Gast, A., Richter, J., & Ruszpel, B. Is There Evidence for Unaware Evaluative Conditioning in a Valence Contingency Learning Task?

# Supplementary File

## Stimulus Material

This section contains the exact stimuli used in Experiment 1a, 1b and 2.

**CSs used in Experiment 1a and 2**

Ablinen

Gowange

Marenes

Tanedim

Bodange

Hilrube

Narefor

Urtelti

Cymolon

Inlotek

Ogerlei

Vagonir

Dagedlu

Jelerac

Paleigo

Werisem

Ebenner

Kelanel

Rethuna

Ydemalt

Fleineto

Lufanke

Sitehma

Zumezen

### CSs used in Experiment 1b

Ablinen

Gowange

Marenes

Tanedim

Bodange

Hilrube

Natefor

Ureltis

Cymolon

Inlotek

Ogenley

Vagonir

Dagedlu

Jelerac

Pilango

Waliset

Ebenner

Kelanel

Rethuna

Yedmalt

Fleineto

Lufanke

Sithema

Zumezen

Fevkani

Kadirga

Lokanta

Nijaron

### Targets used in Experiment 1a.

#### Positive targets.

Blumen (flowers)

Freund (friend)

Frieden (peace)

Geburt (birth)

Geschenk (present)

Jubel (cheer; replacement for warmte/Wärme)

Leben (life)

Liebe (love)

Musik (music)

Traum (dream)

Umarmung (hug)

Urlaub (holidays; replacement for gift/Geschenk)

#### Negative targets.

Bomben (bombs)

Drogen (drugs)

Exekution (execution)

Gewehre (guns)

Krankheit (illness/disease)

Krebs (cancer; also: crab)

Krieg (war)

Mord (murder)

Tumor (tumor)

Unfall (accident)

Virus (virus)

Verbrechen (crime)

### Targets used in Experiment 1b.

#### Positive targets.

Holiday

Dream

Peace

Gift

Warmth

Music

Birth

Life

Love

Friend

Flowers

Hug

#### Negative targets.

Execution

Accident

Disease

War

Cancer

Tumor

Bombs

Drugs

Murder

Virus

Crime

Guns

[Comment: present replaced by holiday]

### Targets used in Experiment 2

#### Positive targets in the learning phase.

Blumen (flowers)

Freund (friend)

Frieden (peace)

Geburt (birth)

Geschenk (present)

Jubel (cheer)

Leben (life)

Liebe (love)

Umarmung (hug)

Urlaub (holidays)

#### Negative targets in the learning phase.

Bomben (bombs)

Drogen (drugs)

Exekution (execution)

Krankheit (illness)

Virus (virus)

Krieg (war)

Mord (murder)

Tumor (tumor)

Verbrechen (crime)

Gewehre (guns)

#### Neutral targets, set A.

Kanal (canal)

Zaun (fence)

Schere (scissors)

Spatel (spatula)

Fliese (tile)

Stock (stick)

Hammer (hammer)

Bremse (brake)

Schnalle (buckle)

Eimer (bucket)

Rang (rank)

Kilogramm (kilogram)

#### Neutral targets, set B.

Nagel (nail)

Sohle (sole)

Fuge (fugue)

Kasse (cash register)

Pflaster (plaster)

Schraube (screw)

Kabel (cable)

Kragen (collar)

Trichter (funnel)

Seil (rope)

Muster (pattern)

Weile (while)

#### Positive targets in the measurement phase.

Erfolg (success)

Genuss (pleasure)

Humor (humor)

Treue (loyalty)

Hoffnung (hope)

Lachen (laughter)

Hochzeit (wedding)

Freiheit (freedom, liberty)

Respekt (respect)

Sommer (summer)

#### Negative targets in the measurement phase.

Armut (poverty)

Diebstahl (theft)

Betrug (scam)

Koma (coma)

Kummer (sorrow)

Sadist (sadist)

Abscheu (loathing)

Parasit (parasite)

Gestank (smell)

Verlust (loss)

## Additional Analyses

This section contains the results of ANOVA analyses with memory as a factor for Experiment 1a, 1b, and, the results of linear mixed model analyses with contingency, valence and memory factors on reaction times, errors and ratings of all experiments. It also contains linear mixed model analyses across experiments with the factors contingency, valence, memory, and experiment on reaction times, errors and ratings. Please note that the regression analyses in the main manuscript that involve the memory factor use effect scores (contingency effect scores: low minus high contingency for RT and errors; valence effect scores: CSpos minus CSneg for ratings). Therefore, corresponding results contain the contingency or valence factor in this supplement but not in the main manuscript.

### Experiment 1a

#### Reaction times.

### *ANOVA with memory factor.*

To investigate the effect of contingency memory on contingency learning, we categorized CSs as remembered or not remembered depending on whether the participant had indicated the correct US valence. Average RT were then analyzed with a 2 x 2 repeated measures ANOVA with within-subject factors for valence contingency memory (remembered, not remembered) and contingency (high, low). Treating memory as a factor resulted in empty cells and list-wise exclusion reduced our participant sample to 48. There was no significant effect of memory, *F*(1, 47) = 1.21, *p* = .991, ηp2 = .000, BF10 = 0.16, and no significant effect of contingency, *F*(1, 47) = 3.57, *p* = .065, ηp2 = .071, BF10 = 0.81. Importantly, also the interaction of memory and contingency was not significant, *F*(1, 47) = 2.84, *p* = .099, ηp2 = .057, BF10 = 0.58.

An analogous ANOVA with the response contingency memory measure revealed a significant main effect of contingency, *F*(1, 45) = 7.440; *p* = .009; ηp2 = .142, BF10 = 4.218 indicating that participants were faster on high contingency trials. The main effect of contingency memory and the interaction effect of contingency and contingency memory remained nonsignificant.

### *Linear mixed model with memory factor.*

For this and all following analyses including memory, we modelled RT with a linear mixed model in order to avoid listwise participant exclusion. The analysis was conducted with the package lme4 (Bates, Maechler, Bolker, & Walker, 2015) in R (Version 3.3.2). Test statistics were calculated with the package lmerTest (Kuznetsova, Brockhoff, & Christensen, 2017). We fitted a model including fixed effects for paired US valence (positive, negative), contingency (high, low), valence contingency memory (remembered, not remembered), and their interactions. We included random intercepts for participants, CSs, and USs; by-participant and by-CS random slopes for US valence, contingency and memory, and their interactions; by-US random slopes for contingency, memory, and their interaction. To achieve convergence, we excluded correlations between random intercepts and slopes for all random effects.

Model results are displayed in Table 1. The only significant hypothesis-relevant effect is the main effect of contingency (indicating faster responses on high-contingency trials). We did not find a moderation of the effect of contingency by contingency memory. We obtained a similar result pattern with the response memory measure.

**Table 1.** Results for the fixed effects of a mixed linear model analysis on RT (valence contingency memory measure).

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| (Intercept) | 592.313 (10.501) | 56.403 | < .001 |
| Contingency | 5.409 (1.519) | 3.561 | < .001 |
| US valence | -7.219 (4.498) | -1.605 | .117 |
| Memory | -2.686 (1.764) | -1.523 | .135 |
| Contingency x US Valence | -3.597 (1.634) | -2.202 | .039 |
| Contingency x Memory | -0.197 (1.555) | -0.127 | .899 |
| US Valence x Memory | -0.834 (1.691) | -0.493 | .626 |
|  |  |  |  |
| US valence x Contingency x Memory | -0.305 (1.653) | -0.185 | .854 |

#### Errors.

### *ANOVA with memory factor.*

To investigate the role of contingency memory, we conducted a 2 x 2 repeated-measures ANOVA on error percentages with the within-subject factors contingency memory (valence contingency memory: remembered, not remembered) and contingency (high, low). The sample was reduced to 48 participants. None of the effects were significant, neither the main effect of contingency, *F*(1, 47) = 0.855, *p* = .360, ηp2 = 0.018, BF10 = 0.234, nor the main effect of contingency memory, *F*(1, 47) = 1.612, *p* = .210, ηp2 = 0.033, BF10 = 0.333, nor the interaction of contingency and contingency memory, *F*(1, 47) = 0.005, *p* = .942, ηp2 = 0.0001, BF10 = 0.157.

An analogous ANOVA with the response contingency memory measure revealed a significant interaction effect of contingency and contingency memory *F*(1, 45) = 4.216, *p* = .046, ηp2 = 0.086, BF10 = 1.084. The main effect of contingency and the main effect of contingency memory remained non-significant.

### *Linear mixed model with memory factor.*

For the mixed linear model analysis including the memory factor, we used a logistic regression model because of the dichotomous error data and aimed to fit the same (preregistered) fixed and random effect structure described for the RT. This full model did not converge. The final model included fixed factors for contingency, US valence and contingency memory and their interactions; by-participant, by-CS and by-US random intercepts and by-participant random slopes for contingency. Model results are displayed in Table 2. The only hypothesis-relevant significant effect was contingency, indicating significantly fewer errors on high contingency trials. Importantly, there was no moderation of the contingency effect by memory. When fitting the same (reduced) model with the response contingency memory measure, we obtained a significant main effect for contingency and a significant interaction of contingency and memory, *b* = -0.10, *SE* = 0.03, *z* = -3.451, *p* < .001.

**Table 2.** Results for fixed factors from linear mixed model analysis on errors (valence contingency memory measure).

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *z* value | *p* value |
| Intercept | -2.576 (0.170) | -15.198 | < .001 |
| Contingency | 0.107 (0.036) | 2.937 | .003 |
| Target valence | 0.110 (0.054) | 2.029 | .042 |
| Memory | -0.026 (0.033) | -0.792 | .428 |
| Contingency x Valence | 0.047 (0.029) | 1.644 | .100 |
| Contingency x Memory | 0.039 (0.030) | 1.291 | .197 |
| Target valence x Memory | -0.021 (0.030) | -0.709 | .478 |
| Target valence x Contingency x Memory | -0.020 (0.031) | -0.659 | .510 |

#### Ratings.

### *ANOVA with memory factor.*

To test whether contingency memory had an effect, we conducted a 2 x 2 repeated-measures ANOVA on average ratings with within-subject factors for US valence (positive, negative) and contingency memory (first measure; remembered, not remembered). Only 20 participants had cell means for all four factor combinations. Neither the main effect of US valence, *F*(1, 19) = 1.773, *p* = .199, ηp2 = .085, BF10 = 0.501, nor the main effect of contingency memory, *F*(1, 19) = 1.055, *p* = .317, ηp2= .053, BF10 = 0.370, were significant. The interaction of valence and contingency memory, however, was significant, *F*(1, 19) = 7.567, *p* = .013, ηp2 = .285, BF10 = 4.197. Analyses with the response memory measure yielded very similar results.

### *Linear mixed model with memory factor.*

In the mixed linear model analysis including the memory factor, we included fixed effects for US valence (positive, negative) and valence contingency memory (remembered, not remembered) and their interaction, and random intercepts for participants and CSs. We included by-participant and by-CS random slopes for US valence and memory and their interaction. To achieve convergence, we excluded correlations between random intercepts and slopes for participants and CSs.

Results are displayed in Table 3. The only significant effect was the interaction of valence and memory, indicating that the EC effect was found for remembered CS-US pairings. For non-remembered CS-US pairings EC effects were reversed. An equivalent result pattern emerged when fitting the same model with the response contingency memory measure.

**Table 3.** Results for fixed factors of linear mixed model analysis on CS ratings (valence contingency memory measure), Experiment 1a.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| Intercept | 3.972 (0.122) | 32.424 | < .001 |
| Valence | 0.032 (0.094) | 0.339 | 0.738 |
| Memory | 0.073 (0.085) | 0.863 | 0.390 |
| Valence x Memory | 0.328 (0.089) | 3.677 | < .001 |

### Experiment 1b

#### Reaction times.

### *ANOVA analyses with Memory factor.*

From the 2 x 2 repeated measures ANOVA with within-subject factors for valence contingency memory (remembered, not remembered) and contingency (high, low) 64 participants were excluded because of empty cells. There was no significant effect of memory, *F*(1,206) = 3.17, *p* = .076, ηp2 = .015, BF10 = 0.37, and no significant effect of contingency, *F*(1,206) = 0.90, *p* = .340, ηp2 = 0.004, BF10 = 0.12,. Also the interaction of memory and contingency was not significant, *F*(1,260) = 0.15, *p* = .696, ηp2 = 0.0007, BF10 = 0.08.

### *Linear mixed model with memory factor.*

The mixed linear model analysis including the memory factor was based on the same model as in Experiment 1a. The main effect of contingency was the only significant effect (see Table 4).

**Table 4.** Results for fixed effects of mixed linear model analysis on RT, Experiment 1b.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| Intercept | 697.617 (6.809) | 102.454 | < .001 |
| Contingency | 3.463 (0.792) | 4.370 | < .001 |
| Valence | -2.750 (3.341) | -0.823 | .418 |
| Memory | -1.187 (0.888) | -1.337 | .185 |
| Contingency x Valence | 1.347 (0.762) | 1.768 | .080 |
| Contingency x Memory | 0.502 (0.783) | 0.641 | .522 |
| Valence x Memory | 0.720 (0.873) | 0.824 | .416 |
| Contingency x Valence x Memory | 0.175 (0.783) | 0.223 | .823 |

#### Errors.

In the 2 x 2 repeated-measures ANOVA with contingency memory and contingency as factors, 60 participants were excluded due to empty cells. Neither the main effects nor the interaction were significant (all *F* < 1, all *p* > .3, all ηp2 < 0.005).

### *Linear mixed model with memory factor.*

For the mixed linear model analysis, we used a similar model as in Experiment 1a, with the difference that by-distractor and by-target random slopes for contingency were retained in the model. Model results are displayed in Table 5. There was a significant main effect of contingency, indicating less errors on high contingency trials. No other effects were significant.

**Table 5.** Results for fixed factors from linear mixed model analysis on errors, Experiment 1b.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *z* value | *p* value |
| Intercept | -3.051 (0.100) | -30.419 | <.001 |
| Contingency | 0.082 (0.025)  | 3.256 | .001 |
| Valence | 0.037 (0.050) | 0.755 | .450 |
| Memory | 0.029 (0.019) | 1.560 | .119 |
| Contingency x Valence | 0.014 (0.019) | 0.732 | .465 |
| Contingency x Memory | 0.025 (0.017) | 1.473 | .141 |
| Valence x Memory | 0.027 (0.016) | 1.625 | .104 |
| Contingency x Valence x Memory | 0.017 (0.017) | 1.035 | .300 |

#### Ratings.

For the 2 (valence) x 2 (contingency memory) repeated-measures ANOVA, 163 participants had to be excluded because of missing cells. Neither the main effect of US valence, *F*(1,107) = 1.172, *p* = .281, ηp2 = 0.011, BF10 = 0.19, nor the main effect of contingency memory, *F*(1,107) = 2.687, *p* = .104, ηp2 = 0.024, BF10 = 0.39, were significant. The interaction between US valence and memory was significant, *F*(1,107) = 21.424, *p* < .001, ηp2 = 0.167, BF10=1482.19. To further explore this interaction, we analyzed simple main effects of US valence separately for CSs with correctly and incorrectly remembered contingencies with *t*-tests for matched samples. These analyses were less affected by list-wise participant exclusion. For correctly indicated contingencies, CSs mainly paired with positive USs (*M* = 4.24, *SD* = 1.52) were rated significantly higher than CSs mainly paired with negative USs (*M* = 3.63, *SD* = 1.45), *t*(190) = 4.78, *p* < .001, *d*z = 0.35, BF10 = 3351.45. For incorrectly indicated contingencies, CSs mainly paired with positive USs (*M* = 3.77, *SD* = 1.48) were rated significantly lower than CSs mainly paired with negative USs (*M* = 4.41, *SD* = 1.48), *t*(175) = -4.73, *p* < .001, *d*z = -0.36, BF10 = 2663.46.

### *Linear mixed model with memory factor.*

 The mixed linear model analysis was based on the same model as in Experiment 1a (see Table 6). The interaction effect between valence and memory was the only significant effect.

In follow-up analyses of correctly remembered contingencies, CSs that were paired with mainly positive targets were rated significantly more positively compared with CSs that were paired with mainly negative targets, *t*(20.41) = 5.897, *p* < .001. For incorrectly remembered contingencies, there was a significant effect of valence in the opposite direction, *t*(160.28) = -5.804, *p* < .001.

To check whether the absence of the EC effect might be due to selection of CSs, we ran an analysis with only those participants who saw the CSs used also in the study by Schmidt and De Houwer. Also in this sample, CSpos (*M* = 3.81, *SD* = 1.42) were not rated higher than CSneg (*M* = 4.00, *SD* = 1.41), *t*(33) = -0.76, *p* = .451.

There was a small number of participants with high rates of errors and missed responses during the learning task. Following Schmidt and De Houwer (2012) we did throughout this line of work not specify criteria for excluding participants based on erroneous or missed responses. Different from RT and error analyses, were missed responses (and errors for the RT analyses) are excluded on a trial basis, these could, however, potentially distort rating analyses. We therefore ran an additional analysis where we excluded 11 participants (4.06 %) with more than 50 % invalid (i.e. missed or erroneous) responses. The results are highly similar to the results reported here (no significant valence main effect, *p* > .8; highly significant valence by memory interaction, *p* < .001).

**Table 6.** Results for fixed factors from linear mixed model analysis on ratings, Experiment 1b.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | t value | *p* value |
| Intercept | 3.963 (0.081) | 48.895 | < .001 |
| Valence | 0.009 (0.043) | 0.210 | .833 |
| Memory | -0.055 (0.046) | -1.206 | .228 |
| Valence x Memory | 0.345 (0.056) | 6.179 | < .001 |

### Experiment 2

#### Neutral target trials.

### *Linear mixed model with memory factor.*

 The mixed linear model contained fixed effects for associated valence, experimental phase, valence contingency memory, and their interactions. We included random intercepts for participants, CSs and targets, and by-participant, by-CS and by-target random slopes for associated valence and phase, and their interaction, as well as random slopes for memory for each of these. The only significant effect was associated valence (see Table 7), indicating that the ratio of positive responses was larger for CSpos. In an analogous analysis with the response memory measure, the same result pattern emerged with the only difference that there was an additional (hypothesis-irrelevant) main effect of contingency memory.

**Table 7.** Results for fixed factors of linear mixed model analysis of responses to neutral targets (based on valence contingency memory measure).

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *z* value | *p* value |
| Intercept | -0.022 (0.212) | -0.105 | .917 |
| Valence | 0.128 (0.061) | 2.088 | .037 |
| Phase | -0.041 (0.083) | -0.495 | .621 |
| Memory | -0.002 (0.066) | -0.035 | .972 |
| Valence x Phase | -0.033 (0.050) | -0.654 | .513 |
| Valence x Memory | 0.015 (0.038) | 0.396 | .692 |
| Phase x Memory | 0.022 (0.032) | 0.678 | .500 |
| Valence x Phase x Memory | 0.037 (0.032) | 1.154 | .249 |

**Ratings.**

To test the relation of the rating effect and contingency memory, we ran a mixed linear model analysis with the fixed factors US valence (positive, negative), valence contingency memory (remembered, not remembered) and their interactions. In the random part of the model, the aimed-for and final structure were the same as in Experiment 1a. Results are displayed in Table 8. The only significant effect was the interaction between US valence and contingency memory. To examine this interaction, we ran simple main effects analyses with the same model separately for remembered and not remembered contingencies. There was a significant EC effect on ratings for remembered contingencies, *b* = 0.583, *t*(29.09) = 4.21, *p* < .001, that was significantly reversed when participants remembered the incorrect contingencies, *b* = -0.355, *t*(14.52) = -2.86, *p* = .012. Results on analyses with the second memory measure as factor yielded a largely equivalent result pattern.

 **Table 8.** Results for fixed factors of linear mixed model analysis of CS ratings (based on valence contingency memory measure).

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| (Intercept) | 4.106 (0.105) | 39.04 | < .001 |
| Valence | 0.141 (0.111) | 1.27 | .214 |
| Memory | -0.060 (0.076) | -0.80 | .426 |
| Valence x Memory | 0.469 (0.078) | 5.99 | < .001 |

### Linear mixed model analyses across experiments

#### Reaction times.

**Table 9.** The effects of Contingency, Valence and Memory factors on reaction times across experiments.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| Intercept | 663.947 (5.119) | 129.709  | < .001 |
| Contingency | 4.114 (0.629) | 6.538 | < .001 |
| Valence | -6.847 (2.332) | -2.936 | .004 |
| Memory | -1.179(0.653) | -1.805 | .073 |
| Study contrast 1 | 108.024 (14.821) | 7.289 | < .001 |
| Study contrast 2 | -71.272 (17.678) | -4.032 | < .001 |
| Study contrast 3 | 22.792 (12.902) | 1.766 | .078 |
| Contingency x Valence | 0.177 (0.597) | 0.297 | .768 |
| Contingency x Memory | 0.576 (0.638) | 0.903 | .369 |
| Valence x Memory | 0.377 (0.628) | 0.601 | .550 |
| Contingency x Study contrast 1 | -1.683 (1.916) | -0.878 | .381 |
| Contingency x Study contrast 2 | 8.482 (2.307) | 3.677 | < .001 |
| Contingency x Study contrast 3 | -5.185 (1.764) | -2.940 | .003 |
| Valence x Study contrast 1 | 1.660 (5.227) | 0.318 | .751 |
| Valence x Study contrast 2 | 5.318 (4.740) | 1.122 | .263 |
| Valence x Study contrast 3 | -8.047 (3.676) | -2.189 | .030 |
| Memory x Study contrast 1 | 1.207(1.939) | 0.622 | .534 |
| Memory x Study contrast 2 | -0.645 (2.662) | -0.242 | .809 |
| Memory x Study contrast 3 | 2.008 (1.870) | 1.074 | .283 |
| Contingency x Valence x Memory | 0.372 (0.652) | 0.570 | .570 |
| Contingency x Valence x Study contrast 1 | 4.513 (1.817) | 2.485 | .014 |
| Contingency x Valence x Study contrast 2 | 0.723 (2.189) | 0.330 | .742 |
| Contingency x Valence x Study contrast 3 | -0.233 (1.683) | -0.139 | .890 |
| Contingency x Memory x Study contrast 1 | 0.344 (1.897) | 0.181 | .856 |
| Contingency x Memory x Study contrast 2 | 2.680 (2.306) | 1.162 | .246 |
| Contingency x Memory x Study contrast 3 | -0.857 (1.773) | -0.484 | .629 |
| Valence x Memory x Study contrast 1 | 1.677 (1.868) | 0.898 | .370 |
| Valence x Memory x Study contrast 2 | 0.028 (2.424) | 0.011 | .991 |
| Valence x Memory x Study contrast 3 | 0.708 (1.770) | 0.400 | .689 |
| Contingency x Valence x Memory x Study contrast 1 | 0.432 (1.942) | 0.222 | .824 |
| Contingency x Valence x Memory x Study contrast 2 | 0.474 (2.331) | 0.203 | .839 |
| Contingency x Valence x Memory x Study contrast 3 | 0.947 (1.827) | 0.518 | .605 |

#### Errors.

**Table 10.** The effects of Contingency, Valence and Memory factors on error percentages across experiments.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| Intercept | 8.460 (0.718) | 11.790 | < .001 |
| Contingency | 0.522 (0.089) | 5.864 | < .001 |
| Valence |  0.080 (0.260) | 0.307 | .760 |
| Memory | -0.030 (0.082) | -0.369 | .712 |
| Study contrast 1 | -3.175 (2.140) | -1.484 | .139 |
| Study contrast 2 | -1.864 (2.600) | -0.717 | .474 |
| Study contrast 3 | -2.000 (1.893) | -1.057 | .291 |
| Contingency x Valence | 0.121 (0.079) | 1.534 | .132 |
| Contingency x Memory | 0.306 (0.093) | 3.272 | .001 |
| Valence x Memory | 0.027 (0.081) | 0.329 | .742 |
| Contingency x Study contrast 1 | -0.297 (0.255) | -1.165 | .246 |
| Contingency x Study contrast 2 | 0.539 (0.315) | 1.713 | .088 |
| Contingency x Study contrast 3 | 0.071(0.235) | 0.304 | .761 |
| Valence x Study contrast 1 | -0.973 (0.654) | -1.488 | .138 |
| Valence x Study contrast 2 | 0.409 (0.699) | 0.586 | .558 |
| Valence x Study contrast 3 | -0.386 (0.524) | -0.737 | .461 |
| Memory x Study contrast 1 | 0.360 (0.240) | 1.502 | .133 |
| Memory x Study contrast 2 | 0.156 (0.345) | 0.452 | .652 |
| Memory x Study contrast 3 | -0.044 (0.237) | -0.187 | .852 |
| Contingency x Valence x Memory | 0.043 (0.076) | 0.570 | .571 |
| Contingency x Valence x Study contrast 1 | -0.347 (0.224) | -1.550 | .124 |
| Contingency x Valence x Study contrast 2 | -0.169 (0.265) | -0.639 | .523 |
| Contingency x Valence x Study contrast 3 | -0.164 (0.206) | -0.799 | .425 |
| Contingency x Memory x Study contrast 1 | 0.008 (0.279) | 0.028 | .978 |
| Contingency x Memory x Study contrast 2 | 1.364 (0.345) | 3.950 | < .001 |
| Contingency x Memory x Study contrast 3 | -0.394 (0.264) | -1.493 | .136 |
| Valence x Memory x Study contrast 1 | 0.203 (0.240) | 0.845 | .398 |
| Valence x Memory x Study contrast 2 | -0.164 (0.333) | -0.494 | .621 |
| Valence x Memory x Study contrast 3 | 0.241(0.235) | 1.026 | .305 |
| Contingency x Valence x Memory x Study contrast 1 | 0.372 (0.225) | 1.653 | .100 |
| Contingency x Valence x Memory x Study contrast 2 | -0.092 (0.274) | -0.336 | .737 |
| Contingency x Valence x Memory x Study contrast 3 | 0.275 (0.219) | 1.255 | .210 |

#### Ratings.

|  |  |  |  |
| --- | --- | --- | --- |
| Predictor | Coefficient (SE) | *t* value | *p* value |
| Intercept | 4.019 (0.055) | 72.491 | < .001 |
| Valence | 0.075 (0.034) | 2.244 | .025 |
| Memory | -0.027 (0.035) | -0.773 | .439 |
| Study contrast 1 | -0.006 (0.154) | -0.039 | .969 |
| Study contrast 2 | 0.251 (0.195) | 1.287 | .199 |
| Study contrast 3 | 0.046 (0.136) | 0.340 | .734 |
| Valence x Memory | 0.425 (0.041) | 10.421 | < .001 |
| Valence x Study contrast 1 | -0.029 (0.103) | -0.281 | .779 |
| Valence x Study contrast 2 | 0.494 (0.128) | 3.852 | < .001 |
| Valence x Study contrast 3 | -0.077 (0.092) | -0.836 | .403 |
| Memory x Study contrast 1 | -0.120 (0.108) | -1.118 | .264 |
| Memory x Study contrast 2 | 0.045 (0.140) | 0.322 | .747 |
| Memory x Study contrast 3 | -0.067 (0.097) | -0.684 | .494 |
| Valence x Memory x Study contrast 1 | 0.028 (0.119) | 0.237 | .813 |
| Valence x Memory x Study contrast 2 | 0.454 (0.149) | 3.043 | .003 |
| Valence x Memory x Study contrast 3 | 0.012 (0.107) | 0.116 | .908 |

**Table 11**. The effects of Contingency, Valence and Memory factors on evaluative ratings across experiments.