

Does group contact shape styles of pictorial representation? A case study of Australian rock art

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Supplementary Information

1. Example of coding

For motif 1, we had a list of answers (see Table A). We split this list in 3 clusters, including 27, 2 and 1 items respectively. Therefore, for this motif we obtained the vector <27, 2, 1>, which had an entropy value of 0.389.

Table A - List of responses for motif 1 and how they were split in clusters

Responses	Clusters
Snake	
Snake	
Snake	
Worm	
Snake	
That is a snek	
Snake	
Snake	
Snake	
Animal	
Snake	
Snake	
Snike	
Worm	
Snake	
A snake	

Snake	
A snake	
A snake	
A snake	
Snake	
Snake	
Snake	
A snake	
Snake	
Snake	
Snake	
Snake	
Snake	
Snake	
Snake	

2. Bayesian models: structure, priors and chain convergence

Intersubjective recognisability model

The code of the Intersubjective recognisability model is the following:

```
m1 <- map2stan(
  alist(
    Recognisability ~ dbinom (30, p),
    logit(p) <- a +
      + a_Item[Item]
      + a_Site[Site]
      + a_questionnaire[questionnaire]
      + b_AnthropomorphicContent*AnthropomorphicContent
      + b_Area*Area,
    a ~ dnorm(0,10),
    a_Item[Item] ~ dnorm(0, sigma_Item),
    a_Site[Site] ~ dnorm(0, sigma_Site),
    a_questionnaire[questionnaire] ~ dnorm(0, sigma_questionnaire),
    b_AnthropomorphicContent ~ dnorm(0,10),
```

```

b_Area ~ dnorm(0,10),
sigma_Item ~ dcauchy(0,1),
sigma_Site ~ dcauchy(0,1),
sigma_questionnaire ~ dcauchy(0,1)
),
data = d, warmup = 1000, iter = 4000, chains = 3, control=list(adapt_delta=0.8)
)

```

Item, Site and Questionnaire are included as random variables generating varying intercepts (varying intercepts priors). Anthropomorphic content (0,1) is a covariate which is included as a fixed variable. The fixed factor Area was coded as Western Plateau = 0, Timor Sea = 1.

The parameters for anthropomorphic content, culture area and the mean intercept were assigned normal distributions (mean=0, SD=10). The varying intercept parameters for item, site and questionnaire were assigned normal distributions with mean at 0 and SD as a hyperparameter, sigma, which takes a half-Cauchy distribution (0, 1) (McElreath, 2016).

We ran 3 Markov chains of 4000 iterations (with 1000 warmup), all of which converged ($R^2=1$). The model gave this output:

	Mean	StdDev	lower 0.89	upper 0.89	n_eff	Rhat
a	-0.72	0.39	-1.32	-0.10	1981	1
b_AnthropomorphicContent	0.26	0.20	-0.06	0.58	2297	1
b_Area	1.98	0.42	1.33	2.66	2169	1
sigma_Item	1.10	0.09	0.96	1.23	3125	1
sigma_Site	0.55	0.23	0.19	0.91	863	1
sigma_questionnaire	0.40	0.23	0.03	0.69	1343	1

Intersubjective consistency model

The code of the Intersubjective consistency model is the following:

```

m2 <- map2stan (alist(
entropyvalue ~ dnorm (mu, sigma),
mu <- a + a_Item[Item] + a_SiteN[SiteN] + a_SurveyN[SurveyN] + b_Human*Human + b_Area*Area,
a ~ dnorm(0,10),
a_Item[Item] ~ dnorm (0, tau_Item),

```

```

a_SiteN[SiteN] ~ dnorm(0, tau_SiteN),
a_SurveyN[SurveyN] ~ dnorm(0, tau_SurveyN),
b_Human ~ dnorm(0,10),
b_Area ~ dnorm(0,10),
tau_Item ~ dcauchy(0,10),
tau_SiteN ~ dcauchy(0,10),
tau_SurveyN ~ dcauchy(0,10),
sigma ~ dcauchy (0,10)
),
data = data, warmup = 1000, iter = 11000, chains = 3, control=list(adapt_delta=0.99))

```

Item, Site and Questionnaire are included as random variables generating varying intercepts (varying intercepts priors). Anthropomorphic content (0,1) is a covariate which is included as a fixed variable. The fixed factor Area was coded as Western Plateau = 0, Timor Sea = 1.

The parameters for anthropomorphic content, culture area and the mean intercept were assigned normal distributions (mean=0, SD=10). The varying intercept parameters for site and questionnaire were assigned normal distributions with mean at 0 and SD as a hyperparameter, tau, which takes a half-Cauchy distribution (0, 1) (McElreath, 2016).

We ran 3 Markov chains of 11000 iterations (with 1000 warmup), all of which converged ($R^2=1$). The model gave this output:

	Mean	StdDev	lower 0.89	upper 0.89	n_eff	Rhat
A	2.78	0.14	2.56	3.00	4182	1
b_Human	0.24	0.08	0.12	0.37	7117	1
b_Area	-1.74	0.16	-1.98	-1.50	4609	1
tau_Item	0.32	0.13	0.11	0.51	118	1
tau_SiteN	0.20	0.09	0.06	0.33	3193	1
tau_SurveyN	0.13	0.11	0.00	0.24	3200	1
sigma	0.30	0.14	0.07	0.50	107	1

3. Rock art sites and ethnographic sources of motifs

Motifs selected for this study come from the following sites, taken from Layton (1992):

Culture area	Site / region (Layton 1992)	site n. (Layton 1992)
Timor Sea	Western Arnhem Land	17
	Gumadir River	25
	North-East Victoria River district	60
	Drysdale River	69
	Sliesbeck	71
	Southern Arnhem Land	72
	Katherine	74
	Kimberleys	20a
	Western Kimberleys	20b
Western Plateau	Uluru	14
	Tomkinson Range and surrounding area	37
	Musgrave Ranges	38
	The Granites	41
	Yuendumu region	42
	Rawlinson Range	43

Motifs were sampled from the following monographs documenting the sites listed above (taken from Layton 1992):

Arndt, W. (1962). The Nargorkun-Narlinji Cult. *Oceania*, 32 (4): 298-320.

Basedow, H. (1903). Anthropological notes made on the South Australian Government north-west prospecting expedition. *Royal Society of South Australia Transactions*, 28: 12–51.

Brandl, E. J. (1973). Australian Aboriginal paintings in western and central Arnhem Land: temporal sequences and elements of style in Cadell River and Deaf Adder Creek art.

Chaloupka, G. (1984). From Palaeoart to Casual Painting: The Chronological Sequence of Arnhem Land Plateau Rock Art. Monograph Series 1. Northern Territory Museum of Arts and Sciences, Darwin.

Crawford, I. M. (1968). The Art of the Wandjina: Aboriginal Cave Paintings in Kimberley, Western Australia. Oxford University Press.

- Elkin, A. P. (1952). Cave painting in southern Arnhem Land. *Oceania*, 22(4): 245-255.
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