

Aberrant Salience Relates to Emotion Processing in Youth at Clinical High-Risk for Psychosis

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Background

- Aberrant experiences of salience have been found to be elevated in people with schizophrenia spectrum disorders and have been put forth as prognostic of the emergence and/or exacerbation of psychosis^{1,2}.
- For this reason, experimental measures of aberrant salience could be instrumental in predicting outcomes in youth at clinical high-risk for psychosis (CHR-P).
- The Salience Attribution Test was designed to quantify the tendency to assign salience where none is warranted – for example when a stimulus dimension is not predictive of reward frequency or magnitude^{3,4}.
- Previous researchers have observed relationships between self-report measures of aberrant salience and emotion recognition accuracy⁵.
- We hypothesized that CHR-P individuals would score higher on experimental measures of aberrant salience and lower on measures of adaptive salience, and that experimental measures of aberrant salience would correlate (negatively) with Emotion Recognition scores from the Penn Computerized Neurobehavioral Battery (CNB).

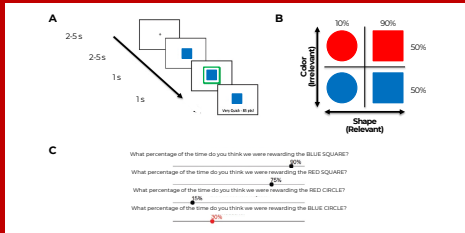
Clinical/Cognitive Assessments

- Positive symptoms** were assessed using the PSYCHS (Positive Symptoms and Diagnostic Criteria for the CAARMS Harmonized with the SIPS).
- Negative symptoms** were assessed using the NSI-PR (Negative Symptom Inventory - Psychosis Risk).
- To assess **role and social functioning**, we administered the Cornblatt Global Functioning Scales.
- To assess **intellectual function**, we used the Penn CNB, administering the Emotion Recognition Test for social cognition, as well as six other tests covering a range of cognitive functions.

Quantifying Salience

We computed four salience measures for each participant, from task data:

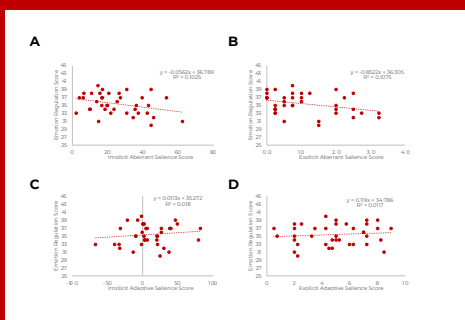
- Implicit Adaptive Salience** (reaction time [RT] difference between more-rewarded and less-rewarded cue types).
- Implicit Aberrant Salience** (absolute value of RT difference between the two task-irrelevant cue types).
- Explicit Adaptive Salience** (same as for implicit measure, but using the participant's reported reward likelihood/frequency estimates for each stimulus); and
- Explicit Aberrant Salience** (same as for implicit measure but using the participant's reported reward likelihood/frequency estimates for each stimulus).



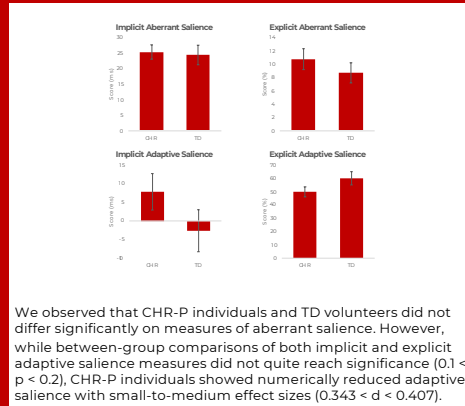
A. On each trial of the mSAT, participants were shown a shape of a given color for 2-5 s, before a response prompt appeared. Participants were instructed to press a button as quickly as possible when a response prompt appeared, after which they received 0 points or a number of points contingent on their response time (RT). **B.** In a given block of 40 trials, each stimulus was selected from a set of four possible stimuli made up of one of two shapes (circle and square, e.g.) and one of two colors (red and blue, e.g.). Along one of the dimensions (shape, e.g.), one stimulus-type (square, e.g.) was followed by a reward much more frequently (90% vs. 10%) than the other (circle, e.g.). Along the other dimension (color, e.g.), the two stimulus-types (red and blue, e.g.) were equally likely to be followed by a reward. **C.** After each block of trials, participants were prompted to estimate the reward frequency of each of the four stimuli, using a visual-analog scale.

Experimental measures of salience signaling correlated with Emotion Recognition scores from the Penn CNB, as well as social functioning scores from the Global Functioning Scales.

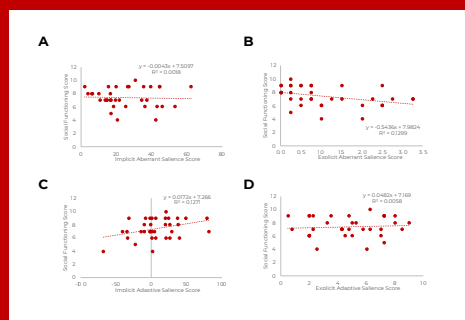
- Within the CHR-P group, both implicit and explicit aberrant salience measures correlated with scores on the Emotion Recognition subtest of the Penn Computerized Neurobehavioral Battery.
- Additionally, both explicit aberrant salience and implicit adaptive salience scores correlated with social functioning scores from the Global Functioning Scales.



Within the CHR-P group, both (A) implicit ($r = -0.320$; $p = 0.050$) and (B) explicit ($r = -0.328$; $p = 0.044$) aberrant salience measures correlated with scores on the ER40 subtest of the CNB. Neither (C) implicit nor (D) explicit adaptive salience measures correlated with CNB Emotion Recognition scores (both p 's > 0.4).



We observed that CHR-P individuals and TD volunteers did not differ significantly on measures of aberrant salience. However, while between-group comparisons of both implicit and explicit adaptive salience measures did not quite reach significance ($0.1 < p < 0.2$), CHR-P individuals showed numerically reduced adaptive salience with small-to-medium effect sizes ($0.343 < d < 0.407$).



Within the CHR-P group, both (B) explicit aberrant salience ($r = -0.360$; $p = 0.033$) and (C) implicit adaptive salience ($r = 0.356$; $p = 0.036$) scores correlated with social functioning scores from the Global Functioning Scales, whereas (A) implicit aberrant salience and (D) explicit adaptive salience scores did not (both p 's > 0.6).

Participants

	CHR (n=40)	TD (n=29)	Statistic	p
Age	Mean 24.45 SD 1.800	Mean 24.32 SD 1.588	t=0.321	0.742
Education (years)	Mean 14.800 SD 1.682	Mean 15.345 SD 1.542	t=1.375	0.174
Sex	25 F, 15 M	17 F, 12 M	$\chi^2=0.106$	0.744
Race	23 W, 12 B, 2 AS, 1 NA, 1 O, 1 U	11 W, 6 B, 8 AS, 0 NA, 4 O, 0 U	$\chi^2=12.192$	0.032
Ethnicity	6 H, 34 NH, 0 U	4 H, 24 NH, 1 U	$\chi^2=4.066$	0.495
CPS Social Rating	Mean 7.400 SD 1.459	Mean 8.862 SD 0.793	t=-4.784	<.001
CPS Role Rating	Mean 7.229 SD 0.474	Mean 9.241 SD 0.830	t=-4.185	<.001
NSI-PR Avoidant	Mean 1.764 SD 0.866	Mean 0.769 SD 0.561	t=5.401	<.001
NSI-PR Anhedonia	Mean 2.211 SD 1.070	Mean 1.289 SD 0.823	t=4.819	<.001
NSI-PR Blunted_Affect	Mean 1.722 SD 1.149	Mean 0.948 SD 0.659	t=3.222	0.002
NSI-PR Alopecia	Mean 0.704 SD 0.967	Mean 0.080 SD 0.212	t=3.396	0.001
NSI-PR Alogia	Mean 0.477 SD 1.029	Mean 0.054 SD 0.196	t=1.58	0.052

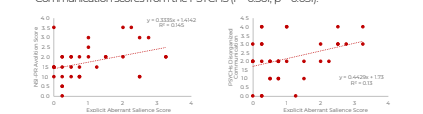
Abbreviations: W, White; B, Black; AS, Asian; NA, Native American; O, Other; U, Unknown; H, Hispanic; NH, Non-Hispanic; CPS, Clinical Functioning Scales; NSI-PR, Negative Symptom Inventory - Psychosis Risk.

Additional Results

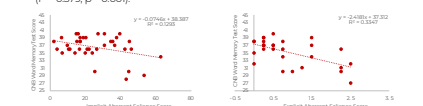
- Although the CHR and TD groups did not significantly differ on any CNB subtest (all p 's > 0.1), effect sizes for between-group differences in ER40, PMAT24, and CPW scores were in the small-to-medium range (0.357-0.384).



- In CHR youth, the explicit aberrant salience measure correlated with avoidant ratings from the NSI-PR ($r = 0.381$, $p = 0.022$), as well as Disorganized Communication scores from the PSYCHS ($r = 0.361$, $p = 0.031$).



- In CHR youth, the implicit aberrant salience scores correlated with CNB Word Memory Test scores ($r = -0.360$, $p = 0.027$). In controls, explicit aberrant salience scores correlated with CNB Word Memory Test scores ($r = -0.579$, $p = 0.001$).



Implications

- This study provides further support for the idea that the construct of aberrant salience relates to the emergence of psychosis and the disability associated with psychosis.
- Importantly, aberrant salience may be tied to social cognitive skills, such as emotion recognition.
- Future analyses will investigate how the neural signals underlying the adaptive and aberrant attribution of salience relate to the clinical and functional course of individuals in the clinical high-risk for psychosis state.

References

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Acknowledgements

NIH Grant 1R01MH131566

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