Sensory Processing Sensitivity and drug use recovery pathways

STANDUP
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
Sensory-Processing Sensitivity

- Increased emotional reactivity
- Awareness of environmental subtleties
- Ease of overstimulation

Increased:
- Stimuli
- Stress
- Intervention
- Parenting

Genes:
- Polygenic continuous trait
- Heritability ~50%
- Dopamine
- Serotonin

Brain:
- Insula
- Prefrontal Cingulate Cortex
- Amygdala
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.
Partners: Melchior and Quednow: human cohort data analyses
Homberg: experimental studies using animals

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

WORK PACKAGE 2.
Partner: Fumagalli: molecular analyses
> Effects of environment and genotype
WORK PACKAGE 1 - Quednow

Alcohol

- Opioid users and alcohol dependent patients 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.
- SPS is positively correlated with symptoms of depression, ADHD, and anxiety, as well as with impulsivity and childhood trauma scores.

> Effects of environment
SPS facets in humans and rats

<table>
<thead>
<tr>
<th>Facets</th>
<th>..in humans</th>
<th>..in rats</th>
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<tbody>
<tr>
<td>Increased emotionality</td>
<td>High reactivity to emotional pictures</td>
<td>Increased emotionality</td>
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<tr>
<td>①</td>
<td>Test: elevated plus maze</td>
<td>Test: cued fear memory retrieval in new context</td>
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<tr>
<td>Increased information processing</td>
<td>‘pause-to-check’ memory before action in new situations</td>
<td>Freezing in new situations</td>
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60 wild-type rats

Top 25% of scores = high sensitive
Bottom 25% of scores = low sensitive
> Negative and positive environmental manipulations ongoing
Increased cocaine self-administration in rats lacking the serotonin transporter: a role for glutamatergic signaling in the habenula

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> Molecular analyses on SPS rat model and blood cells from humans
High societal interest

IMPACT
Society is craving for information about SPS. Impact will depend on whether associations between SPS, drug use and environmental influences are found in humans.