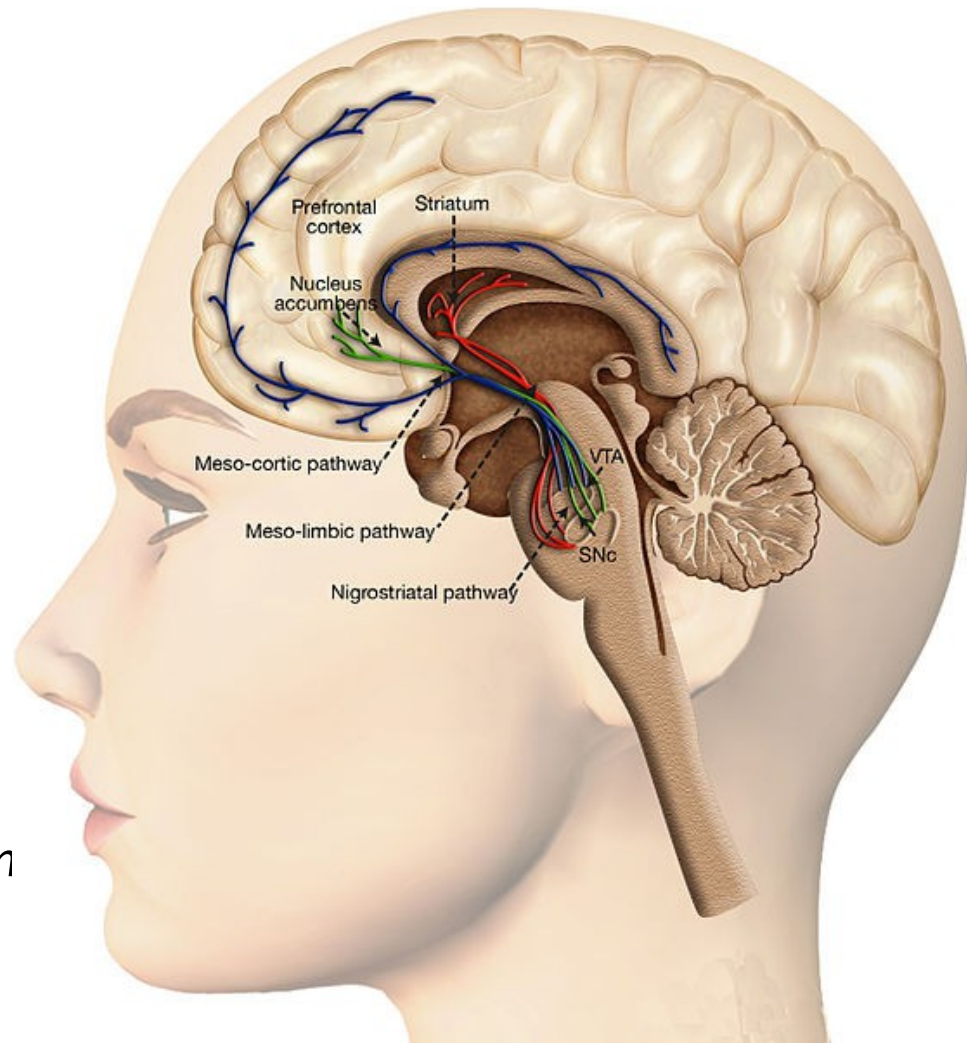


# Nature of drug addiction

- “compulsive pattern of drug-seeking and drug-taking behavior that takes place at the expense of most other activities”
- Clear relation to intentional action / free will.
- Drug exposure high (60%; 90% inc. alcohol)
- Addiction (at least as defined above) rare (cocaine: 15% in 10yrs use)

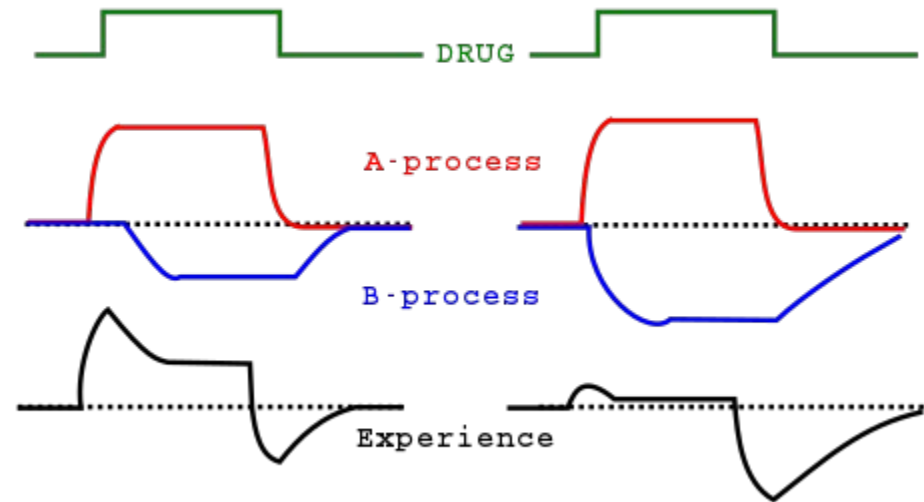
# Brain systems

- The basic neuroscience is well understood, and applies to most addictive drugs.
- dopamine projections from the ventral tegmental area and substantia nigra to the nucleus accumbens (NAcc) and striatum, as well as glutamate inputs from the prefrontal cortex, amygdala and hippocampus.
- In other words, central reward system.
- Addictive drugs not only *operate on* but also *change* these pathways.
- But what are the psychological effects?



# Tolerance and withdrawal symptoms

- Drug taking is initially reinforced by the “highs”, but pharmacological tolerance sets in, and then drug taking is maintained by avoidance of the “lows”.
- Formally, “opponent process” theory.
- But the relation between withdrawal symptoms and recidivism is pretty weak (hence the relatively poor record of detox-based drug rehabilitation programmes).
- Also some interesting animal studies considering a-process and b-process induction by drugs, and effects on relapse (turns out to be a rather than b).



# Goal versus Habit learning systems

- Action-outcome (goal directed learning)
- Stimulus-response (habitual learning)
- Even with reinforcers such as food, or secondary reinforcement, repeated actions become habitual (hence “slips of action”).
- Neuroscience indicates drugs of addiction powerfully activate reward systems in the S-R system (corticostriatal loops).
- Good support from animal studies
- Some (e.g. Robinson & Berridge) think it’s unlikely because many habitual behaviours do not appear to be “addictive” in the same sense as drug taking. A rather phenomenological argument.
- One real paradox - drug-seeking behaviour in humans seems highly goal-directed and flexible.

# Incentive sensitization: Compulsive “wanting”

- “Wanting” (incentive motivation) and “liking” (reward systems) are dissociable.
- Not all drug effects habituate (tolerance), some sensitive (increase).
- Addictive drugs seem to cause psychomotor sensitization (e.g. Heightened locomotion, exploration, approach).
- Psychomotor sensitization is context-specific (and hence seems to involve learning) – both in terms of generalization decrement, and the absolute novelty of the learning context.
- Drug-induced sensitization leads rats to work harder for a reward, and increases incentive value of a reward (e.g. as measured by running speed)
- Drug-related cues (in animal models) seem to do the same ie. Make them work harder for a reward.
- Implication: Drug-related cues in humans produce excessive “wanting” of those drugs.
- Animal models suggest this psychomotor sensitization can persist for years after drugs administration has stopped.
- Psychomotor sensitization shows stark individual differences.
- There may be cross-sensitization to other drugs. And to stress.

## Frontal damage: “Blowing your brains out”

- Chronic drug exposure depresses neural processing in frontal regions – both activity and, in polysubstance abuse – sometimes also volume.
- Chronic drug users show a similar profile of deficits on cognitive tasks to those seen in patients with frontal lobe damage.
- Frontal regions are involved in inhibitory control. Damage leads to difficulty in inhibiting prepotent responses.