Mapping the cultural learnability landscape of danger

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Supplementary Text

Participant demographics

Animals. Data for the animals study are from Barrett and Broesch (2012), where full details on participant recruitment are reported. The U.S. sample included 26 children, 10 girls and 16 boys, who ranged in age from four to five years. The Shuar sample included 21 children, 13 boys and 8 girls, who ranged in age from four to eight years (mean age six years).

Foods. The U.S. sample included 23 children, 13 girls and 10 boys, ranging in age from four to five years (age data were missing for three participants). The Shuar sample included 22 children, 12 girls and 10 boys, ranging in age from four to nine years (mean age six years). Of these children, four children were not ethnically Shuar, but were being cared for in the same daycare, and had been brought up in the same rural environment.

Artifacts. The U.S. sample included 20 children, seven girls and 13 boys, who ranged in age from four to five years (age data were missing for five participants). The Shuar sample included 24 children, 11 girls and 13 boys, who ranged in age from four to eight years (mean age five years). Of these children, five children were not ethnically Shuar, but were being cared for in the same daycare, and had been brought up in the same rural environment.

Recruitment note. Shuar participants were recruited through both village daycares and local schools in order to increase the size of our samples, because age cohorts in small villages are often very small (and the samples included several non-Shuar children; see details below). However, we first tested as many younger children as possible and then added to the sample with a few older children to make sample sizes across Ecuador and the U.S. comparable. Because the age of some of our Ecuadorian participants could only be determined to the nearest year, we truncated all ages to integers for the purpose of analysis.

Method variations across the animal, artifact, and food studies

Animals

Full details of the animals study can be found in Barrett & Broesch (2012). For this study, 16 animals were selected that would be unusual for U.S. and Shuar preschoolers (e.g., pangolins, komodo dragons). This study also had a 2 x 2 design in which animal dangerousness was crossed with animal diet (herbivore vs. carnivore), with 4 of each category (see Barrett & Broesch, 2012, for details). Children were taught and tested on three properties: name (free recall), danger (dangerous vs. safe, binary), and diet (eats plants vs. eats animals, binary; note that this is grouped as "Feature" in the property types listed below). Name recall was poor, so name was substituted for a third binary property in the foods and artifacts studies below (and naming data for animals are not reported here). For the animals study, a control condition was used to ensure that children's memory performance could not be explained either through recognition of the individual animals or inferences that could be made from the photos, e.g., about dangerousness. The control participants (a separate group) received no training on the cards, but were simply presented with the test questions; performance was at chance, and is not reported here (see Barrett & Broesch, 2012).

Foods

Based on our experience with the animals study, we modified the foods and artifacts studies in several ways, while still retaining the basic flashcard design and the use of binary properties to test memory. First, we no longer used names, or tested children on names (except in artifacts, where we named the items but did not test children on the names later). Second, we dropped the control condition and instead used a design with multiple card banks that had different property values for the same pictures. In other words, the same picture would appear in one bank as dangerous, and in another as safe (of course, a given child was always tested on the same bank). This ensured that above-chance responses could only be due to correctly remembering the information presented for a particular card.

Stimulus selection for foods required selecting items that were ambiguous with respect to their potential food / non-food status. For example, showing items that give evidence of being prepared or modified for consumption (e.g., cooked) strongly suggest that the item is edible and therefore not dangerous. Thus, we picked photos of berries, nuts, and other plant items that would be rare for both U.S. and Shuar children.

For potential foods, danger generally means the potential to cause illness, and so our pretest of children consisted of asking them what "dangerous" and "safe" means in the context of eating food; replies such as "it could make me sick" were considered correct (children were also asked to give examples of safe and dangerous foods). The other two properties that we tested were based on pre-tests with Shuar and U.S. children to ensure that they were locally comprehensible. One type of property was the season or time of year at which the item was available. This was

spring vs. fall for U.S. participants, and rainy season vs. dry season for Shuar participants. For comparability across studies, this property is called "Feature" in the figures and results.

The other type of property, "Location," for the foods consisted of where the food could be found. For U.S. participants, this was in the mountains vs. in the jungle. For Shuar participants, this was in a tree vs. on the ground.

Artifacts

The basic design of the artifacts study was the same as for the foods study: instead of a control group, the cards came in multiple banks with different property values for the same card, to ensure that above-chance memory could only be due to the property value presented by the experimenter. In the U.S. sample, we began by using made-up names for the artifacts, and tested the first few children on the names, but performance was zero, so we continued with the names as labels without testing them. For the Shuar version of the same study, we dropped the use of names altogether.

The stimuli were photos of clearly man-made artifacts, often unfamiliar tools, tool parts, or other functional items taken from internet searches (e.g., unusual-looking kitchen or garden tools). We attempted to find tools that were hand-held and relatively simple (e.g., not complex artifacts like computers or cell phones). Most of the tools were plastic or metal, with distinctive shapes.

For the "danger" property, we accepted any response suggesting that an artifact might cause injury. Children might give a knife as an example of a dangerous object, and a pillow or ball as a safe object. The "Feature" property in the case of artifacts was breakable vs. non-breakable for the U.S. participants, and expensive vs. cheap for the Shuar participants. The "Location" property was used indoors vs. used outdoors for the U.S. participants, and used in the kitchen vs. used in the garden for the Shuar participants.

Results

GLMM models were compared using AIC scores, and the best-fit model (i.e., model with the lowest AIC score) was selected for report in the main text. Below, we list which models were compared, with associated AIC scores.

Table S1. Model comparison results. Factor composition of each model shown, along with AIC score. Best fit model is Model 3, denoted by *.

Model	**Fixed factors**	**Random factors**	**AIC score**
Baseline		Participant Test/retest	14227.6
1	Domain	Participant Test/retest	14186.6
2	Property	Participant Test/retest	14096.9
3*	Domain Property	Participant Test/retest	14056.7
4	Domain Property	Participant Test/retest Population	14057.2
5	Domain Property Sex	Participant Test/retest	14056.8
6	Domain Property Sex	Participant Test/retest Population	14057.3

For technical reasons (rank deficiency of model) we were unable to fit a version of model 3 with an interaction term for the fixed factors Domain and Property. In order to estimate the size of the interaction between Domain and Property, we fit an additional model, similar to Model 3, except that Domain and Property were modeled as random factors, with an additional random factor for the Domain x Property interaction. The results are shown in Table S2.

Table S2. Model with Domain and Property modeled as random factors

Fixed factors				
Factor	***Estimate***	***SE***	***z***	***Pr(>|z|)***
Intercept	0.260	0.187	1.39	0.16
Random factors				
Factor	***Variance***	***SD***		
Participant	0.104	0.322		
Test / Retest	0.00415	0.0644		
Domain	0.0256	0.16		
Property	0.0268	0.164		
Domain x Property	0.0979	0.313		

Table S3. Mean performance by condition, with upper and lower bounds on confidence interval (CI, +/- 95%). Condition combinations that differ from chance performance (*z*-test, two-tailed, $p < .05$) are denoted by *.

Population	Domain	Property	Test/retest	Mean proportion correct	CI lower bound	CI upper bound	$p<.05$
Shuar	animals	danger	retest	0.833	0.793	0.873	*
		danger	test	0.875	0.839	0.911	*
		feature	retest	0.527	0.473	0.580	
		feature	test	0.622	0.570	0.674	*
	artifacts	danger	retest	0.474	0.424	0.524	
		danger	test	0.508	0.458	0.558	
		feature	retest	0.503	0.452	0.553	
		feature	test	0.526	0.476	0.576	
		location	retest	0.542	0.492	0.592	
		location	test	0.521	0.471	0.571	
	foods	danger	retest	0.602	0.549	0.656	*
		danger	test	0.560	0.508	0.612	*
		feature	retest	0.494	0.439	0.549	
		feature	test	0.503	0.450	0.555	
		location	retest	0.521	0.463	0.579	
		location	test	0.538	0.483	0.592	
USA	animals	danger	retest	0.675	0.629	0.720	*
		danger	test	0.708	0.665	0.752	*
		feature	retest	0.495	0.446	0.544	
		feature	test	0.518	0.470	0.567	
	artifacts	danger	retest	0.581	0.513	0.650	*
		danger	test	0.600	0.538	0.662	*
		feature	retest	0.522	0.453	0.591	
		feature	test	0.525	0.461	0.589	
		location	retest	0.502	0.433	0.572	
		location	test	0.563	0.499	0.626	
	foods	danger	retest	0.563	0.508	0.617	*
		danger	test	0.641	0.588	0.693	*
		feature	retest	0.456	0.401	0.511	
		feature	test	0.472	0.417	0.527	
		location	retest	0.494	0.439	0.549	
		location	test	0.472	0.417	0.527	