
eAppendix. Supplemental material

eReferences.

eFigure. Illustration of structurally defined anterior cingulate cortex regions of interest

eTable. Affective data (mean, SD) for women with childhood sexual abuse and remitted depression (CSA+rMDD), remitted depressed women (rMDD), and healthy females

This supplementary material has been provided by the authors to give readers additional information about their work.
**eAppendix**

**Supplemental Methods**

**Sample recruitment and selection.** Details on the study were distributed on fliers and posted on local job websites. In addition, advertisements were placed in a local free newspaper. Separate ads were placed to recruit women with no history of abuse or psychopathology, remitted depressed women and remitted depressed women with a history of CSA to take part in a confidential study on emotion and coping at Harvard University. Following an initial phone screen, 72 participants were invited for the clinical and trauma interview to determine study eligibility. Sixteen participants were excluded due to current symptoms meeting criteria for MDD and other comorbid psychopathologies (as assessed by the SCID) or reported histories of physical or emotional abuse during childhood or adolescence (as assessed by TAQ). A final sample of 56 women was enrolled in the second session, in which EEG data were collected. Finally, seven participants were excluded due to major artifacts (N=6) or task non-compliance (N=1) leaving a final sample of 49 women (HC: n=18, rMDD: n=16, CSA+rMDD: n=15).

**Rational for recruitment of female participants.** Longitudinal findings from birth cohort studies have identified gender as a critical variable when considering long-term sequelae of CSA. There are a range of abuse-related and unrelated variables that may lead to diverse outcome of CSA. First, with a larger number of males than females acting as perpetrators, CSA is more likely to constitute a same-sex experience for boys compared to girls which could affect subsequent outcomes. Secondly, gender-specific differences in brain regions can occur in areas containing sex steroids receptors or regions with strong connections to areas with high sex steroids receptor density. As a result of these abuse-related and unrelated variables, the sequelae of CSA are likely to differ for males and females. The current study therefore recruited exclusively females with the aim to extend findings to male population in future studies.

**Experienced childhood sexual abuse (CSA) events.** For almost half of the females with a history of CSA and remitted depression (CSA+rMDD), the abuse occurred weekly (46.7%). Perpetrators were primarily multiple extra-familial abusers (33.3%) or biological brothers (26.7%). One participant (6.7%) each reported a stepfathers/mother’s live-in partner, an acquaintance/friend, multiple intra- and extra-familial abusers, a multiple intra-familial abuser, a foster/adopted brother, and a stepgrandfather. In our sample, CSA had been disclosed between the ages of 9-12 years for 60% of women whereas 40% first disclosed CSA between the ages 15 to 30 years.

**Past psychopathology.** Remitted diagnoses for anxiety and eating disorders were present for women with remitted depression but no trauma (rMDD) and CSA+rMDD groups (remitted anxiety: CSA+rMDD: n=5, rMDD: n=0; remitted eating: CSA+rMDD: n=3; rMDD: n=2).

**Probabilistic Stimulus Selection Task (PSST).** Participants were seated in front of a computer screen equipped with a response box. The experimenter read aloud the instructions presented on a screen prior to the onset of the task. Participants were told that they would see two images side-by-side, and that they had to select one image by pressing the left or right keys on the button box. It was explained that the task consisted of a training phase in which each response was followed by either positive (Correct! Well done!) or negative (Incorrect! Concentrate!) feedback and a test phase with no feedback. Participants were instructed to select the images with the highest chance of being correct as quickly and accurately as possible. Participants were informed that not all correct and incorrect answers would yield positive and negative feedback, respectively. Participants were not informed about the probabilistic reinforcement schedule for the different stimulus pairs (A 80% correct, B 20% correct; C-D 70%-30%, E-F 60%-40%). Brief breaks were provided between the different training blocks and before transitioning to the test phase. The task varied in length between 25-40 minutes due to the differential number of training blocks needed before transitioning to the test phase.

**Bonferroni correction for correlational analyses.** To limit the numbers of analyses, Pearson correlations were performed only between behavioral variables and maladaptive behaviors showing group differences. This led to 16 correlations [4 behavioral indices (accuracy and RT for AB and A Novel trials) x 4 maladaptive behaviors (self-...
harm/suicidal behavior, violent-related behavior, sexual behavior and dysfunctional eating)]. Accordingly, a Bonferroni adjusted alpha value was set at 0.05/16 = .003

Event-related potentials (ERPs). ERP analyses were conducted using Brain Vision Analyzer software (BV, Brain Products, Gilching, Germany). Artifacts (e.g., eye blinks, EKG) were identified and corrected with Independent Component Analysis. Corrupted channels were replaced through spatially weighted linear interpolations. Blind to group membership, manual artifact detection was performed for remaining artifacts. Offline, data were filtered using a 30-Hz filter and re-referenced to an average reference. ERPs were computed time-locked to positive or negative feedback in all training blocks and time-locked to correct and incorrect responses in the test block. Peak-to-peak computation, a baseline-independent measure of ERP amplitude, was preferred over baseline-to-peak analysis as the latter is more likely to be affected by pre-stimulus activation (e.g., outcome anticipation for feedback-locked ERPs). Analyses were repeated using baseline-to-peak computations, and are available upon request.

Source localization. Current density was extracted from structurally defined ACC regions-of-interest (ROI) according to prior studies (see also eFigure 1): the subgenual ACC (BA 25; 17 voxels, 5.83 cm³), affective subdivisions of the ACC (rostral ACC; BA 24 (12 voxels, 4.12 cm³) and BA 32 (25 voxels, 8.58 cm³)), and cognitive subdivisions of the ACC (dorsal ACC; BA 24' (48 voxels, 16.46 cm³) and BA 32' (20 voxels, 6.86 cm³)).

Supplemental Results

State-related affect. As shown in eTable 1, no between-group differences emerged for pre-study and post-study measures on positive affect and state anxiety. Group differences in mean negative affect were only trend significant ($P = .06$). However, the highest mean group score was 14 (out of 50) for the CSA+rMDD group. Based on Crawford et al. (2004), a score of 14 corresponds to the 47 percentile and is therefore not likely to be in the clinical range. Also, groups did not show differences in state anxiety ($P = .52$) at the onset of the study. Over the course of the session, within-subjects analysis revealed a general decrease (mean difference = score of 1) in negative affect ($t(48)=3.21, P=.002$). State anxiety levels, however, did not change over time ($t(48)=1.192, P=.24$). See eTable 1.

PSST: Training phase. Participants were required to have more than 50% of correct AB choices in half of the training blocks in order to be included in the analyses. There was no significant between-group difference in the number of blocks needed to transition to the test phase ($F(2,46)=.13, P=.88$). On average, the controls were exposed to 213 (SD=111.15) training trials, CSA+rMDD completed 196 (SD=105.07), and rMDD completed 210 (SD=90.33) training trials. As a result, completed number of AB trials were highly comparable between the groups (controls: 71.11±37.08; CSA+rMDD: 65.33±35.02; rMDD: 70.00±30.11). No between-group differences were found between individuals who needed 6 blocks but achieved the 50% AB criterion (controls: $n = 5$; CSA+rMDD: $n = 4$; rMDD: $n = 2$) compared to those individuals who needed fewer blocks ($x^2(2)=1.36, P=.51$).

ERP latency. In the training phase, a Group x Feedback (correct, incorrect) x Electrode (Fz, FCz, Cz) ANCOVA for the FRN latency revealed no significant effects. In the test phase, a Group x Response (ERN, CRN) x Electrode (Fz, FCz, Pz, CZ) ANCOVA for AB trials revealed a main effect of Electrode ($F(2.23,78)=3.04, P=.05$) with post-hoc tests showing significant difference from Pz to both Fz ($P=.03$) and Cz ($P=.006$). However, mean latency values for Fz, FCz, Cz, and Pz were of marginal difference ranging from 54ms to 61ms for ERN and from 53 to 61ms for CRN on AB trials. The Group x Condition (A Novel, B Novel) x Response (ERN, CRN) x Electrode (FCz, Fz, Cz, Pz) ANCOVA revealed a main effect of Electrode ($F(1126.68, 84)=2.94, P=.012$) and Group x Electrode interaction ($F(4.37, 84)=9.61, P=.03$). Latency across electrodes varied due to shorter latency of FCz relative to Fz ($P=.01$) and Pz ($P<.01$), Fz relative to Pz ($P=.03$) and Cz to Pz ($P<.01$). However, differences were marginal with average latencies across electrodes ranging from 53ms to 60ms (Mean latency: 53ms to 59ms for controls, 55 to 61ms for CSA+rMDD, and 51ms to 64ms for rMDD). Follow-up tests on the Group x Electrode interaction did not show significant group differences. No main effects involving Group emerged on any latency analyses.
List of eReferences


eFigure. Illustration of structurally defined anterior cingulate cortex regions of interest
eTable. Affective data (Mean, SD) for women with childhood sexual abuse and remitted depression (CSA+rMDD), remitted depressed women (rMDD), and healthy females.

<table>
<thead>
<tr>
<th></th>
<th>CSA+rMDD (n=15)</th>
<th>rMDD (n=16)</th>
<th>Controls (n=18)</th>
<th>P-Value</th>
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<tr>
<td>STAI pre-task</td>
<td>31.60 (9.26)</td>
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<td>29.28 (8.25)</td>
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<td>STAI post-task</td>
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<td>29.72 (6.95)</td>
<td>0.22</td>
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<td>10.75 (1.73)</td>
<td>10.39 (1.24)</td>
<td>0.12</td>
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</table>

STAI: State Trait Anxiety Inventory, PANAS: Positive and Negative Affect Schedule; PA: Positive Affect, NA: Negative Affect.