Modelling report

Are there unconscious visual images in aphantasia? Development of an implicit priming paradigm

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# 1. Questionnaires analyses

## 1.1 Group differences

### 1.1.1 Table

| Questionnaire | yes | no | df | t | p |
| --- | --- | --- | --- | --- | --- |
| VVIQ | 19.083 ± 0.913 | 54.188 ± 1.095 | 148 | -21.24 | 8.65e-47 |
| OSIQ\_Object | 23.924 ± 0.994 | 46.561 ± 1.192 | 148 | -13.29 | 5.07e-27 |
| OSIQ\_Spatial | 41.011 ± 0.865 | 45.452 ± 1.036 | 148 | -3.40 | 8.58e-04 |
| SUIS | 17.335 ± 0.749 | 37.132 ± 0.898 | 148 | -15.51 | 7.75e-33 |

### 1.1.2 Plot

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| Figure S1.1 |

## 1.2 Congruence effects correlations

### 1.2.1 Matrices

# Correlation Matrix (spearman-method)  
  
Parameter1 | Parameter2 | rho | 95% CI | S | p  
--------------------------------------------------------------------------------  
Implicit effect | Explicit effect | 0.05 | [-0.11, 0.21] | 5.44e+05 | 0.571   
Implicit effect | VVIQ | 0.21 | [ 0.05, 0.37] | 4.51e+05 | 0.016\*   
Implicit effect | OSIQ\_Object | 0.26 | [ 0.10, 0.40] | 4.27e+05 | 0.003\*\*   
Implicit effect | OSIQ\_Spatial | 0.05 | [-0.11, 0.21] | 5.44e+05 | 0.571   
Implicit effect | SUIS | 0.27 | [ 0.11, 0.41] | 4.21e+05 | 0.002\*\*   
Explicit effect | VVIQ | 0.08 | [-0.09, 0.24] | 5.29e+05 | 0.427   
Explicit effect | OSIQ\_Object | 0.12 | [-0.04, 0.28] | 5.03e+05 | 0.194   
Explicit effect | OSIQ\_Spatial | -0.02 | [-0.18, 0.15] | 5.84e+05 | 0.831   
Explicit effect | SUIS | 0.16 | [ 0.00, 0.32] | 4.82e+05 | 0.081   
VVIQ | OSIQ\_Object | 0.76 | [ 0.68, 0.82] | 1.40e+05 | < .001\*\*\*  
VVIQ | OSIQ\_Spatial | 0.28 | [ 0.13, 0.43] | 4.11e+05 | 0.001\*\*   
VVIQ | SUIS | 0.84 | [ 0.79, 0.88] | 89975.33 | < .001\*\*\*  
OSIQ\_Object | OSIQ\_Spatial | 0.09 | [-0.07, 0.25] | 5.20e+05 | 0.341   
OSIQ\_Object | SUIS | 0.82 | [ 0.75, 0.86] | 1.06e+05 | < .001\*\*\*  
OSIQ\_Spatial | SUIS | 0.30 | [ 0.15, 0.45] | 3.99e+05 | < .001\*\*\*  
  
p-value adjustment method: Benjamini & Hochberg (1995)  
Observations: 151

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| Figure S1.2 |

### 1.2.2 Plots

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| Figure S1.3 |

# 2. Accuracy analyses

We quickly checked for accuracy differences between groups with a logistic regression model.

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| Table S2.1: Performance and estimates of the logistic GLMM fitted on accuracy in the implicit task.   | AIC | AICc | BIC | R2 (cond.) | R2 (marg.) | ICC | RMSE | Sigma | Log\_loss | Score\_log | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2614.99 | 2615.01 | 2679.02 | 0.17 | 9.48e-03 | 0.16 | 0.18 | 1.00 | 0.13 | -Inf |   Analysis of Deviance Table (Type II Wald chisquare tests)  Response: correct\_implicit  Chisq Df Pr(>Chisq)  aphantasia 1.1704 1 0.27932  congruence 0.2858 1 0.59296  color 6.3683 1 0.01162 \* aphantasia:congruence 0.2986 1 0.58479  aphantasia:color 0.5591 1 0.45463  congruence:color 0.0163 1 0.89851  aphantasia:congruence:color 0.5143 1 0.47327  --- Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1 |

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| Table S2.2: Estimated probability of a correct answer and log-odds contrasts between groups for the accuracy in the implicit task.  Estimated Marginal Means   | color | Probability | SE | 95% CI | | --- | --- | --- | --- | | Uncoloured | 0.97 | 3.37e-03 | (0.96, 0.98) | | Coloured | 0.98 | 2.70e-03 | (0.97, 0.98) |   Marginal means estimated at color  Marginal Contrasts Analysis   | Level1 | Level2 | Odds ratio | 95% CI | SE | df | z | p | | --- | --- | --- | --- | --- | --- | --- | --- | | Uncoloured | Coloured | 0.73 | (0.58, 0.92) | 0.09 | Inf | -2.63 | 0.009 |   Marginal contrasts estimated at color p-values are uncorrected. |

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| Table S2.3: Performance and estimates of the logistic GLMM fitted on accuracy in the explicit task.   | AIC | AICc | BIC | R2 (cond.) | R2 (marg.) | ICC | RMSE | Sigma | Log\_loss | Score\_log | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 2020.26 | 2020.28 | 2084.03 | 0.18 | 0.03 | 0.16 | 0.15 | 1.00 | 0.11 | -Inf |   Analysis of Deviance Table (Type II Wald chisquare tests)  Response: correct\_explicit  Chisq Df Pr(>Chisq)  aphantasia 1.5712 1 0.2100  congruence 0.2753 1 0.5998  color 18.9615 1 1.334e-05 \*\*\* aphantasia:congruence 0.0186 1 0.8916  aphantasia:color 0.6236 1 0.4297  congruence:color 1.1352 1 0.2867  aphantasia:congruence:color 0.2825 1 0.5951  --- Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1 |

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| Table S2.4: Estimated probability of a correct answer and log-odds contrasts between groups for the accuracy in the explicit task.  Estimated Marginal Means   | color | Probability | SE | 95% CI | | --- | --- | --- | --- | | Uncoloured | 0.97 | 3.15e-03 | (0.97, 0.98) | | Coloured | 0.99 | 1.99e-03 | (0.98, 0.99) |   Marginal means estimated at color  Marginal Contrasts Analysis   | Level1 | Level2 | Odds ratio | 95% CI | SE | df | z | p | | --- | --- | --- | --- | --- | --- | --- | --- | | Uncoloured | Coloured | 0.52 | (0.39, 0.69) | 0.08 | Inf | -4.49 | < .001 |   Marginal contrasts estimated at color p-values are uncorrected. |

# 3. Response Times analyses

## 3.1 Rationale

To account for the non-normal, positively skewed distributions of the RTs, we fitted Generalized Linear Mixed Models (GLMMs) with inverse Gaussian distributions. The models were implemented in the lme4 R package and integrated in tidymodels workflows using the package multilevelmod. Models with Gamma and Gaussian distributions were also fitted and compared with the AIC and BIC to ensure that we chose the best distribution available.

The models included the ***Group*** (aphantasic, control), ***Congruence*** condition (congruent or incongruent) and ***Color*** condition (color or uncolored) along with all their two and three way interactions as fixed categorical predictors, while ***participants*** have been included as grouping factors (i.e. “random effects”). The random effect structure was chosen by fitting and comparing models with every possible combination of distribution and structure (intercept by participant, congruence or color, slope by participant on congruence and/or color) aiming for the best balance between goodness of fit and parsimony. Complex random-effects structures including various slopes on the factors failed to converge to stable and reliable estimates, hence the optimal models chosen included a single by-participant random intercept.

## 3.2 Model fitting

The formula of the model fitted is . See the HTML version for the code and details.

## 3.3 Model diagnostics

The quality checks of the models are displayed in [Figure S3.1](#suppfig-implicit-checks-2) and [Figure S3.2](#suppfig-explicit-checks-2).

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| Figure S3.1: Model assumption checks for the Generalized Linear Mixed Model fit on the RTs in the implicit task. |

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| Figure S3.2: Model assumption checks for the Generalized Linear Mixed Model fit on the RTs in the explicit task. |

## 3.4 Model summaries

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S3.1: Performance and estimates of the GLMM fitted on the implicit task data.   | AIC | AICc | BIC | R2 (cond.) | R2 (marg.) | ICC | RMSE | Sigma | | --- | --- | --- | --- | --- | --- | --- | --- | | -4619.06 | -4619.03 | -4548.26 | 0.01 | 3.47e-04 | 0.01 | 0.26 | 0.48 |   Analysis of Deviance Table (Type II Wald chisquare tests)  Response: rt  Chisq Df Pr(>Chisq)  aphantasia 0.6079 1 0.435588  congruence 8.6040 1 0.003354 \*\* color 0.4346 1 0.509730  aphantasia:congruence 8.5799 1 0.003399 \*\* aphantasia:color 0.0021 1 0.963046  congruence:color 2.1571 1 0.141914  aphantasia:congruence:color 1.4468 1 0.229035  --- Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S3.2: Performance and estimates of the GLMM fitted on the explicit task data.   | AIC | AICc | BIC | R2 (cond.) | R2 (marg.) | ICC | RMSE | Sigma | | --- | --- | --- | --- | --- | --- | --- | --- | | -2673.61 | -2673.58 | -2603.01 | 0.03 | 7.96e-04 | 0.03 | 0.28 | 0.41 |   Analysis of Deviance Table (Type II Wald chisquare tests)  Response: rt  Chisq Df Pr(>Chisq)  aphantasia 0.0769 1 0.7815503  congruence 14.5055 1 0.0001398 \*\*\* color 47.6344 1 5.136e-12 \*\*\* aphantasia:congruence 10.6801 1 0.0010830 \*\*  aphantasia:color 0.8183 1 0.3656672  congruence:color 0.2153 1 0.6426749  aphantasia:congruence:color 0.7010 1 0.4024535  --- Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1 |

## 3.5 Estimated means and contrasts

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| Table S3.3: Estimated means for each group in each congruence condition and contrasts between groups and conditions in the implicit task.   | Group | Condition | Median (ms) | SE | df | asymp.LCL | asymp.UCL | | --- | --- | --- | --- | --- | --- | --- | | Control | Incongruent | 669.71 | 19.36 | Inf | 631.77 | 707.65 | | Aphantasia | Incongruent | 676.89 | 15.84 | Inf | 645.84 | 707.93 | | Control | Congruent | 644.38 | 19.31 | Inf | 606.53 | 682.22 | | Aphantasia | Congruent | 675.05 | 15.83 | Inf | 644.02 | 706.08 |   Marginal Contrasts Analysis   | Level1 | Level2 | Difference | 95% CI | SE | df | z | p | | --- | --- | --- | --- | --- | --- | --- | --- | | Aphantasia Incongruent | Aphantasia Congruent | 1.84e-03 | (-0.01, 0.01) | 5.23e-03 | Inf | 0.35 | 0.725 | | Aphantasia Incongruent | Control Congruent | 0.03 | (-0.02, 0.08) | 0.02 | Inf | 1.30 | 0.193 | | Control Congruent | Aphantasia Congruent | -0.03 | (-0.08, 0.02) | 0.02 | Inf | -1.23 | 0.219 | | Control Incongruent | Aphantasia Congruent | -5.34e-03 | (-0.05, 0.04) | 0.02 | Inf | -0.21 | 0.831 | | Control Incongruent | Aphantasia Incongruent | -7.18e-03 | (-0.06, 0.04) | 0.02 | Inf | -0.29 | 0.774 | | Control Incongruent | Control Congruent | 0.03 | ( 0.01, 0.04) | 6.13e-03 | Inf | 4.13 | < .001 |   Marginal contrasts estimated at aphantasia, congruence p-values are uncorrected. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S3.4: Estimated means for each group in each congruence condition and contrasts between groups and conditions in the explicit task.   | Group | Condition | Median (ms) | SE | df | asymp.LCL | asymp.UCL | | --- | --- | --- | --- | --- | --- | --- | | Control | Incongruent | 801.78 | 33.22 | Inf | 736.68 | 866.88 | | Aphantasia | Incongruent | 799.21 | 27.05 | Inf | 746.18 | 852.23 | | Control | Congruent | 770.29 | 33.17 | Inf | 705.28 | 835.30 | | Aphantasia | Congruent | 794.57 | 27.04 | Inf | 741.56 | 847.57 |   Marginal Contrasts Analysis   | Level1 | Level2 | Difference | 95% CI | SE | df | z | p | | --- | --- | --- | --- | --- | --- | --- | --- | | Aphantasia Incongruent | Aphantasia Congruent | 4.64e-03 | (-0.01, 0.02) | 5.45e-03 | Inf | 0.85 | 0.394 | | Aphantasia Incongruent | Control Congruent | 0.03 | (-0.05, 0.11) | 0.04 | Inf | 0.68 | 0.499 | | Control Congruent | Aphantasia Congruent | -0.02 | (-0.11, 0.06) | 0.04 | Inf | -0.57 | 0.570 | | Control Incongruent | Aphantasia Congruent | 7.21e-03 | (-0.08, 0.09) | 0.04 | Inf | 0.17 | 0.866 | | Control Incongruent | Aphantasia Incongruent | 2.57e-03 | (-0.08, 0.09) | 0.04 | Inf | 0.06 | 0.952 | | Control Incongruent | Control Congruent | 0.03 | ( 0.02, 0.04) | 6.42e-03 | Inf | 4.91 | < .001 |   Marginal contrasts estimated at aphantasia, congruence p-values are uncorrected. |

## 3.6 Visualisations

The figures below are also displayed in the main article. See the HTML version for the code and details.

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| Figure 3.1: Subject means and model-estimated means per group and condition in the implicit task. |

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| Figure 3.2: Subject means and model-estimated means per group and condition in the explicit task. |

# 4. Finer sub-groups

| Aphantasia | Sub-group | N |
| --- | --- | --- |
| Control | Hyperphantasia | 1 |
| Control | Control | 57 |
| Aphantasia | Hypophantasia | 37 |
| Aphantasia | Aphantasia | 48 |

Interestingly, we have 39 participants that did not score at floor VVIQ but between 17 and 32, a score range that Reeder & Pounder (2024) have proposed to call “hypophantasia”. However, our sample comprised only 2 hyperphantasics, i.e. participants scoring above 74 (Zeman et al., 2020). These two participants will therefore be removed from the sample before performing new analyses on the aphantasic, hypophantasic and control groups.

## 4.1 Questionnaires analyses

### 4.1.1 Table

| Questionnaire | Control | Hypophantasia | Aphantasia |
| --- | --- | --- | --- |
| VVIQ | 53.492 ± 1.016 | 22.923 ± 1.26 | 16.049 ± 1.117 |
| OSIQ\_Object | 46.09 ± 1.192 | 25.041 ± 1.478 | 23.04 ± 1.31 |
| OSIQ\_Spatial | 45.467 ± 1.045 | 42.98 ± 1.295 | 39.456 ± 1.149 |
| SUIS | 36.983 ± 0.893 | 18.895 ± 1.107 | 16.102 ± 0.981 |

| Level1 | Level2 | Difference | CI | SE | t(145) | p | Questionnaire |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Control | Aphantasia | 37.44 | (34.45, 40.44) | 1.51 | 24.73 | < .001 | VVIQ |
| Control | Hypophantasia | 30.57 | (27.37, 33.76) | 1.62 | 18.91 | < .001 | VVIQ |
| Hypophantasia | Aphantasia | 6.87 | ( 3.54, 10.21) | 1.69 | 4.07 | < .001 | VVIQ |
| Control | Aphantasia | 23.05 | (19.54, 26.56) | 1.78 | 12.98 | < .001 | OSIQ\_Object |
| Control | Hypophantasia | 21.05 | (17.30, 24.80) | 1.90 | 11.10 | < .001 | OSIQ\_Object |
| Hypophantasia | Aphantasia | 2.00 | (-1.91, 5.91) | 1.98 | 1.01 | 0.314 | OSIQ\_Object |
| Control | Aphantasia | 6.01 | ( 2.93, 9.09) | 1.56 | 3.86 | < .001 | OSIQ\_Spatial |
| Control | Hypophantasia | 2.49 | (-0.80, 5.77) | 1.66 | 1.50 | 0.137 | OSIQ\_Spatial |
| Hypophantasia | Aphantasia | 3.52 | ( 0.09, 6.95) | 1.74 | 2.03 | 0.044 | OSIQ\_Spatial |
| Control | Aphantasia | 20.88 | (18.25, 23.51) | 1.33 | 15.70 | < .001 | SUIS |
| Control | Hypophantasia | 18.09 | (15.28, 20.89) | 1.42 | 12.74 | < .001 | SUIS |
| Hypophantasia | Aphantasia | 2.79 | (-0.14, 5.72) | 1.48 | 1.88 | 0.062 | SUIS |

### 4.1.2 Plot

# A tibble: 12 × 6  
 Questionnaire sub\_group Mean SE CI\_low CI\_high  
 <fct> <fct> <dbl> <dbl> <dbl> <dbl>  
 1 VVIQ Control 5.86e- 1 0.0158 0.555 0.617   
 2 VVIQ Hypophantasia 1.09e- 1 0.0196 0.0698 0.147   
 3 VVIQ Aphantasia -4.44e-16 0.0173 -0.0342 0.0342  
 4 OSIQ\_Object Control 5.18e- 1 0.0198 0.479 0.557   
 5 OSIQ\_Object Hypophantasia 1.68e- 1 0.0245 0.119 0.216   
 6 OSIQ\_Object Aphantasia 1.34e- 1 0.0217 0.0909 0.176   
 7 OSIQ\_Spatial Control 5.09e- 1 0.0174 0.474 0.543   
 8 OSIQ\_Spatial Hypophantasia 4.68e- 1 0.0216 0.425 0.510   
 9 OSIQ\_Spatial Aphantasia 4.05e- 1 0.0191 0.368 0.443   
10 SUIS Control 5.22e- 1 0.0186 0.485 0.558   
11 SUIS Hypophantasia 1.45e- 1 0.0230 0.0992 0.190   
12 SUIS Aphantasia 8.33e- 2 0.0203 0.0431 0.124

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| Figure S4.1 |

## 4.2 Response Times analysis

## 4.3 Model fitting

## 4.4 Model diagnostics

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| Figure S4.2: Model assumption checks for the Generalized Linear Mixed Model fit on the RTs in the implicit task with finer sub-groups. |

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| Figure S4.3: Model assumption checks for the Generalized Linear Mixed Model fit on the RTs in the explicit task with finer sub-groups. |

## 4.5 Model summaries

| AIC | AICc | BIC | R2 (cond.) | R2 (marg.) | ICC | RMSE | Sigma |
| --- | --- | --- | --- | --- | --- | --- | --- |
| -4629.18 | -4629.13 | -4530.16 | 0.02 | 6.43e-04 | 0.01 | 0.26 | 0.48 |

Analysis of Deviance Table (Type II Wald chisquare tests)  
  
Response: rt  
 Chisq Df Pr(>Chisq)   
sub\_group 1.4143 2 0.493042   
congruence 8.7113 1 0.003162 \*\*  
color 0.5361 1 0.464064   
sub\_group:congruence 13.2326 2 0.001338 \*\*  
sub\_group:color 1.2212 2 0.543029   
congruence:color 1.9224 1 0.165588   
sub\_group:congruence:color 1.7589 2 0.415017   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

| AIC | AICc | BIC | R2 (cond.) | R2 (marg.) | ICC | RMSE | Sigma |
| --- | --- | --- | --- | --- | --- | --- | --- |
| -2549.41 | -2549.36 | -2450.78 | 0.03 | 6.89e-04 | 0.03 | 0.28 | 0.41 |

Analysis of Deviance Table (Type II Wald chisquare tests)  
  
Response: rt  
 Chisq Df Pr(>Chisq)   
sub\_group 0.0238 2 0.9881837   
congruence 11.4280 1 0.0007234 \*\*\*  
color 44.0495 1 3.202e-11 \*\*\*  
sub\_group:congruence 8.1752 2 0.0167794 \*   
sub\_group:color 0.4794 2 0.7868834   
congruence:color 0.2415 1 0.6230973   
sub\_group:congruence:color 2.2646 2 0.3222926   
---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## 4.6 Estimated means and contrasts

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| Table S4.1: Marginal Contrasts Analysis   | Condition | Sub-group | Median (ms) | SE | df | asymp.LCL | asymp.UCL | | --- | --- | --- | --- | --- | --- | --- | | Incongruent | Control | 667.63 | 19.48 | Inf | 629.45 | 705.82 | | Congruent | Control | 642.01 | 19.43 | Inf | 603.92 | 680.10 | | Incongruent | Hypophantasia | 668.39 | 24.03 | Inf | 621.28 | 715.49 | | Congruent | Hypophantasia | 654.24 | 24.00 | Inf | 607.20 | 701.28 | | Incongruent | Aphantasia | 682.92 | 20.92 | Inf | 641.92 | 723.92 | | Congruent | Aphantasia | 691.12 | 20.93 | Inf | 650.10 | 732.13 |  | Level1 | Level2 | Difference | 95% CI | SE | df | z | p | | --- | --- | --- | --- | --- | --- | --- | --- | | Congruent Control | Congruent Aphantasia | -0.05 | (-0.11, 0.01) | 0.03 | Inf | -1.72 | 0.085 | | Congruent Control | Congruent Hypophantasia | -0.01 | (-0.07, 0.05) | 0.03 | Inf | -0.40 | 0.692 | | Congruent Control | Incongruent Aphantasia | -0.04 | (-0.10, 0.01) | 0.03 | Inf | -1.43 | 0.152 | | Congruent Control | Incongruent Hypophantasia | -0.03 | (-0.09, 0.03) | 0.03 | Inf | -0.85 | 0.393 | | Congruent Hypophantasia | Congruent Aphantasia | -0.04 | (-0.10, 0.03) | 0.03 | Inf | -1.16 | 0.247 | | Congruent Hypophantasia | Incongruent Aphantasia | -0.03 | (-0.09, 0.03) | 0.03 | Inf | -0.90 | 0.367 | | Incongruent Aphantasia | Congruent Aphantasia | -8.19e-03 | (-0.02, 0.01) | 7.04e-03 | Inf | -1.16 | 0.244 | | Incongruent Control | Congruent Aphantasia | -0.02 | (-0.08, 0.03) | 0.03 | Inf | -0.82 | 0.411 | | Incongruent Control | Congruent Control | 0.03 | ( 0.01, 0.04) | 6.15e-03 | Inf | 4.17 | < .001 | | Incongruent Control | Congruent Hypophantasia | 0.01 | (-0.05, 0.07) | 0.03 | Inf | 0.43 | 0.665 | | Incongruent Control | Incongruent Aphantasia | -0.02 | (-0.07, 0.04) | 0.03 | Inf | -0.54 | 0.592 | | Incongruent Control | Incongruent Hypophantasia | -7.55e-04 | (-0.06, 0.06) | 0.03 | Inf | -0.02 | 0.981 | | Incongruent Hypophantasia | Congruent Aphantasia | -0.02 | (-0.09, 0.04) | 0.03 | Inf | -0.71 | 0.475 | | Incongruent Hypophantasia | Congruent Hypophantasia | 0.01 | ( 0.00, 0.03) | 7.79e-03 | Inf | 1.82 | 0.069 | | Incongruent Hypophantasia | Incongruent Aphantasia | -0.01 | (-0.08, 0.05) | 0.03 | Inf | -0.46 | 0.648 |   Marginal contrasts estimated at congruence, sub\_group p-values are uncorrected. |

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| Table S4.2: Marginal Contrasts Analysis   | Condition | Sub-group | Median (ms) | SE | df | asymp.LCL | asymp.UCL | | --- | --- | --- | --- | --- | --- | --- | | Incongruent | Control | 805.25 | 33.85 | Inf | 738.91 | 871.59 | | Congruent | Control | 776.89 | 33.81 | Inf | 710.64 | 843.15 | | Incongruent | Hypophantasia | 799.65 | 40.77 | Inf | 719.74 | 879.56 | | Congruent | Hypophantasia | 796.06 | 40.76 | Inf | 716.17 | 875.95 | | Incongruent | Aphantasia | 798.72 | 36.34 | Inf | 727.49 | 869.96 | | Congruent | Aphantasia | 793.26 | 36.33 | Inf | 722.05 | 864.47 |  | Level1 | Level2 | Difference | 95% CI | SE | df | z | p | | --- | --- | --- | --- | --- | --- | --- | --- | | Congruent Control | Congruent Aphantasia | -0.02 | (-0.11, 0.08) | 0.05 | Inf | -0.33 | 0.742 | | Congruent Control | Congruent Hypophantasia | -0.02 | (-0.12, 0.08) | 0.05 | Inf | -0.36 | 0.717 | | Congruent Control | Incongruent Aphantasia | -0.02 | (-0.12, 0.08) | 0.05 | Inf | -0.44 | 0.660 | | Congruent Control | Incongruent Hypophantasia | -0.02 | (-0.13, 0.08) | 0.05 | Inf | -0.43 | 0.667 | | Congruent Hypophantasia | Congruent Aphantasia | 2.81e-03 | (-0.10, 0.11) | 0.05 | Inf | 0.05 | 0.959 | | Congruent Hypophantasia | Incongruent Aphantasia | -2.66e-03 | (-0.11, 0.10) | 0.05 | Inf | -0.05 | 0.961 | | Incongruent Aphantasia | Congruent Aphantasia | 5.46e-03 | (-0.01, 0.02) | 7.44e-03 | Inf | 0.73 | 0.463 | | Incongruent Control | Congruent Aphantasia | 0.01 | (-0.09, 0.11) | 0.05 | Inf | 0.24 | 0.809 | | Incongruent Control | Congruent Control | 0.03 | ( 0.02, 0.04) | 6.58e-03 | Inf | 4.31 | < .001 | | Incongruent Control | Congruent Hypophantasia | 9.19e-03 | (-0.09, 0.11) | 0.05 | Inf | 0.17 | 0.862 | | Incongruent Control | Incongruent Aphantasia | 6.53e-03 | (-0.09, 0.10) | 0.05 | Inf | 0.13 | 0.895 | | Incongruent Control | Incongruent Hypophantasia | 5.60e-03 | (-0.10, 0.11) | 0.05 | Inf | 0.11 | 0.916 | | Incongruent Hypophantasia | Congruent Aphantasia | 6.39e-03 | (-0.10, 0.11) | 0.05 | Inf | 0.12 | 0.907 | | Incongruent Hypophantasia | Congruent Hypophantasia | 3.59e-03 | (-0.01, 0.02) | 8.01e-03 | Inf | 0.45 | 0.654 | | Incongruent Hypophantasia | Incongruent Aphantasia | 9.30e-04 | (-0.11, 0.11) | 0.05 | Inf | 0.02 | 0.986 |   Marginal contrasts estimated at congruence, sub\_group p-values are uncorrected. |

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| Figure 4.1 |

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| Figure 4.2 |

# 5. Bayesian modelling

We used Bayesian hypothesis testing to assess the congruence effect separately for each group. Thus, for each subset of the data (control, aphantasia, hypophantasia, aphantasia without hypo., control without hyperphantasia), we fitted a model with the formula and compared the models with and without the congruence effect using Bayes Factors.

We used more sensible priors than the default ones as regularizing priors to avoid overfitting.

Bayesian models were fitted using the brms package with the cmdstanr backend. We used parallel processing to fit the models. We aimed for 40000 post-warmup iterations to have sufficient draws to compute reliable Bayes Factors. Using a computer with 20 cores available for parallel processing, we could fit 20 chains of 3000 iterations with 1000 warmup iterations. Each model fitted in approximately 1 minute. Model fits are saved as .rds files for reproducibility and can be found on OSF in the analysis project, under the data/r-data-structures folder.

To save compilation time, we used the brms function update to use the first compiled model as a template for all the others.

We finally compute Bayes Factor in favour of the null model of an absence of congruence effect for each group.

Implicit task models ------------------------------------------------

Aphantasia group, evidence against an implicit congruence effect:   
 BF\_01 = 14.12439

Control group, evidence against an implicit congruence effect:   
 BF\_01 = 2.014823e-06

Finer aphantasia group, evidence against an implicit congruence effect:   
 BF\_01 = 12.59357

Hypophantasia group, evidence against an implicit congruence effect:   
 BF\_01 = 2.413134

Finer control group, evidence against an implicit congruence effect:   
 BF\_01 = 0.004105608

Explicit task models ------------------------------------------------

Aphantasia group, evidence against an explicit congruence effect:   
 BF\_01 = 12.08795

Control group, evidence against an explicit congruence effect:   
 BF\_01 = 0.002964782

Finer aphantasia group, evidence against an explicit congruence effect:   
 BF\_01 = 11.78268

Hypophantasia group, evidence against an explicit congruence effect:   
 BF\_01 = 9.81433

Finer control group, evidence against an explicit congruence effect:   
 BF\_01 = 2.179724e-06

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