



Sensory Processing SensiTivity AND drug Use recovery Pathways

STANDUP

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Evolutionary emergence of responsive and unresponsive personalities

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Two types of behavioral responses to new or threatening situations can be observed:

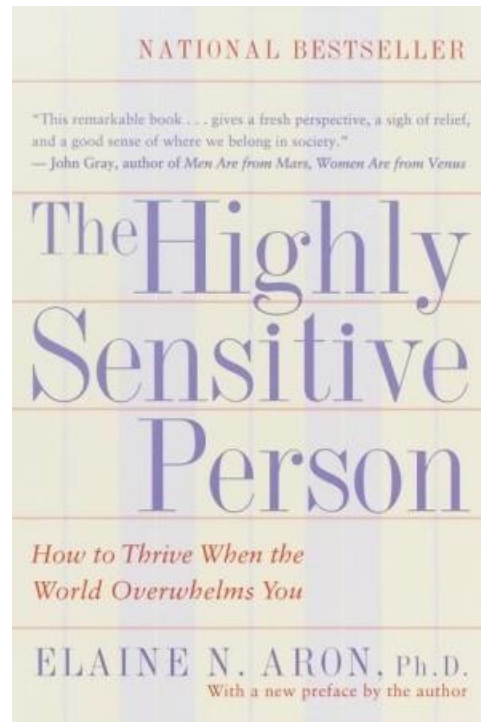
- Some individuals are bold, aggressive and impulsive; they quickly form a routine and are not influenced by (minor) environmental changes
- Other individuals are cautious and fearful; they avoid forming a routine and remain attentive to (minor) environmental changes

Individual differences in environmental sensitivity are seen across species

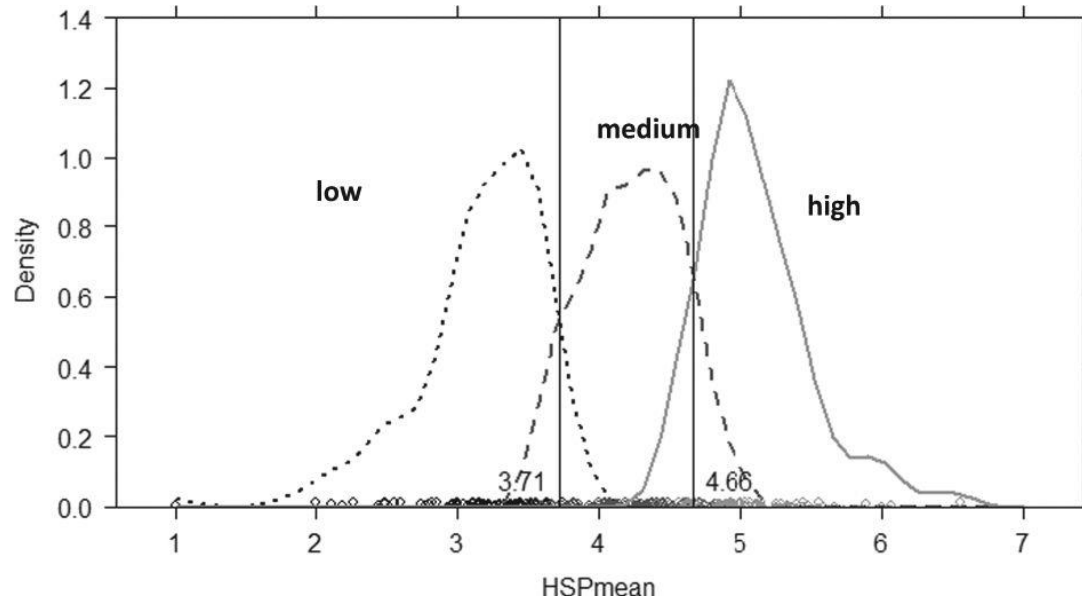


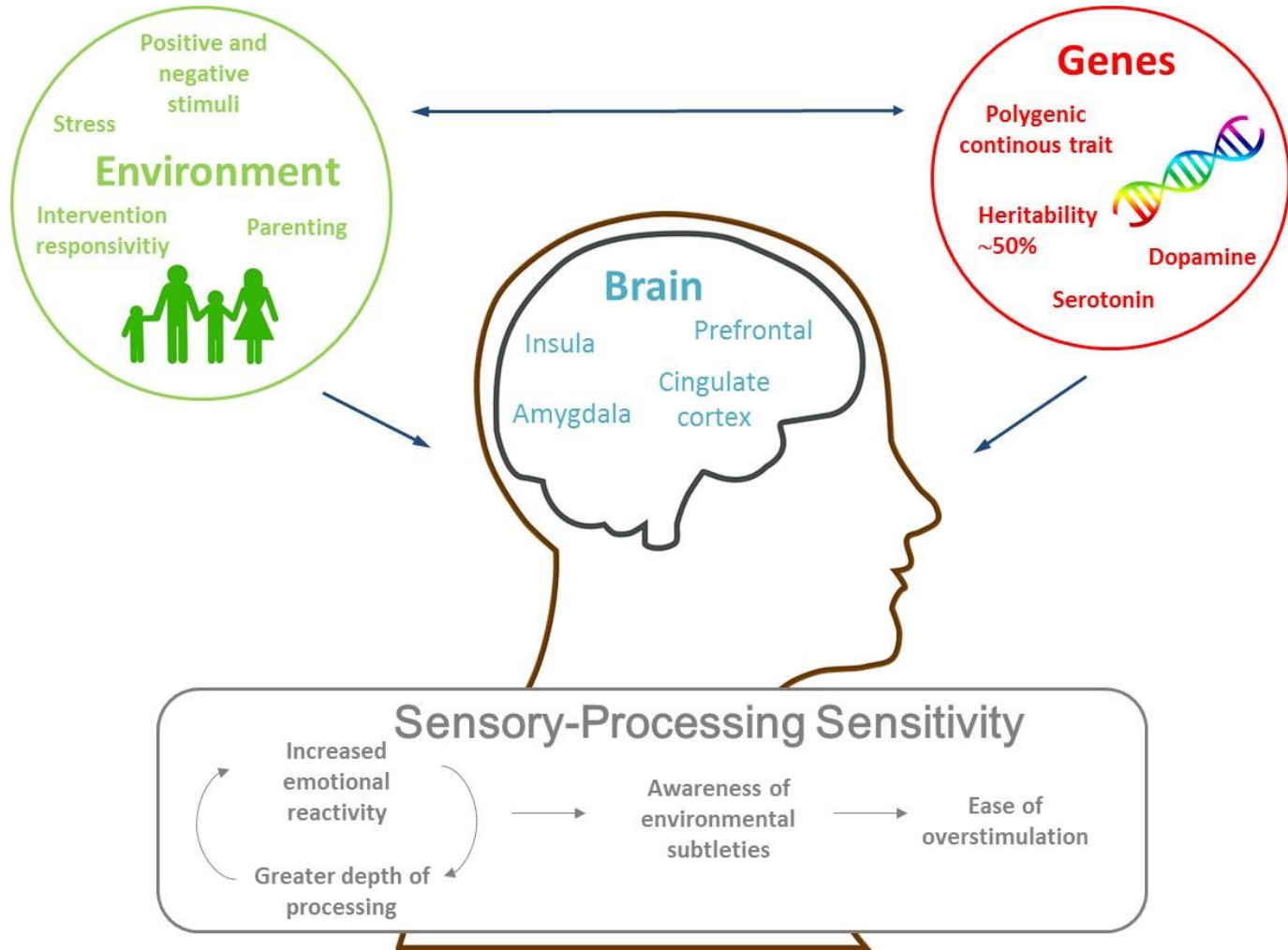


Sensory processing sensitivity



Dimensional or categorical?





Sensory Processing Sensitivity: trait predicting drug use pathways?



Persons high on SPS

Persons low on SPS

20%

20%

- High emotional reactivity
- Deep information processing

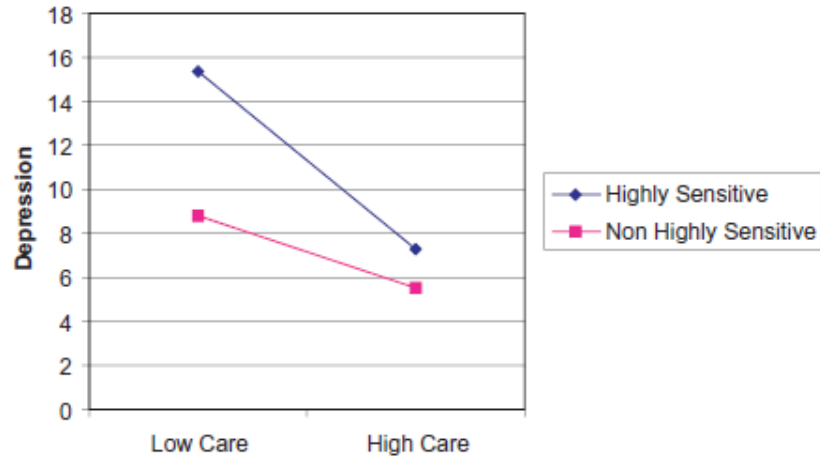


Stress-related disorder, such as addiction

Negative side of Sensory processing sensitivity

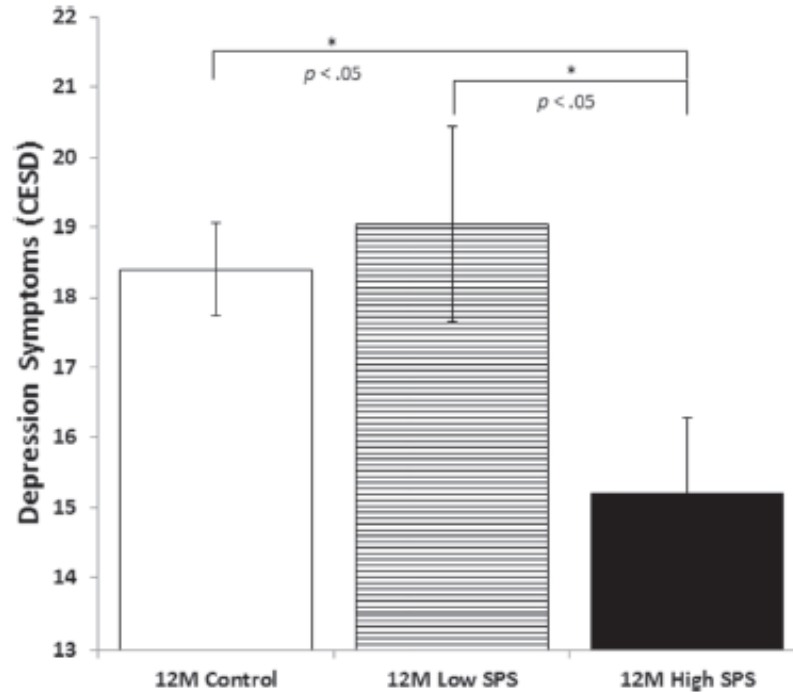


SPS increases risk for depression under conditions of stress





SPS predicts responsivity to supportive school-based program





We aim to elucidate whether: (1a) overstimulation increases drug use in individuals high on SPS individuals and (1b) supportive social environmental factors can buffer against overstimulation and reduce drug use in individuals high on SPS.

➡ WORK PACKAGE 1

Additionally, we aim to identify (2) biomarkers of SPS-environment-drug use pathway links.

➡ WORK PACKAGE 2

High SPS

Adverse social environment	Increase in drug use
Supportive social environment	Decrease in drug use



SENSORY PROCESSING SENSITIVITY

1 2 3 4 5 6 7
Not at all Moderately Extremely

1. Do you find it unpleasant to have a lot going on at once?
2. Do you find yourself needing to withdraw during busy days, into bed or into a darkened room or any place where you can have some privacy and relief from stimulation?
3. Are you easily overwhelmed by things like bright lights, strong smells, coarse fabrics or sirens close by?
4. Do you get rattled when you have a lot to do in a short amount of time?
5. Do changes in your life shake you up?
6. Are you bothered by intense stimuli, like loud noises or chaotic scenes?
7. Do other people's moods affect you?
8. Are you made uncomfortable by loud noises?
9. Are you annoyed when people try to get you to do too many things at once?
10. Do you become unpleasantly aroused when a lot is going on around you?
11. When you must compete or be observed while performing a task, do you become so nervous or shaky that you do much worse than you would otherwise?



German



French

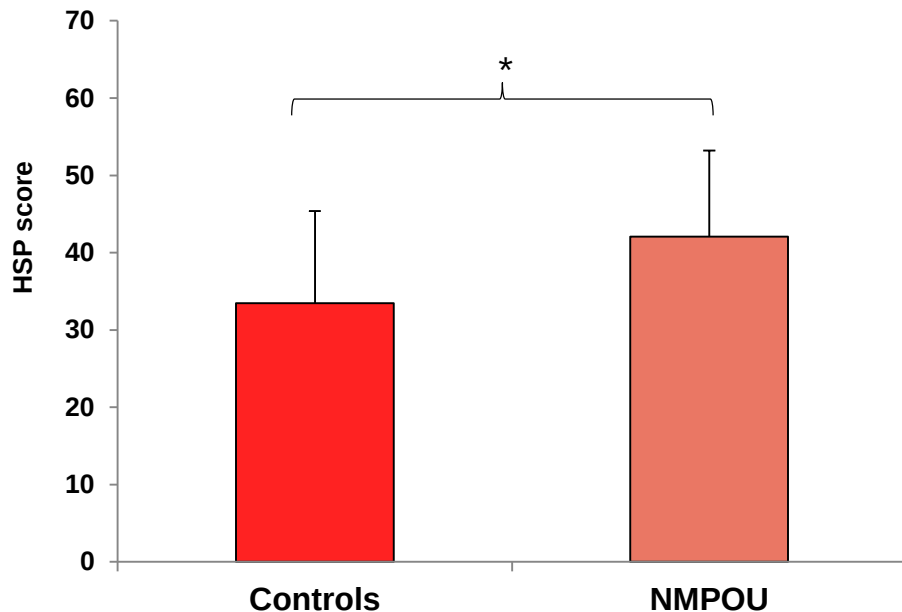


To elucidate whether (1a) overstimulation increases drug use in individuals high on SPS individuals and (1b) supportive social environmental factors can buffer against overstimulation and reduce drug use in individuals high on SPS.



HSP score in opioid users

Boris Quednow



*t-test: $p < .05$
Cohen's $d = 0.70$

27 (9 f / 18 m) opioid-naïve **healthy controls** matched for sex, age, verbal IQ, and years of school education
15 (4 f / 11 m) non-medical prescription opioid users (**NMPOU**) with on average 127 (SD±200) morphine equivalents per day

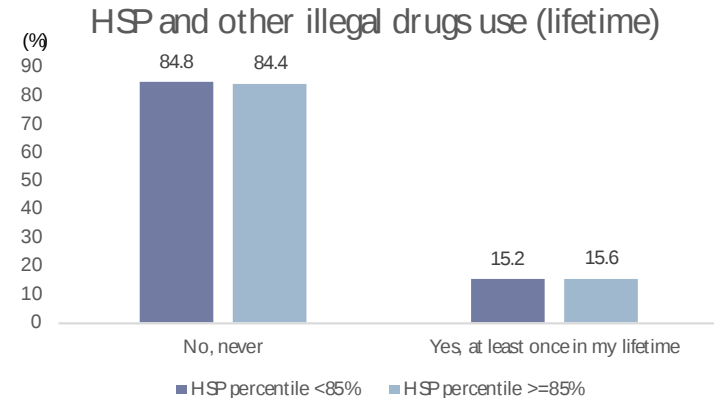
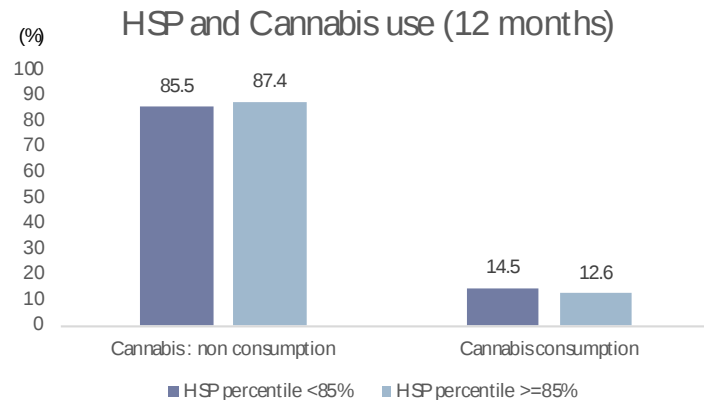
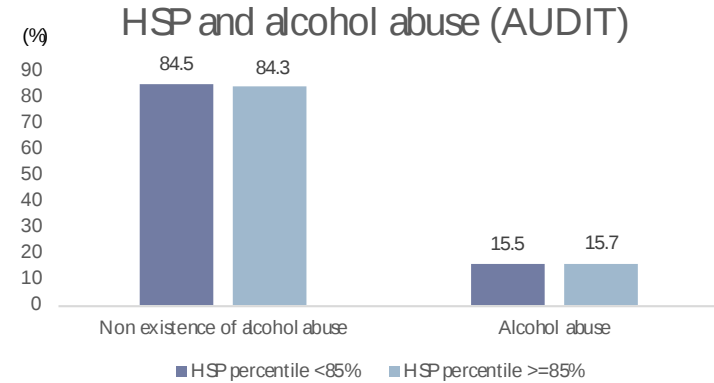
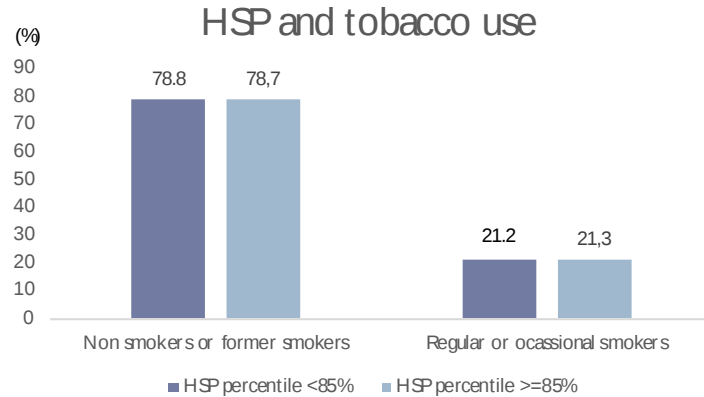
Other findings Boris Quednow



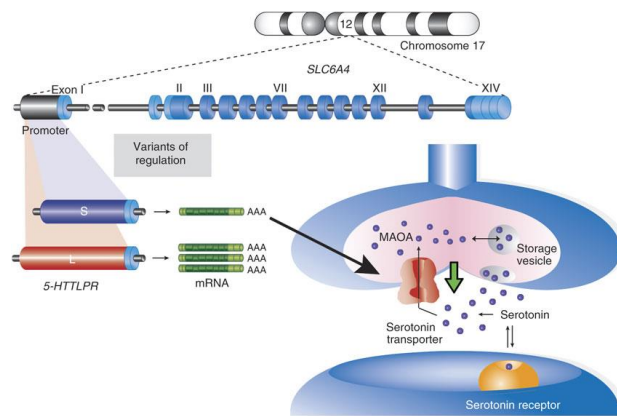
- Opioid users but not cocaine users show elevated SPS scores.
- In opioid users, drug use severity is inversely correlated with SPS scores indicating that recreational use rather than severe addiction is associated with increased sensory sensitivity.
- In cocaine users, duration of cocaine use but not weekly consumption is positively correlated with SPS.

HSP level and substance use in 2018 (%)

Maria Melchior



The serotonin transporter knockout rat



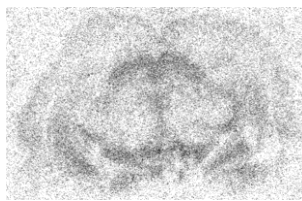
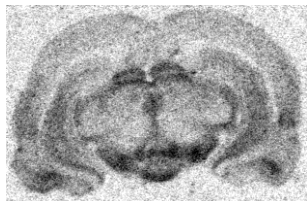
Serotonin transporter polymorphism linked to SPS: Homberg.....Aron, 2016



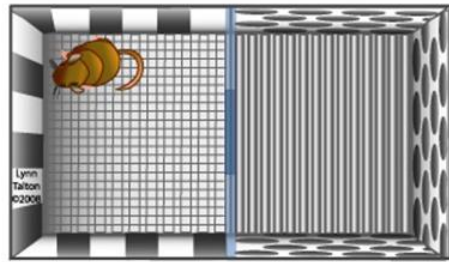
$+/+$

$+/-$

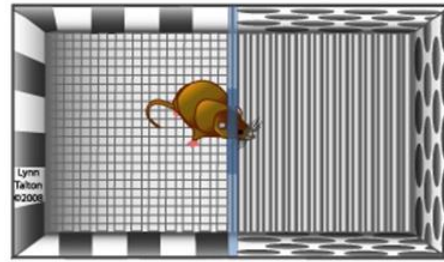
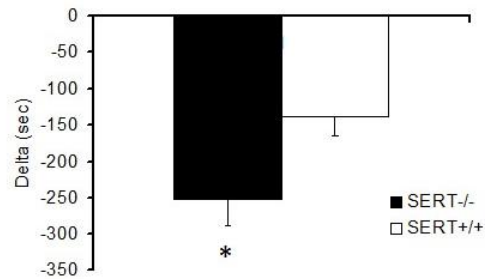
$-/-$



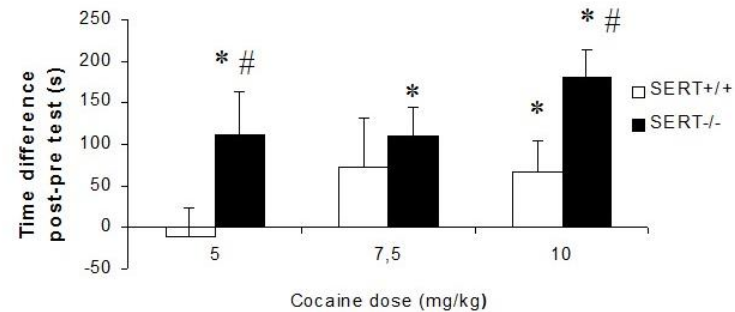
Conditioned place preference and aversion



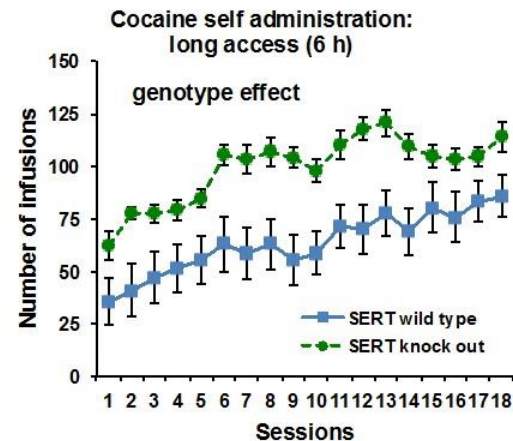
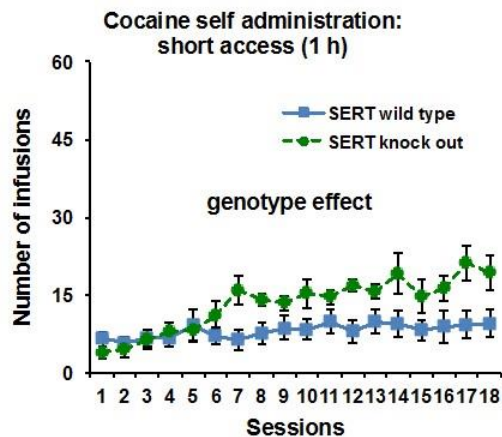
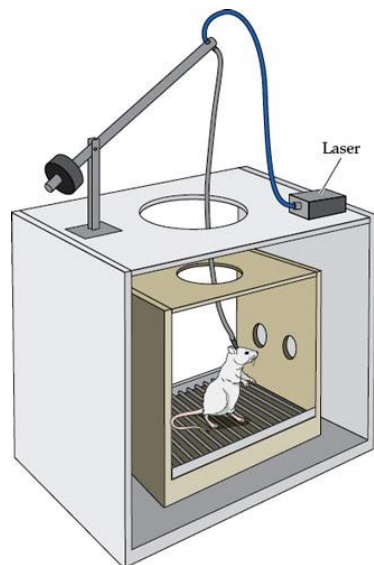
Footshock



Cocaine



Increased cocaine intake



Increased cocaine intake is associated with increased anxiety

→ To identify biomarkers of SPS-environment-drug use pathway links.



Addiction Biology

SSA SOCIETY FOR THE
STUDY OF
ADDICTION

ORIGINAL ARTICLE

doi:10.1111/adb.12673

Increased cocaine self-administration in rats lacking the serotonin transporter: a role for glutamatergic signaling in the habenula

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Can positive stimuli reduce drug intake in sensitive (SERT knockout) individuals?



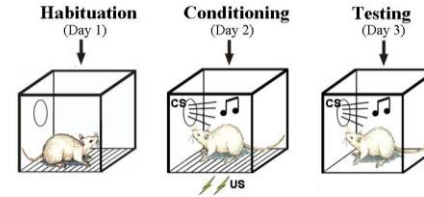
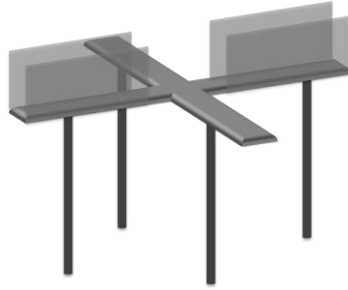
SPS facets in humans and rats

Facets	..in humans	..in rats
Increased emotionality ①	High reactivity to emotional pictures	Increased emotionality <u>Test:</u> elevated plus maze
Increased information processing ②	'pause-to-check' memory before action in new situations	Freezing in new situations <u>Test:</u> cued fear memory retrieval in new context

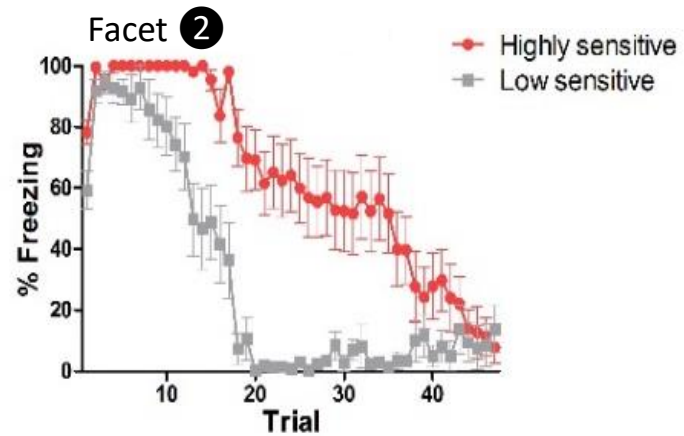
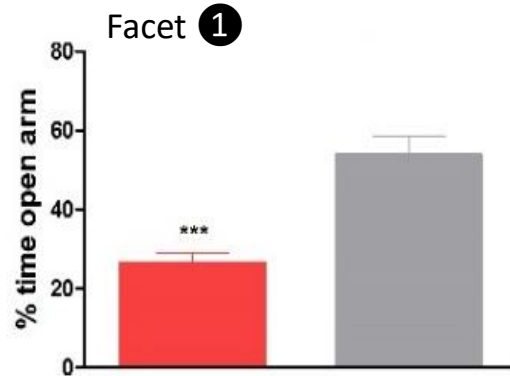
Selection procedure



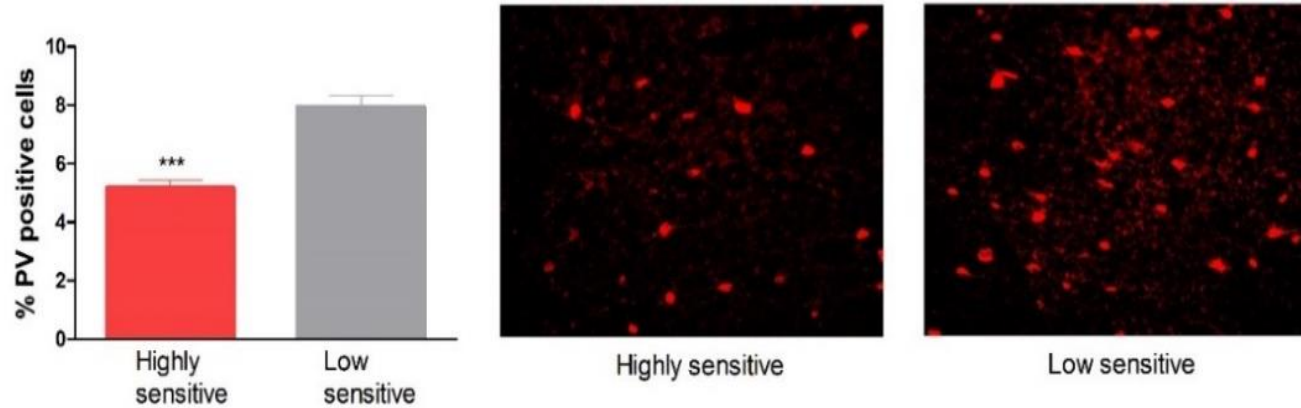
40 wild-type rats →



Top 25% of scores = high sensitive
Bottom 25% of scores = low sensitive



Number of GABAergic neurons in prelimbic cortex





Plan:

- Selection of high and low sensitive rats
- Expose them to 1) environmental enrichment; 2) standard housing conditions; 3) social isolation
- Measure social interaction, and social preference/memory
- Study WIN55,212 or heroin self-administration

 Ethical permit and workprotocol obtained

Michel Verheij works part-time on the project.

PhD student Chao Guo will help with the execution of experiments

PhD student Karine Koversi will extend the experiments to early life ‘tactile stimulation’

What makes your project valuable?



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**HET IS
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HET SENSITIEVE PERSOON - HSP**

HOOG SENSIVITEIT

STRICKHARTT, J. H. 1990. *Journal of Great Lakes Research* 16:1-10.

5 HS

DAVID A. HENNING Assistant Professor

WAT WETEN WE OVER
DE INVLOED VAN DE OMGEVINGSFACTOREN

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ALLE RECHTEN VOORBEHOUDEN AAN REALISERENDE PARTIJEN

Question to other project leaders

To extend findings and increase understanding and impact of SPS, do you know existing cohorts containing data on drug use, which we could approach?