

# SOMA Report



# SOMA Report Details

**Generated by:** Chad C. Williams

**Date:** 2025-04-16

## Inputted Parameters

**Help:** False

**Author:** Chad C. Williams

**Dataset:** Both pain datasets

**Rscripts Path:** C:/Program Files/R/R-4.4.1/bin/x64/Rscript

**File Path:** D:\BM\_Carney\_Petzschner\_Lab\SOMAStudyTracking\SOMAV1\database\_exports\avoid\_learn\_prolific

**File Name:** ['v1a\_avoid\_pain\v1a\_avoid\_pain.csv', 'v1b\_avoid\_paindepression\v1b\_avoid\_paindepression.csv']

**Split By Group:** pain

**Split By Group Id:** pain

**Covariate:** None

**Depression Cutoff:** 10

**Rolling Mean:** 5

**Accuracy Exclusion Threshold:** 55

**Rt Low Threshold:** 200

**Rt High Threshold:** 5000

**Tests:** basic

**Test Rolling Mean:** 5

**Test Context Type:** context

**Hide Stats:** False

**Hide Posthocs:** True

**Load Stats:** True

**Load Models:** False

**Verbose:** True

# Data Characteristics

**Files:** v1a\_avoid\_pain\v1a\_avoid\_pain.csv, v1b\_avoid\_paindepression\\v1b\_avoid\_paindepression.csv

## Grouping

**Split by Group:** Pain

## Column Names

participant\_id, trial\_type, trial\_index, rt, symbol\_L\_name, symbol\_R\_name, feedback\_L, feedback\_R, context\_val, choice\_made, context\_val\_name, duration, group\_code, intensity, unpleasant, interference, age, sex, symbol\_L\_value, symbol\_R\_value, neutral\_values, composite\_pain

## Data Dimensions

**Rows:** 119376

**Columns:** 22

**Number of Groups:** 3

**Number of Original Participants:** 360

**Number of Participants Excluded (Pain Threshold):** 74

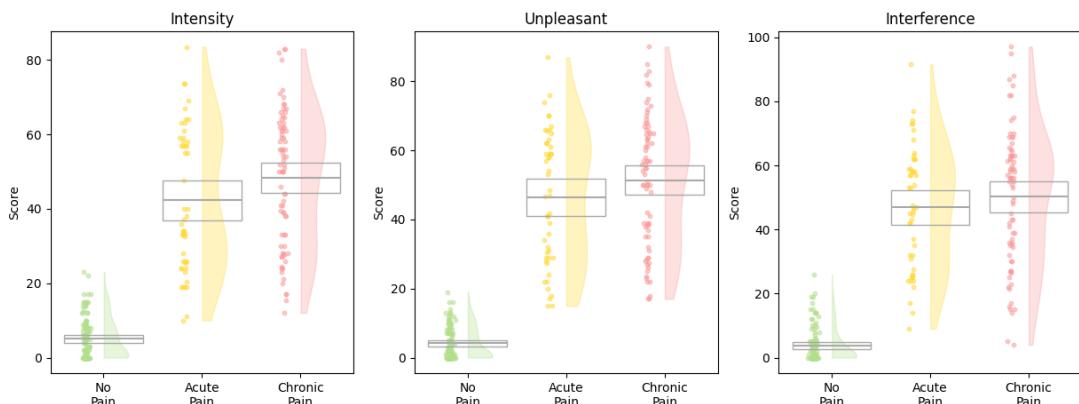
**Number of Participants Excluded (Accuracy Threshold: 55%):** 52

**Number of Participants Remaining:** 234

**Percentage of Trials Excluded (RT Threshold: < 200ms or > 5000ms):** 1.3%

**Table 1.** Demographic information for each group. Group differences reflect which groups are significantly different from the no pain group in planned follow-up tests.

	No Pain	Acute Pain	Chronic Pain	P-Value
<b>Demographics</b>				
<b>Sample Size</b>	108	49	77	
<b>Age</b>	34.05 (11.64)	36.88 (13.93)	40.4 (12.86)	0.0036
<b>Gender (F/M/N)</b>	55 / 53 / 0	28 / 21 / 0	53 / 23 / 1	
<b>Pain Scores</b>				
<b>Intensity</b>	5.1 (5.61)	42.23 (18.92)	48.37 (18.01)	<0.0001
<b>Unpleasant</b>	4.2 (4.73)	46.36 (18.82)	51.32 (18.56)	<0.0001
<b>Interference</b>	3.83 (5.5)	46.85 (18.76)	50.26 (21.31)	<0.0001



**Figure 1.** Pain metrics for each group. Boxplots show the mean and 95% confidence intervals of the corresponding metric for each group. Half-violin plots show the distribution of the scores of the corresponding metric for each group. Scatter points show the scores of the corresponding metric for each participant within each group.

### Demographics And Clinical Scores Statistics

Age, pain intensity, pain unpleasantness, pain interference were modelled using linear regression with the following formula:  $metric \sim group\_code$ .

**Age\***:  $F(2, 231) = 5.77, p = 0.004$

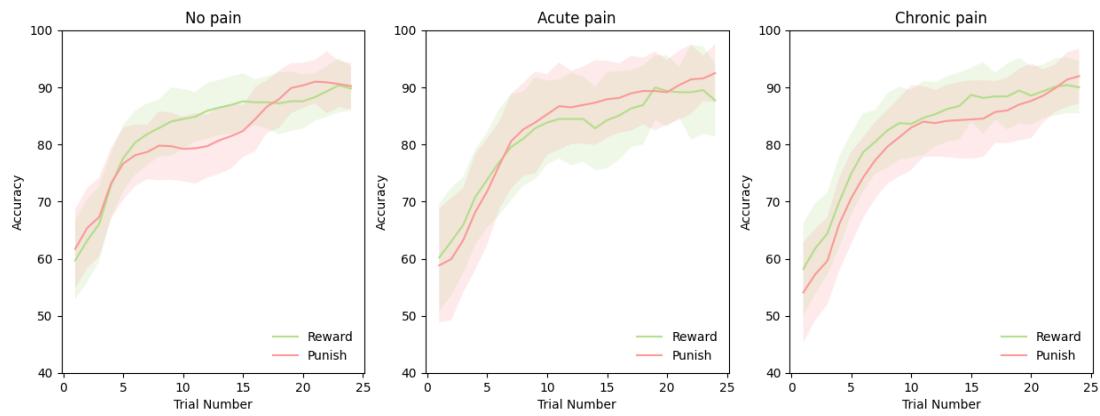
**Pain Intensity\***:  $F(2, 231) = 248.79, p < 0.001$

**Pain Unpleasantness\***:  $F(2, 231) = 301.34, p < 0.001$

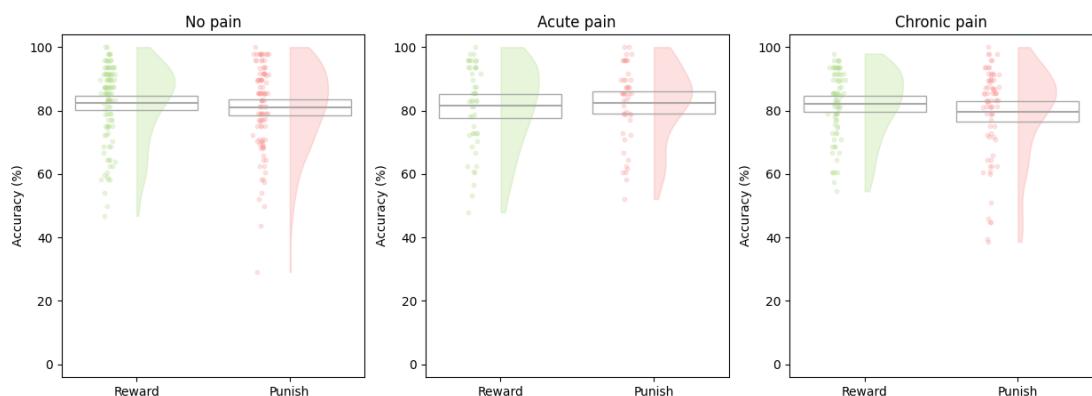
**Pain Interference\***:  $F(2, 231) = 249.7, p < 0.001$

# Results

## Learning Accuracy



**Figure 2.** Behavioral performance across learning trials for the reward and punishment contexts for each group. For visualization, the accuracy is smoothed using a rolling mean of 5 trials. Shaded regions represent 95% confidence intervals.



**Figure 3.** Averaged behavioral performance during learning for the reward and punishment contexts for each group. Boxplots show the mean and 95% confidence intervals of the accuracy for each context across participants within each group. Half-violin plots show the distribution of accuracy for each context across participants within each group. Scatter points show the averaged accuracy for each participant within each context.

## Learning Accuracy Statistics

Accuracy in the learning phase was modelled using a linear mixed effects model with the following formula:  $accuracy \sim 1 + group:context:binned\_trial + (1|participant\_id)$ , where *group*, *context*, *binned\_trial*, *group:context:binned\_trial* are the fixed effects and *participant\_id* is the random effect. Following each main and interaction finding from the linear model, we report planned comparison t-tests, corrected using a Welch's t-test when the assumption of homogeneity of variance was violated.

**Group:**  $\chi^2(2, N=234) = 0.53, p = 0.769$

### Chronic Pain Vs No Pain

$t(183) = -0.49, p = 0.6224, d = -0.07.$

### Chronic Pain Vs Acute Pain

$t(124) = -0.58, p = 0.5641, d = -0.11.$

**Context\*:**  $\chi^2(1, N=234) = 10.5, p = 0.001$

**Binned\_Trial\*:**  $\chi^2(3, N=234) = 961.34, p < 0.001$

**Group:Context:**  $\chi^2(2, N=234) = 1.95, p = 0.378$

### Chronic Pain Vs No Pain: Reward

$t(183) = -0.15, p = 0.88, d = -0.02.$

### Chronic Pain Vs No Pain: Loss Avoid

$t(183) = -0.6, p = 0.5473, d = -0.09.$

### Chronic Pain Vs No Pain: Reward-Loss Avoid

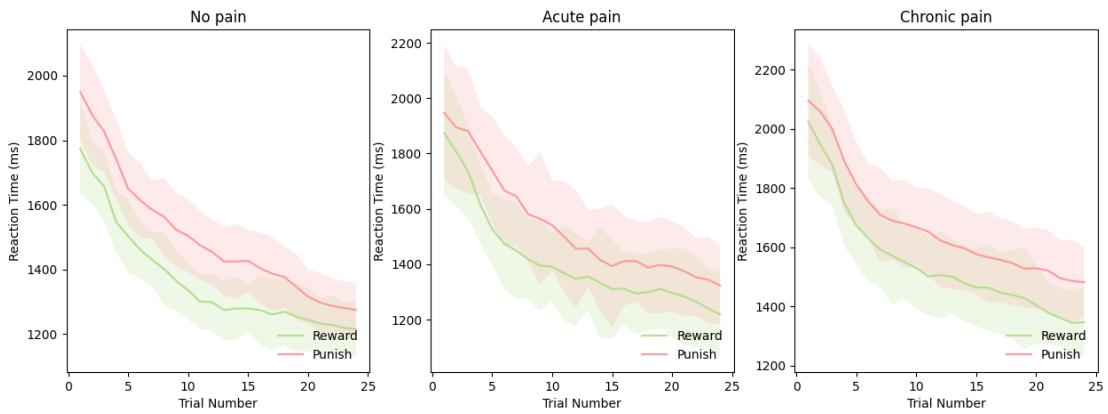
$t(183) = 0.41, p = 0.6849, d = 0.06.$

**Group:Binned\_Trial\*:**  $\chi^2(6, N=234) = 20.96, p = 0.002$

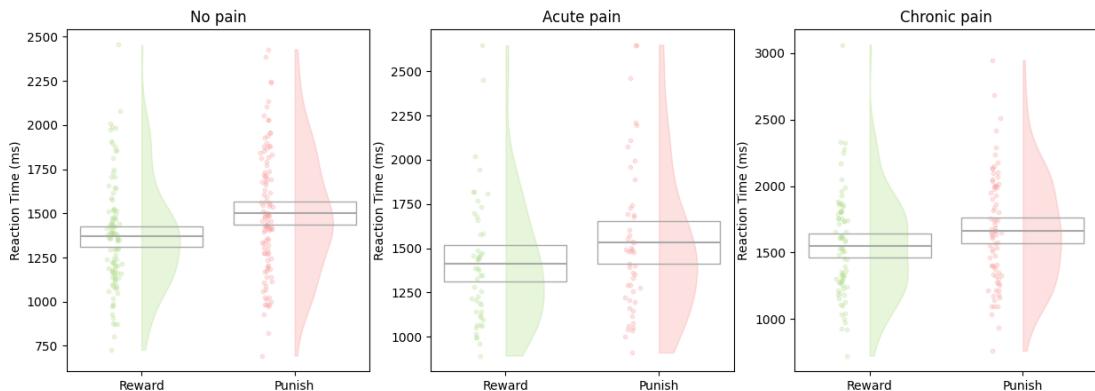
**Context:Binned\_Trial:**  $\chi^2(3, N=234) = 2.19, p = 0.534$

**Group:Context:Binned\_Trial:**  $\chi^2(6, N=234) = 11.43, p = 0.076$

## Learning Reaction Time



**Figure 4.** Reaction times across learning trials for the reward and punishment contexts for each group. For visualization, the reaction time is smoothed using a rolling mean of 5 trials. Shaded regions represent 95% confidence intervals.



**Figure 5.** Averaged behavioral performance during learning for the reward and punishment contexts for each group. Boxplots show the mean and 95% confidence intervals of the reaction times for each context across participants within each group. Half-violin plots show the distribution of reaction times for each context across participants within each group. Scatter points show the averaged reaction times for each participant within each context.

## Learning Rt Statistics

Rt in the learning phase was modelled using a linear mixed effects model with the following formula:  $rt \sim 1 + group:context:binned\_trial + (1|participant\_id)$ , where *group*, *context*, *binned\_trial*, *group:context:binned\_trial* are the fixed effects and *participant\_id* is the random effect.

Following each main and interaction finding from the linear model, we report planned comparison t-tests, corrected using a Welch's t-test when the assumption of homogeneity of variance was violated.

**Group\***:  $\chi^2(2, N=234) = 6.4, p = 0.041$

### Chronic Pain Vs No Pain

$t(183) = -3.17, p = 0.0018^*, d = -0.47$ .

### Chronic Pain Vs Acute Pain

$t(124) = -2.0, p = 0.0481^*, d = -0.36$ .

**Context\***:  $\chi^2(1, N=234) = 241.86, p < 0.001$

**Binned\_Trial\***:  $\chi^2(3, N=234) = 1763.24, p < 0.001$

**Group:Context**:  $\chi^2(2, N=234) = 5.97, p = 0.05$

### Chronic Pain Vs No Pain: Reward

$t_{Welch}(136) = 3.42, p = 0.0008^*, d = 0.53$ .

### Chronic Pain Vs No Pain: Loss Avoid

$t(183) = 2.93, p = 0.0038^*, d = 0.44$ .

### Chronic Pain Vs No Pain: Reward-Loss Avoid

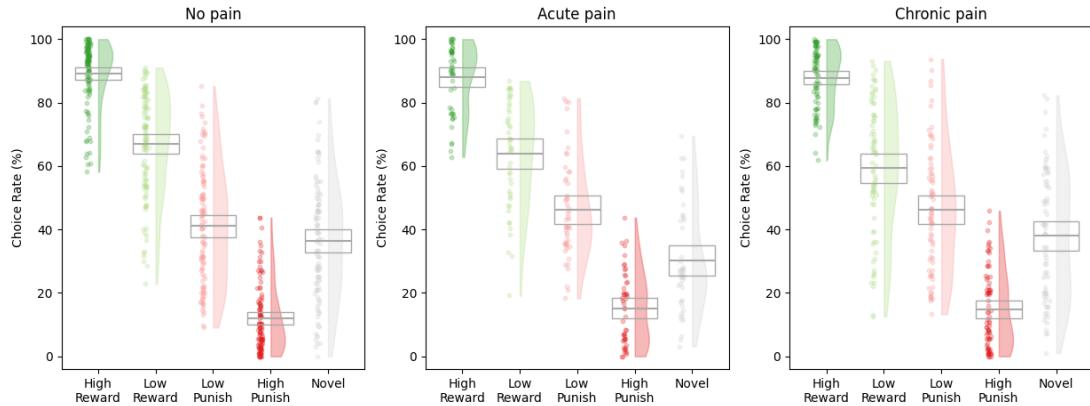
$t(183) = 0.5, p = 0.6156, d = 0.08$ .

**Group:Binned\_Trial\***:  $\chi^2(6, N=234) = 25.71, p < 0.001$

**Context:Binned\_Trial**:  $\chi^2(3, N=234) = 4.88, p = 0.181$

**Group:Context:Binned\_Trial**:  $\chi^2(6, N=234) = 8.79, p = 0.186$

## Choice Rate



**Figure 6.** Choice rate for each symbol during transfer trials for each group. Choice rate is computed as the percentage of times a symbol was chosen given the number of times it was presented. Boxplots show the mean and 95% confidence intervals of the choice rate for each symbol type across participants within each group. Half-violin plots show the distribution of choice rates for each symbol type across participants within each group. Scatter points show the averaged choice rate for each participant within each symbol type.

## Transfer Choice Rate Statistics

Choice\_rate in the transfer phase was modelled using a linear mixed effects model with the following formula:  $\text{choice\_rate} \sim 1 + \text{group:symbol} + (1|\text{participant\_id})$ , where *group*, *symbol*, *group:symbol* are the fixed effects and *participant\_id* is the random effect. Following each main and interaction finding from the linear model, we report planned comparison t-tests, corrected using a Welch's t-test when the assumption of homogeneity of variance was violated.

**Group:**  $\chi^2(2, N=234) = 1.59, p = 0.452$

### Chronic Pain Vs No Pain

$t(183) = -2.54, p = 0.012^*, d = -0.38.$

### Chronic Pain Vs Acute Pain

$t(124) = -1.73, p = 0.0859, d = -0.32.$

**Symbol\*:**  $\chi^2(4, N=234) = 664.15, p < 0.001$

### High Reward Vs Low Punish

$t(233) = 27.6, p < 0.0001^*, d = 1.8.$

### Low Reward Vs Low Punish

$t(233) = 9.06, p < 0.0001^*, d = 0.59.$

**Group:Symbol\*:**  $\chi^2(8, N=234) = 22.96, p = 0.003$

### No Pain Vs Acute Pain: High Reward-Low Punish

$t(155) = -1.49, p = 0.1376, d = -0.26.$

### No Pain Vs Chronic Pain: High Reward-Low Punish

$t(183) = -1.72, p = 0.0879, d = -0.26.$

### Acute Pain Vs Chronic Pain: High Reward-Low Punish

$t(124) = -0.04, p = 0.9696, d = -0.01.$

### No Pain Vs Acute Pain: Low Reward-Low Punish

$t(155) = 1.5, p = 0.1369, d = 0.26.$

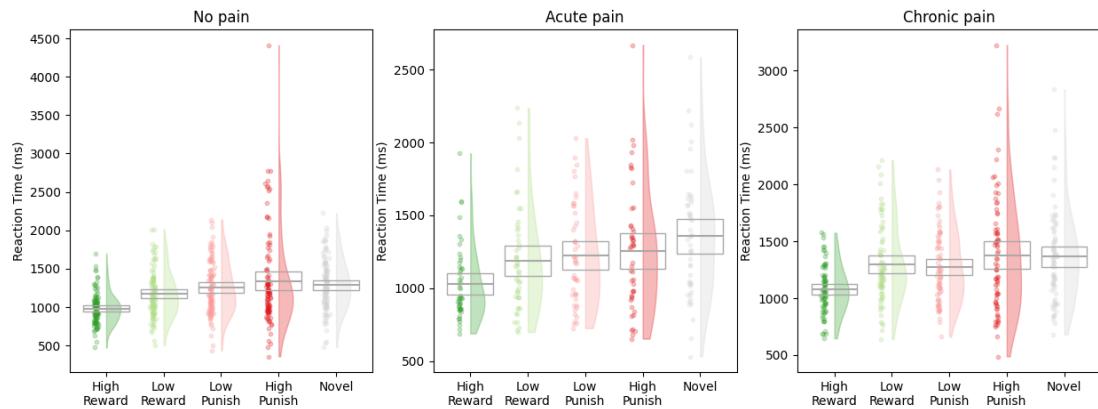
### No Pain Vs Chronic Pain: Low Reward-Low Punish

$t(183) = 2.48, p = 0.0139^*, d = 0.37.$

### Acute Pain Vs Chronic Pain: Low Reward-Low Punish

$t(124) = 0.73, p = 0.4665, d = 0.13.$

## Transfer Reaction Time



**Figure 7.** Reaction times for each symbol during transfer trials for each group. Boxplots show the mean and 95% confidence intervals of the reaction times for each symbol type across participants within each group. Half-violin plots show the distribution of reaction times for each symbol type across participants within each group. Scatter points show the averaged reaction time for each participant within each symbol type.

## **Transfer Rt Statistics**

Choice\_rt in the transfer phase was modelled using a linear mixed effects model with the following formula:  $choice\_rt \sim 1 + group:symbol + (1|participant\_id)$ , where *group*, *symbol*, *group:symbol* are the fixed effects and *participant\_id* is the random effect. Following each main and interaction finding from the linear model, we report planned comparison t-tests, corrected using a Welch's t-test when the assumption of homogeneity of variance was violated.

**Group:**  $\chi^2(2, N=234) = 1.93, p = 0.381$

### **Chronic Pain Vs No Pain**

$t(183) = -2.29, p = 0.0231^*, d = -0.34$ .

### **Chronic Pain Vs Acute Pain**

$t(124) = -2.21, p = 0.029^*, d = -0.4$ .

**Symbol\*:**  $\chi^2(4, N=234) = 427.34, p < 0.001$

### **High Reward Vs Low Punish**

$t(233) = -15.82, p < 0.0001^*, d = -1.03$ .

### **Low Reward Vs Low Punish**

$t(233) = -2.42, p = 0.0163^*, d = -0.16$ .

**Group:Symbol\*:**  $\chi^2(8, N=234) = 33.52, p < 0.001$

### **No Pain Vs Acute Pain: High Reward-Low Punish**

$t(155) = 2.05, p = 0.0416^*, d = 0.35$ .

### **No Pain Vs Chronic Pain: High Reward-Low Punish**

$t(183) = 2.22, p = 0.0277^*, d = 0.33$ .

### **Acute Pain Vs Chronic Pain: High Reward-Low Punish**

$t(124) = -0.14, p = 0.8879, d = -0.03$ .

### **No Pain Vs Acute Pain: Low Reward-Low Punish**

$t(155) = -1.24, p = 0.2167, d = -0.21$ .

### **No Pain Vs Chronic Pain: Low Reward-Low Punish**

$t(183) = -2.82, p = 0.0054^*, d = -0.42$ .

### **Acute Pain Vs Chronic Pain: Low Reward-Low Punish**

$t(124) = -1.14, p = 0.2568, d = -0.21$ .