

## Appendix 5: Planned analysis for imagery scores

```
# Load PP verification responses
PP <- dir(path = "..",
  pattern = "all_rawdata_PP",
  recursive = TRUE, full.names = TRUE) %>%
  read_csv() %>%
  subset(correct == 1 & Identical != "F") %>% ## Exclude the incorrect responses and filler trials
  inner_join(select(lab_info, PSA_ID, Language), by = "PSA_ID") %>%
  distinct() %>% ## Merge the language aspects
  mutate(Source = if_else(opensesame_codename == "osweb","osweb","site"),
    Subject = paste0(Source,"_",PSA_ID,"_",subject_nr)) ## Compose the unique participant id

## Tidy PP data for mixed linear model
PP_site_tidy <- PP %>%
  filter(Source!="osweb")

## Tidy PP data for mixed linear model
PP_osweb_tidy <- PP %>%
  filter(Source=="osweb") %>% # include jatos data
  subset(correct == 1 & Identical != "F") %>% ## Exclude the incorrect responses and filler trials
  distinct() %>% ## Merge the language aspects
  filter(!(PSA_ID == "USA_033" & subject_nr == 39)) ## exclude this participant who had not complete PP

PP_tidy = bind_rows(PP_site_tidy, PP_osweb_tidy)

## Dataset for mixed-effect model
PP_lme_data <- PP_tidy %>% left_join(outliers_table, by=c("PSA_ID" = "LAB", "Subject" = "Subject")) %>% ## filter the outliers by SP_V data
  filter(Outlier == FALSE)

PP_lme_data$Language <- ifelse(PP_lme_data$Language == "Magyar","Hungarian",PP_lme_data$Language)
PP_lme_data$Language <- ifelse(PP_lme_data$Language == "Simple Chinese", "Simplified Chinese",PP_lme_data$Language)

PP_lme_data <- mutate(PP_lme_data,
  Identical= factor(Identical,
    levels = c("Y","N"),
    labels = c("SAME","DIFF")))

## standardized the imagery score
PP_lme_data$Language <- if_else(PP_lme_data$Language=="English", "0English",PP_lme_data$Language)

PP_lang.zero_slope.cor.lme <- lmerTest::lmer(response_time ~
  Identical*Language + # Fixed effect
  (1 | Subject) + # By-subject random intercept
  (1 | Picture1) + # By-item random intercept
  (1 | PSA_ID), # By-lab random intercept
  (z_Identical || PSA_ID), # By-lab random slopes
  data = PP_lme_data,
  #method = 'KR', # Calculate p values using Kenward-Roger method
  control = lmerControl(optimizer = "bobyqa",optCtrl = list(maxfun = 1e6)) # Increase maximum number of iterations to facilitate
)

PP_lang.slopes.nocor.lme <- lmerTest::lmer(response_time ~
  Identical*Language + # Fixed effect
  (1 | Subject) + # By-subject random intercept
  (1 | Picture1) + # By-item random intercept
  (Identical || PSA_ID), # By-lab random intercept
  data = PP_lme_data,
  #method = 'KR', # Calculate p values using Kenward-Roger method
  control = lmerControl(optimizer = "bobyqa",optCtrl = list(maxfun = 1e6)) # Increase maximum number of iterations to facilitate
)

PP_lang.slopes.cor.lme <- lmerTest::lmer(response_time ~
  Identical*Language + # Fixed effect
  (1 | Subject) + # By-subject random intercept
  (1 | Picture1) + # By-item random intercept
  (Identical | PSA_ID), # By-lab random intercept
  data = PP_lme_data,
  #method = 'KR', # Calculate p values using Kenward-Roger method
  control = lmerControl(optimizer = "bobyqa",optCtrl = list(maxfun = 1e6)) # Increase maximum number of iterations to facilitate
)

tab_model(PP_lang.zero_slope.cor.lme)
```

Predictors	response_time		
	Estimates	CI	p
(Intercept)	566.93	551.97 – 581.88	<0.001
Identical [DIFF]	50.10	47.24 – 52.97	<0.001
Language [Arabic]	-16.34	-60.42 – 27.73	0.467
Language [Brazilian Portuguese]	59.07	-0.69 – 118.83	0.053
Language [German]	-8.12	-44.52 – 28.28	0.662
Language [Greek]	42.72	-15.64 – 101.08	0.151
Language [Hebrew]	7.56	-49.79 – 64.92	0.796
Language [Hindi]	41.71	-17.44 – 100.86	0.167
Language [Hungarian]	16.36	-41.24 – 73.95	0.578
Language [Norwegian]	16.62	-21.09 – 54.33	0.388
Language [Polish]	-13.67	-74.94 – 47.59	0.662
Language [Portuguese]	12.30	-47.94 – 72.53	0.689
Language [Serbian]	32.61	-10.13 – 75.36	0.135
Language [Simplified Chinese]	22.91	-22.66 – 68.48	0.324
Language [Slovak]	12.57	-30.88 – 56.01	0.571

Language [Spanish]	62.37	18.91 – 105.84	<b>0.005</b>
Language [Thai]	-2.31	-63.57 – 58.95	0.941
Language [Traditional Chinese]	1.18	-41.85 – 44.22	0.957
Language [Turkish]	59.88	24.29 – 95.47	<b>0.001</b>
Identical [DIFF] * Language [Arabic]	-16.76	-27.80 – -5.71	<b>0.003</b>
Identical [DIFF] * Language [Brazilian Portuguese]	-3.76	-17.43 – 9.91	0.590
Identical [DIFF] * Language [German]	-3.70	-10.99 – 3.59	0.319
Identical [DIFF] * Language [Greek]	-10.48	-21.93 – 0.97	0.073
Identical [DIFF] * Language [Hebrew]	-6.80	-16.30 – 2.69	0.160
Identical [DIFF] * Language [Hindi]	12.12	-0.59 – 24.83	0.062
Identical [DIFF] * Language [Hungarian]	-6.19	-16.17 – 3.79	0.224
Identical [DIFF] * Language [Norwegian]	-6.76	-16.36 – 2.83	0.167
Identical [DIFF] * Language [Polish]	6.73	-9.00 – 22.46	0.402
Identical [DIFF] * Language [Portuguese]	3.26	-11.10 – 17.61	0.656
Identical [DIFF] * Language [Serbian]	-9.79	-18.60 – -0.97	<b>0.030</b>
Identical [DIFF] * Language [Simplified Chinese]	-3.70	-16.35 – 8.94	0.566
Identical [DIFF] * Language [Slovak]	-1.78	-11.51 – 7.95	0.720
Identical [DIFF] * Language [Spanish]	15.46	5.20 – 25.72	<b>0.003</b>
Identical [DIFF] * Language [Thai]	11.77	-4.04 – 27.57	0.144
Identical [DIFF] * Language [Traditional Chinese]	-4.72	-14.10 – 4.67	0.324
Identical [DIFF] * Language [Turkish]	1.36	-5.99 – 8.71	0.717
Random Effects			
$\sigma^2$	13509.16		
$\tau_{00}$ Subject	5662.22		
$\tau_{00}$ PSA_ID	747.87		
$\tau_{00}$ Picture1	613.78		
ICC	0.34		
N Subject	2687		
N Picture1	48		
N PSA_ID	50		
Observations	62164		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.052 / 0.377		

tab\_model(PP.lang.slopes.nocor.lme)

response_time			
Predictors	Estimates	CI	p
(Intercept)	566.96	552.64 – 581.27	<b>&lt;0.001</b>
Identical [DIFF]	50.10	46.76 – 53.45	<b>&lt;0.001</b>
Language [Arabic]	-16.38	-58.20 – 25.44	0.443
Language [Brazilian Portuguese]	59.03	2.44 – 115.62	<b>0.041</b>
Language [German]	-9.13	-43.47 – 25.21	0.602
Language [Greek]	42.69	-12.42 – 97.80	0.129
Language [Hebrew]	7.53	-46.52 – 61.58	0.785
Language [Hindi]	41.68	-14.27 – 97.63	0.144
Language [Hungarian]	16.33	-37.97 – 70.63	0.556
Language [Norwegian]	16.15	-19.62 – 51.92	0.376
Language [Polish]	-13.70	-71.88 – 44.48	0.644
Language [Portuguese]	12.26	-44.83 – 69.36	0.674
Language [Serbian]	31.52	-8.87 – 71.91	0.126
Language [Simplified Chinese]	22.79	-20.55 – 66.14	0.303
Language [Slovak]	13.06	-28.05 – 54.17	0.533
Language [Spanish]	62.21	21.04 – 103.39	<b>0.003</b>
Language [Thai]	-2.34	-60.52 – 55.84	0.937
Language [Traditional Chinese]	1.03	-39.68 – 41.73	0.961
Language [Turkish]	59.71	26.08 – 93.35	<b>0.001</b>

Identical [DIFF] * Language [Arabic]	-16.75	-29.14 – -4.36	<b>0.008</b>
Identical [DIFF] * Language [Brazilian Portuguese]	-3.73	-19.45 – 11.98	0.642
Identical [DIFF] * Language [German]	-3.87	-12.61 – 4.87	0.385
Identical [DIFF] * Language [Greek]	-10.48	-24.31 – 3.35	0.137
Identical [DIFF] * Language [Hebrew]	-6.81	-19.07 – 5.45	0.276
Identical [DIFF] * Language [Hindi]	12.13	-2.76 – 27.01	0.110
Identical [DIFF] * Language [Hungarian]	-6.20	-18.85 – 6.44	0.336
Identical [DIFF] * Language [Norwegian]	-7.22	-17.95 – 3.50	0.187
Identical [DIFF] * Language [Polish]	6.73	-10.81 – 24.27	0.452
Identical [DIFF] * Language [Portuguese]	3.27	-13.05 – 19.58	0.695
Identical [DIFF] * Language [Serbian]	-8.38	-18.85 – 2.09	0.117
Identical [DIFF] * Language [Simplified Chinese]	-3.52	-17.37 – 10.33	0.619
Identical [DIFF] * Language [Slovak]	-1.95	-13.20 – 9.31	0.735
Identical [DIFF] * Language [Spanish]	15.30	3.60 – 27.00	<b>0.010</b>
Identical [DIFF] * Language [Thai]	11.77	-5.84 – 29.37	0.190
Identical [DIFF] * Language [Traditional Chinese]	-4.56	-15.50 – 6.39	0.415
Identical [DIFF] * Language [Turkish]	1.56	-7.16 – 10.29	0.726
N Subject	2687		
N Picture1	48		
N PSA_ID	50		
Observations	62164		

tab\_model (PP.lang.slopes.cor.lme)

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(Intercept)	566.96	552.64 – 581.27	< <b>0.001</b>
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Language [Turkish]	59.71	26.08 – 93.35	<b>0.001</b>
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Language [Traditional Chinese]			
Identical [DIFF] *	1.56	-7.16 – 10.29	0.726
Language [Turkish]			
Random Effects			
$\sigma^2$	13507.20		
$\tau_{00}$ Subject	5661.86		
$\tau_{00}$ PSA_ID	656.95		
$\tau_{00}$ Picture1	614.01		
$\tau_{11}$ PSA_ID.IdenticalDIFF	14.89		
$\rho_{01}$ PSA_ID	1.00		
N Subject	2687		
N Picture1	48		
N PSA_ID	50		
Observations	62164		
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>	0.078 / NA		