

Title: The content and structure of reputation domains across human societies: a view from the evolutionary social sciences

Authors: Zachary H. Garfield^{1a}, Ryan Schacht², Emily R. Post³, Dominique Ingram³, Andrea Uehling³, and Shane J. Macfarlan^{3a}

¹ Institute for Advanced Study in Toulouse, Université de Toulouse 1 Capitole, Toulouse, France; ² Department of Anthropology, East Carolina University, Greenville, NC, USA; ³ Department of Anthropology, University of Utah, Salt Lake City, UT, USA

^aCorresponding authors

Keywords: Reputation, Prosociality, Cooperation, Human Uniqueness, Cross-Cultural Analysis

Preprint manuscript also archived at Zendo (<https://doi.org/10.5281/zenodo.4742375>).

Abstract

Reputations are an essential feature of human sociality and the evolution of cooperation and group living. Much scholarship has focused on reputations, yet typically on a narrow range of domains (e.g., prosociality, aggressiveness), usually in isolation. Humans can develop reputations, however, from any collective information. We conducted exploratory analyses on the content, distribution, and structure of reputation domain diversity across cultures, using the Human Relations Area Files ethnographic database. After coding ethnographic texts on reputations from 153 cultures, we used hierarchical modelling, cluster analysis, and text analysis to provide an empirical view of reputation domains across societies. Findings suggest: 1) reputational domains vary cross-culturally, yet reputations for cultural conformity, prosociality, social status, and neural capital are widespread; 2) reputation domains are more variable for males than females; and 3) particular reputation domains are interrelated, demonstrating a structure consistent with dimensions of human uniqueness. We label these features: *Cultural group unity*, *Dominance*, *Neural capital*, *Sexuality*, *Social and material success*, and *Supernatural healing*. We highlight the need for future research on the evolution of cooperation and human sociality to consider a wider range of reputation domains, as well as their social, ecological, and gender-specific variability.

33 Introduction

34 Reputations are essential for human sociality. Whether used to punish norm violators in
35 small communities or orient behaviour in anonymous online markets, reputations matter
36 [1]. Reputations represent collective beliefs and evaluations a community forms about an
37 individual's behavioural or emotional tendencies [2,3]. They function as currencies in a
38 social marketplace with individuals signalling qualities relative to peers [4,5]. Such signals
39 can reduce transaction costs in the formation, maintenance, and termination of
40 relationships by providing information about others without direct experience [6]. Because
41 reputations can facilitate prosocial behaviour and punish deviancy, they provide some
42 cognitive scaffolding supporting human sociality, including, the formation of status
43 hierarchies [7,8], social institutions [9], and prosociality [10,11]. Many species rely on
44 reputation-information exchange [12]. Among humans, however, language and gossip
45 creates a selective environment whereby reputations have significant social consequences
46 [13–15].

47 Individual reputations can develop for any domain in which collective information exists
48 on people's behavioural or emotional tendencies [16]. As new formats of social interaction
49 emerge, the human behavioural repertoire becomes unbounded [17], suggesting an
50 unlimited number of potential reputation domains. Nevertheless, evolutionary scholars
51 have typically focused on a narrow range of reputation domains, such as prosociality
52 [14,18–21], competency [3,22,23], aggressiveness [24–26], and sexuality [27,28]. This
53 research has produced valuable insights on the influence of particular reputation domains
54 on facets of social interaction [4], gendered relationships [28], and the evolution of social
55 systems [29].

56 Research on reputations has remained agnostic, however, about the scope of reputation
57 domains within societies, their frequency across cultures, and potential gender biases [30].
58 Furthermore, research has often occurred in a piece-meal fashion focusing on a single
59 domain, obfuscating the degree to which domains interact and shape behavioural
60 responses as a suite of integrated parts (however, see [3]). Current scholarship lacks a clear
61 understanding of the content, structure, and diversity of reputation domains across
62 societies.

63 We seek to build a foundation for comparative approaches to reputation domain diversity
64 through exploratory analyses of the ethnographic record. We first derive a list of *a priori*
65 reputation domains (discussed in the Supplementary Information [SI]). We then assess the
66 cross-cultural frequency of evidence for reputation domains and how evidence for gender-
67 specific reputations varies. Lastly, we identify features of reputation domain co-occurrence
68 and the semantic content of ethnography describing reputations. The following aims guide
69 our study:

- 70 • Aim 1: To assess the distribution of ethnographic evidence for reputation domains.
- 71 • Aim 2: To identify if reputation domains exhibit systematic gender-biases and if these
72 domains vary within gender.
- 73 • Aim 3: To identify the structure and interrelationships of reputation domains.

74 • Aim 4: To reveal the semantic content of reputation domains in the ethnographic
75 record.

76 Existing work provides strong rationale for both putative universality in human reputation
77 domains, as well as variation by social, ecological, or gender-specific pressures. Leveraging
78 the ethnographic record in a systematic framework, despite limitations and potential
79 biases (see Materials and Methods, Discussion), is a first step in uncovering patterns across
80 human societies.

81 **Materials and Methods**

82 **Ethnographic sample and coding**

83 To accomplish our aims we relied on the electronic Human Relations Area Files (eHRAF) –
84 an online database of primary ethnographic documents. It should be noted, the
85 ethnographic record is male-biased given the majority of ethnographers have been men
86 and their writings and observations have generally prioritized (deliberately or not) the
87 behaviour and social lives of men [31,32].

88 The eHRAF includes thousands of documents from over 300 cultures indexed by subject at
89 the paragraph-level [33]. Users can generate a sample of ethnographic texts (i.e.,
90 paragraphs) using Boolean searches of subject codes and/or key words. Our dataset was
91 compiled using a keyword *and* eHRAF's indexing system, the Outline of Cultural Materials
92 (OCM), which associates each paragraph with any of over 700 subject codes covering a
93 range of topics relevant for the human sciences. We conducted an “Advanced Search” of the
94 keyword “reputation” with any of the OCM subjects: *Social Personality, Personality Traits, or*
95 *Status, Role, and Prestige*. This search aimed to strike a balance between retrieving a
96 generalizable yet manageable sample of the ethnography of reputations. A limitation is that
97 our search may have omitted particular domains of reputations. See the SI for additional
98 details.

99 We read the resulting 1,383 paragraphs for content, excluding those referencing
100 reputations for groups, non-human entities, or ethnographers. We applied these inclusion
101 criteria because our goal is to understand individual reputations within a particular
102 culture. We then aggregated paragraphs from the same document. This resulted in a
103 dataset containing 319 documents from 153 diverse cultures with broad geographic
104 coverage (see Figure S1 and Table S1). These documents had a mean word count of 140
105 (SD of 160 and range of 14 to 1957). We refer to this as our *Document dataset*, which is
106 publicly available in the *Reputation Diversity Database* R package [34], including
107 bibliographic information, culture sample, and all data.

108 We derived, *a priori*, 20 reputation domains from the scientific literature on human
109 sociality. These include: *Aggressiveness, Bravery, Coercive ability, Cooperation, Cultural*
110 *conformity, Honesty, Industriousness, Material capital, Medicine, Neural capital, Oration,*
111 *Parental care, Prosociality, Sexual fidelity, Social capital, Social status, Sociosexuality,*
112 *Somatic capital, Supernatural ability, and Teaching* (see the SI for discussion on
113 operationalization and inclusion). Each domain is operationalized as having both a positive

114 and negative valence. For example, evidence for the reputation domain *Neural capital* –
115 which includes reputations for generalized or specialized intelligence, special knowledge,
116 or cognitive abilities – could be based on evidence that a given society values expertise, as
117 well as evidence indicating that a group actively detests mental ineptitude (or *vice versa*).
118 Using these operationalized reputation domains, we coded the 319 documents in the
119 *Document dataset* for supporting evidence across the 20 reputation domains. Authors
120 decomposed into groups of two were allocated a subset of documents (approximately 106
121 per pair) to read and code, indicating supporting evidence for each domain and whether
122 the evidence was gendered: male-specific, female-specific, or gender neutral. We did not
123 compute inter-coder reliability measures given coders varied in experience reading and
124 coding ethnographic texts and common inter-rater reliability statistics can produce
125 misleadingly low reliability metrics despite relatively high levels of simple agreement for
126 sparse matrices, such as our data [35,36]. Author-pairs compared coded data to resolve
127 disagreements. For divergent codings the text and operational definitions were reviewed
128 and consensus reached on the appropriate coding. The aggregated resolved codings
129 constitute our data. See the SI for example text and coding.

130 Data analysis

131 The current study is primarily exploratory. We rely on descriptive and exploratory
132 statistical approaches to accomplish our aims. We assess the cross-cultural support for
133 each reputation domain by estimating the proportion of documents providing supporting
134 evidence, including across our gender coding (represented as a percentage estimate).
135 Because our *Document dataset* is a sample of the ethnographic record and because multiple
136 documents often described the same culture, we incorporated uncertainty accounting for
137 this non-independence and hierarchical structure with generalized linear mixed effects
138 regression models (GLMM) with random effects for culture using the lme4 package [37].
139 Some analyses are agnostic to gender-specific codings and any coding (female-specific,
140 male-specific, or gender neutral) counts as supporting evidence, while others account for
141 gender-specific codings.

142 To estimate the frequency of supporting evidence for each reputation domain, we fit
143 intercept-only GLMMs with random intercepts for culture, with each binary-coded
144 reputation domain as outcomes, for all coded data (i.e., evidence for each reputation
145 domain independent of gender-specific codings). We also fit identical models for female-
146 specific and male-specific evidence. These GLMMs estimate the proportion of documents
147 providing evidence for the reputation domains (i.e., the fixed effect with 95% CI) adjusting
148 for the non-independence of documents from the same culture (Aims 1 and 2). We also
149 compute the percentage of cultures with at least one document providing supporting
150 evidence for each reputation domain (independent of gender coding), with 95% CI
151 estimated using a cluster bootstrap and 1,000 samples with replacement (Aim 1).

152 Using all data, where each row represents the gender-specific evidence for each document,
153 we assess gender-biased evidence for each reputation domain by comparing (via
154 information criterion model selection) an intercept-only GLMM (with random intercepts
155 for documents nested within culture and for culture language family) to similar models
156 which include a gender-term covariate (Aim 2).

157 We rely on hierarchical cluster analysis to identify structure (i.e., features) among
158 reputation domains (Aim 3). We then use text-analytic methods and a document-term
159 matrix of our corpus of ethnography with penalized regression to identify semantic content
160 predictive of evidence for reputation features (Aim 4).

161 We also investigated sources of bias in our coded data due to features of the ethnographic
162 record. We used the presence of a female coauthor, document publication year, and total
163 pages of ethnography per culture in the eHRAF as predictors of our reputation domains
164 (accounting for the hierarchical document-culture structure and culture language family).

165 All analyses were conducted with R version 4.0.2 (2020-06-22).

166 **Results**

167 Evidence for reputation domains varied across subsistence types with horticulturalists and
168 agriculturalists overrepresented relative to pastoralists and hunter-gatherers (Table S1).
169 Evidence was also male-biased. Of the 1252 counts of supporting evidence across domains,
170 695 (56%) were coded as male-specific, 418 (33%) were coded as gender neutral, and 139
171 (11%) were coded as female-specific (Table S2).

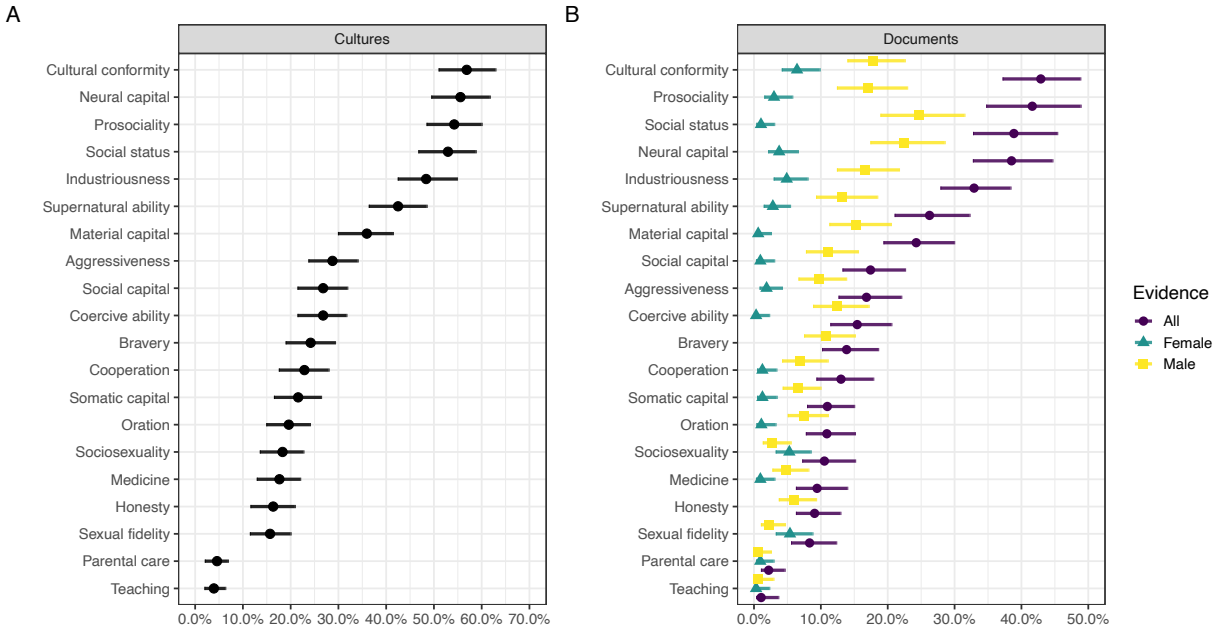
172 Bias assessment analyses did not identify strong evidence of bias due to our meta-
173 ethnographic measures. Consequently, we did not incorporate such measures in analyses.
174 See the SI for results.

175 **Evidence for reputation domains**

176 For all 20 reputation domains, we report the percentage of cultures that provided at least
177 one count of supporting evidence, independent of gender coding. At the culture-level, the
178 most strongly supported domains, documented in over 50% of cultures included *Cultural*
179 *conformity*, *Neural capital*, *Prosociality*, and *Social status* (Figure 1A).

180 We report the proportion of documents that provided supporting evidence including for
181 gender-specific evidence (Figure 1B). At the document-level, the most strongly supported
182 domains, represented in over 30% of documents, included *Cultural conformity*, *Prosociality*,
183 *Social status*, *Neural capital*, and *Industriousness*. Evidence for these reputation domains
184 was strongly male-biased, in particular *Social status* and *Neural capital* which were the
185 most supported male-specific domains. The most strongly supported female-specific
186 reputation domains (although male-biased overall) were *Cultural conformity* and
187 *Industriousness*. The between-domain variation among female-specific evidence was
188 minimal compared to the male-specific evidence which was more variable. We emphasize
189 the relatively low levels of female-specific evidence could be a feature of systemic male-
190 bias in the ethnographic record, more so than gendered patterns of social or cultural
191 diversity (see Discussion).

Estimated support for reputation domains



192
 193 *Figure 1: Evidence for reputation domains. A: Percentage of cultures providing at least one*
 194 *supporting document (95% CI estimated using a cluster bootstrap). B: Percent of documents*
 195 *providing supporting evidence (95% CI computed with intercept-only mixed effects models).*
 196 *Purple circles: Estimates from all data independent of gender coding. Green triangles:*
 197 *Estimates from female-specific evidence. Yellow squares: Estimates from male-specific*
 198 *evidence.*

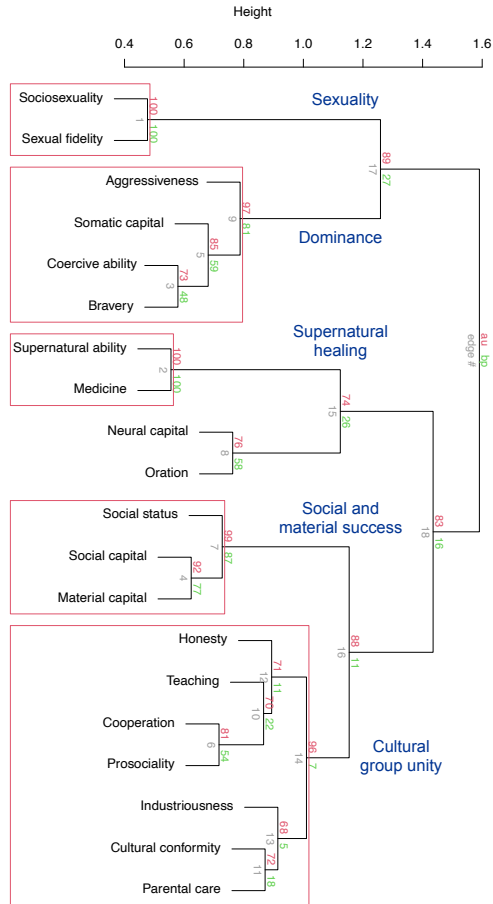
199 To assess gender-biases in the supporting evidence for reputation domains, we fit two
 200 binomial GLMMs of each reputation domain using the entire data set, where each row
 201 represents the gender-specific evidence for each document (i.e., female-specific, male-
 202 specific, gender neutral; three rows per document). The first model was an intercept-only
 203 GLMM with the binary coded reputation domains as outcomes and random intercepts for
 204 document nested within culture (to account for the repeated measures of evidence type per
 205 document and multiple documents per culture) and a random intercept for culture
 206 language family (to partially account for shared ancestry). These intercept-only models
 207 were compared to similar models which included gender-evidence type as a covariate. We
 208 compared the intercept-only models to their respective gender-term models using Akaike
 209 Information Criterion (AIC) [38]. Gender was deemed to be a predictor of reputation
 210 domain evidence when $AIC\Delta < -2$ [39]. Results are reported in Table S3 and support
 211 patterns in Figure 1B. Evidence for all domains was male-biased with the following
 212 exceptions: *Sociosexuality*, *Parental care*, and *Teaching* did not demonstrate gender biases
 213 and *Sexual fidelity* was female-biased. Two reputation domains (*Bravery* and *Honesty*) did
 214 not produce female-specific evidence and were not included.

215 Structural features of reputation domains

216 Evidence for different reputation domains may co-occur within documents, putatively
217 suggesting domain interrelatedness and structure. To identify features (i.e., clusters) of
218 domains we used agglomerative hierarchical cluster analysis. See the SI for details.

219 Figure 2 displays a dendrogram from cluster analysis of the 20 reputation domains, which
220 includes two estimates of significance for how strongly each cluster is supported by the
221 data. We rely on the AU (approximately unbiased) p values (represented in red at each
222 cluster's "edge"), which are computed by multiscale bootstrap resampling and represented
223 as percentages (clusters with AU values > 95 are strongly supported; top-level clusters are
224 automatically outlined by red rectangles). This revealed five strongly supported clusters
225 we *post hoc* identify as *Sexuality*, *Dominance*, *Supernatural healing*, *Social and material*
226 *success*, and *Cultural group unity*. We used these clusters to compute new variables,
227 henceforth reputation domain *features*. Although the cluster capturing *Neural capital* and
228 *Oration* was only moderately supported (AU = 76), given *Neural capital* was among the
229 most frequent domains and oratory abilities are a type of neural capital we computed a
230 *Neural capital* feature from this cluster. For each document, these six reputation domain
231 features are coded as 1, when any of the associated domains provided supporting evidence.

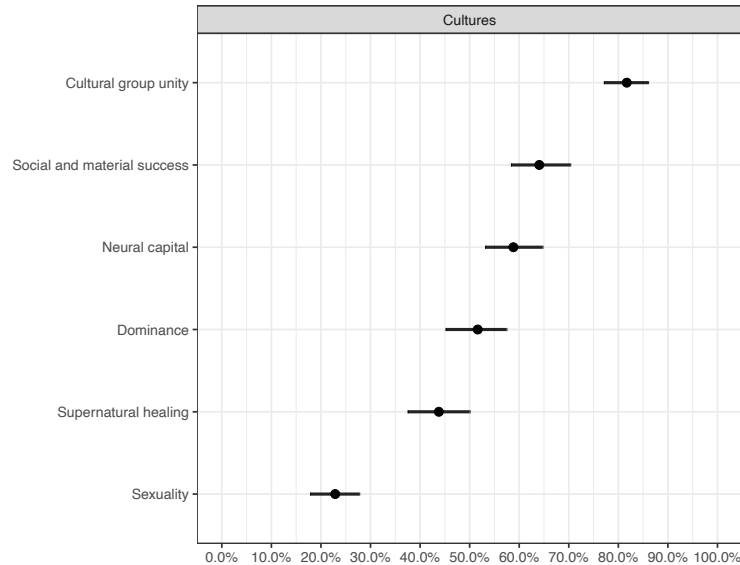
232



233

234 *Figure 2: Cluster analysis of reputation domains. Distances were 1 – cor. Ward*
 235 *agglomeration method. AU p-values (red) computed with 10,000 bootstrap samples using the*
 236 *pvclust package [40]. Edge number in grey.*

237 We estimated the percentage of cultures providing support for each reputation domain
 238 feature using the same cluster bootstrap methods used to estimate the culture-level
 239 support for domains. Supporting evidence for the *Cultural group unity* and *Social and*
 240 *material success* features was common across cultures, documented in 82% and 64% of
 241 cultures, respectively. Evidence for the *Neural capital* feature was documented in 59% of
 242 cultures, the *Dominance* feature in 53% of cultures, the *Supernatural healing* feature in
 243 44% of cultures, and the *Sexuality* feature in 23% of cultures (Figure 3).



244

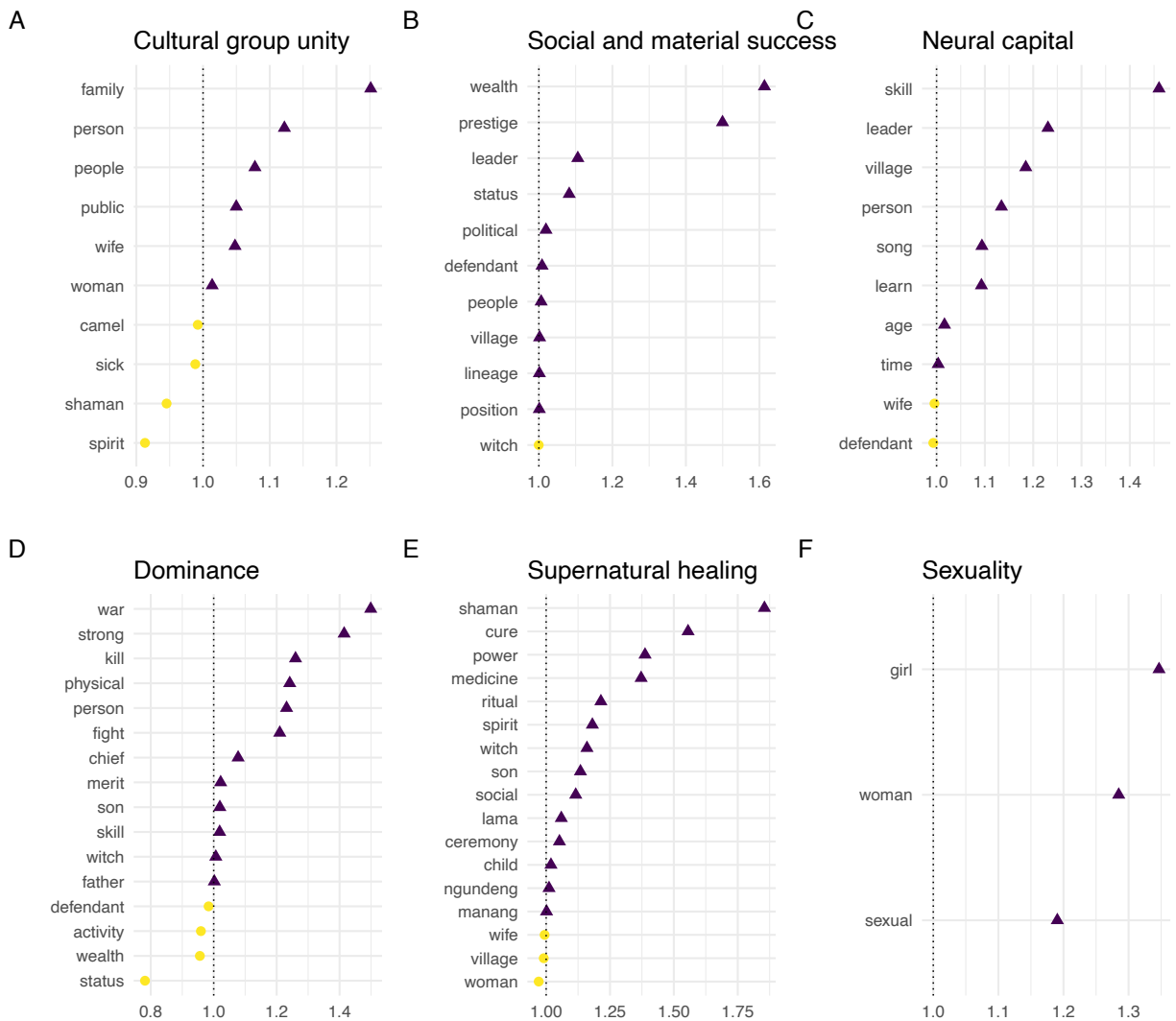
245 *Figure 3: Percentage of cultures providing evidence for reputation features (95% CI estimated*
 246 *via cluster bootstrap).*

247 **The ethnography of reputation domains**

248 We used text analysis to explore the ethnography of reputation domains in reference to our
 249 six features. We created a document-term matrix (DTM) of all “informative” words in our
 250 corpus of texts which captures the frequency of each unique term within each document.
 251 We fit an elastic net logistic regression model (with the lasso penalty, $\alpha = 1$) of each of the
 252 six features as a function of the frequencies of all 8,770 unique words (using the glmnet
 253 package [41]). Words that were strong positive predictors epitomized the semantic content
 254 of documents which provided evidence for that feature. Figure 4 displays non-zero
 255 coefficients from elastic net lasso regression models of each reputation domain feature.

256 Evidence for the *Cultural group unity* feature was positively predicted by terms related to
 257 social relationships and community (e.g., *family, person, wife*) and negatively predicted by
 258 terms related to the supernatural (e.g., *spirit, shaman*). Evidence for the *Social and material*
 259 *success* feature was positively predicted by *wealth, prestige*, and terms for leadership and
 260 status. Evidence for the *Neural capital* feature was positively predicted by *skill, leader*, and
 261 *village*. Evidence for the *Dominance* feature was positively predicted by *war, strong, kill*,
 262 and *physical* implicating reputations for dominance with conflict, physical formidability,
 263 and aggression. Negative predictors of the *Dominance* feature included *status* and *wealth*,
 264 suggesting a distinction between dominance and prestige. Evidence for the *Supernatural*
 265 *healing* feature was positively predicted by the terms, *shaman, cure, power*, and *medicine*;
 266 *woman* was a weak negative predictor. Evidence for the *Sexuality* feature was predicted by
 267 *girl, woman*, and *sexual*.

Text analytic results



268

269 *Figure 4: Non-zero coefficients from text analysis elastic net regression models of evidence for*
 270 *reputation features. Coefficients indicate the words in each document which best predicted*
 271 *evidence for the feature. Positive coefficients as purple triangles. Negative coefficients as*
 272 *yellow circles.*

273 **Discussion**

274 The content, structure, and diversity of reputation domains across societies are
 275 understudied from a holistic perspective. The current study was motivated by a lack of
 276 cross-cultural research, despite widespread theorizing in biology, psychology and
 277 anthropology regarding the role of reputations for sociality and evolutionary dynamics.
 278 Using the eHRAF database we extracted ethnographic accounts of individual-level
 279 reputation domains. Results suggest: 1) there is considerable cross-cultural variability in
 280 evidence for reputation domains – some domains are common in the ethnographic record
 281 (e.g., cultural conformity, prosociality) while others are relatively rare (e.g., teaching,

282 honesty); 2) evidence for most reputations are male-biased with male-specific reputation
283 domains more variable than female-specific domains; and 3) reputation domains cluster
284 within six features: cultural group unity, dominance, neural capital, sexuality, social and
285 material success, and supernatural healing. Below we interpret results from an
286 evolutionary social science perspective.

287 **Diversity in reputation domains**

288 Most reputation domains (16 of 20) were documented in less than half of sampled cultures
289 (Figures 1A and 3). Despite variability, some were more common than others, including
290 reputations for cultural conformity, prosociality, social status, neural capital, and
291 industriousness. These results are notable because of what is missing: “cooperation.”
292 Evolutionary-oriented scholars have implicated cooperative reputations for explaining
293 human ultrasociality [5,13,14], yet reputations for “cooperativeness” were documented in
294 only 23% of cultures. Reputations indirectly related to cooperation (e.g., conformity,
295 honesty, social relationships, and industriousness), however, were common across
296 societies. Reputations for cooperation were also captured by the most common feature:
297 cultural group unity (Figure 3). The limited evidence of reputations for cooperativeness
298 could be due in part to the nature of the ethnographic record (see Limitations) or a product
299 of our operational definition. We follow developmental and neuro-psychologists [23,42,43]
300 by differentiating cooperation – defined as the likelihood an individual intentionally assists
301 another in order to achieve a joint goal – from prosociality – defined as the likelihood one
302 will invest in group welfare or act in group-altruistic ways (see the SI for discussion).

303 While we wish to avoid sweeping claims and emphasize the exploratory nature of our
304 study, these results signal a need to expand research on reputations beyond
305 cooperativeness, incorporating a variety of domains and examining their effect on sociality,
306 particularly in experimental settings (*sensu*, [3]). Across cultures, distinct reputations
307 capturing inter-individual variation in personality, experiences, capacities, and reliability,
308 likely underpin much of human sociality, including cooperativeness.

309 **Gender-differences in reputation domains**

310 Evidence for most reputation domains was male-biased and there was greater variance
311 among male than female reputation domains (Figure 1B). While this finding is consistent
312 with research demonstrating that, across cultures, male social life is typically more public
313 than female social life [44–46] we cannot disentangle male-bias in ethnography from
314 putative male biases in more overt sociality and reputation diversity. This male-biased
315 pattern is consistent, however, with perspectives suggesting societies disproportionately
316 channel opportunities to men to differentiate themselves, at the detriment of women who
317 have fewer avenues to develop social capital [30,45,47,48]. As Rosaldo ([46], pp. 393-394)
318 suggests reviewing much ethnography, “the vast majority of opportunities for public
319 influence and prestige, the ability to forge relationships, determine enmities, speak up in
320 public, use or forswear the use of force are all recognized as men’s privilege and right.”

321 Competition among women, however, has been suggested to be more indirect and
322 reputation-based, compared to men [25,49], which would predict at least some female-

323 specific reputation domains or limited variance between reputation domains of women
324 and men. Some empirical studies of gender-differences in social influence among relatively
325 egalitarian societies have found similarity in the weights of particular status-determining
326 attributes between genders, despite male biases in overall influence [48,50]. Future
327 comparative studies should more comprehensively define female-specific reputation
328 domains and design targeted methods to document supporting evidence [51,52].

329 The only reputation domain more strongly associated with women than men was sexual
330 fidelity; reputations for sociosexuality did not demonstrate gender-bias (see [53] for
331 similar results). These findings support evolutionary psychology models drawing on sexual
332 selection theory which predict gender-specific evaluations related to reproductive
333 strategies [27,49] and widespread male reproductive skew specific to influential men
334 [36,54–56]. Overall, reputations related to sexuality were rare in our data. Sexuality may
335 have been a taboo topic in some ethnographic contexts, but the ethnographic record
336 includes rich descriptions of human sexuality [57,58]. It is possible that our search strategy
337 did not capture much of the ethnography of reputations related to sexuality. Nonetheless,
338 findings *do not* provide support for a universal psychology dedicated to evaluating female
339 sexuality vis-à-vis males and *do* support perspectives emphasizing flexibility in reputations,
340 strategies, and norms related to sexuality [59].

341 Reputation domain structure and evolutionary theories

342 We find reputation domains are structured along six features which we termed *Cultural*
343 *group unity*, *Social and material success*, *Neural capital*, *Dominance*, *Supernatural healing*,
344 and *Sexuality*. This data-driven, exploratory analysis comports well with theory from
345 evolutionary psychology and the framework of human uniqueness in evolutionary
346 anthropology.

347 Evolutionary psychologists examining the content of competitor derogation [27], have
348 predicted men will often be evaluated for abilities to control resources necessary for status
349 achievement, attracting mates, and reproductive success. We find some support for this
350 claim given the reputation features of *Dominance* and *Social and material success*.
351 Additionally, evidence for the reputation domains *Social status*, *Material capital*, and
352 *Coercive ability* were among the most male-biased domains (Figure 1B). Status hierarchies
353 shape priority of access to resources and scholars have suggested they can be navigated
354 through two distinct (though non-mutually exclusive) pathways: dominance and prestige
355 [7,60,61]. These results support a distinction between dominance and social status or
356 prestige [62,63], indicated by the cluster and text analyses (Figures 3, 4C and 4D).

357 Reputations for prestige (our *Social and material success* feature) are associated with social
358 networks as well as material resources, more so than reputations for dominance (Figures 2,
359 4B). These results are consistent with analyses among the Tsimane illustrating
360 interrelationships between status, social networks, and social and material gains from
361 cooperation with high status individuals [64]. Results also support associations between
362 reputations for dominance and coercion, physical aggression, and conflict (Figure 4D) [65].
363 Reputations for bravery were also captured by the *Dominance* feature and cross-cultural
364 research identified bravery as a universal feature of prosocial moral values [66]. Taken

365 together, these results suggest reputations for social status and prestige are often
366 associated with capacities for resource control while reputations for dominance may, in
367 some contexts, be associated with prosocial investments [63,67–69].

368 The clustering of reputations for cooperation, prosociality, conformity, honesty, teaching,
369 and industriousness fits conceptions of the distinct nature of human social cognition, as
370 well as fundamental structures of human groups. For example, scholars suggest human
371 uniqueness relies on an evolved psychology dedicated to reasoning about others having
372 cooperative *and* prosocial motivations [42,43,70]. These models suggest cultural
373 conformity and learning biases leads to the evolution of well-structured groups and better
374 equip groups to compete with others groups [10,71,72]. Such between-group competitive
375 dynamics can occur through altruistic provisioning of group members or through
376 intergroup violence [73,74] and can in turn, further support within group cooperation
377 [75,76].

378 Lastly, the supernatural healing feature is associated with unique features of the human
379 niche (i.e., religion) and fits long-standing anthropological notions about the important role
380 of religious practitioners (e.g., shamans) who manipulate the supernatural to provide
381 benefits for and impose costs on group members [68,77–79].

382 **Limitations**

383 Our study has several limitations. First, our data are limited to the content ethnographers
384 recorded and published. Information on reputations that the ethnographer was unaware
385 of, not interested in, nor permitted to research, constrains available data. Therefore, while
386 we can conclude the widespread ethnographic evidence of some reputation domains likely
387 indicates their cross-cultural importance, we cannot conclude reputations domains lacking
388 substantial evidence are indeed rare across cultures. Additionally, the terms an
389 ethnographer uses for reputation domains may reflect their worldview (etic), rather than
390 the worldview of the focus population (emic). We attempted to assess potential biases in
391 our data due to meta-ethnographic measures (see the SI), however, it is possible other
392 features of ethnography or ethnographers influenced results.

393 Ethnographic materials related to the social, economic, and cultural lives of women are
394 systematically underreported, especially in the early history of the field [30,31,80]. Thus,
395 the extent to which women have fewer avenues for gaining reputations cross-culturally
396 remains unclear and cannot be evaluated via these methods. However, the evidence of
397 gender biases we discovered comport with the common notion that patriarchy is pervasive
398 globally and negatively impacts women's ability to achieve recognition, political power,
399 economic capital, and autonomy (see [81]).

400 We identified the 20 reputation domains *a priori*, drawing on the literature on human
401 uniqueness and sexual selection theory, which itself is likely to be biased by authors and
402 general biases across the human sciences. While a useful starting point for exploring
403 reputational diversity, we imagine that other domains could exist. Lastly, we constrained
404 our eHRAF search using the keyword “reputation”, which could have missed other content
405 on reputations that used adjacent language (e.g., personality, gossip). Recognizing these

406 limitations, these results provide greater cross-cultural validity to existing theories of
407 reputation and can spark future empirical and theoretical work better incorporating the
408 cultural diversity, structure, and gendered dimensions of reputation domains.

409 Conclusion

410 Reputations are a critical component of human social life and have fundamental
411 implications for human evolution. From a socio-structural perspective, reputations are the
412 pathways by which societies evaluate individuals and are the mechanisms through which
413 individuals can distinguish themselves. Despite their centrality to much of human sociality,
414 little systematic cross-cultural research exists on the content and structure of reputation
415 domains. We find that ethnographic evidence for reputations is variable across societies,
416 tends to focus on cultural conformity and prosociality, displays large gender biases with
417 greater variance among males, and is structured around themes related to human
418 uniqueness.

419 Drawing on Chapais' [82] distinction between context-independent vs. context-dependent
420 human universals, we hypothesize reputations for cultural group unity will be a *context-*
421 *independent* universal, likely to manifest in all human societies; whereas reputations for
422 social and material success, neural capital, and dominance are more likely to be *context-*
423 *dependent* universals, promoted or suppressed by socio-ecological or cultural evolutionary
424 processes.

425 Acknowledgements

426 We thank Nicole Hess and Chris von Rueden for helpful comments on this manuscript as
427 well as the editors and two anonymous reviewers for their careful review and useful
428 feedback.

429 Original data produced for the current study are available in the archived
430 *reputationdiversitydata* R package (DOI: 10.5281/zenodo.4740791).

431 Funding

432 This work was supported in part by the Global Change and Sustainability Center and the
433 Office of Undergraduate Research at the University of Utah. Zachary H. Garfield
434 acknowledges IAST funding from the French National Research Agency (ANR) under the
435 Investments for the Future (Investissements d'Avenir) program, grant ANR-17-EURE-0010.

436 References

- 437 1. Alexander RD. 1987 *The biology of moral systems*. New York: De Gruyter.
- 438 2. Barclay P. 2015 Reputation. In *The Handbook of Evolutionary Psychology* (ed D Buss), pp.
439 810–828. New York: John Wiley & Sons.
- 440 3. Macfarlan SJ, Lyle HF. 2015 Multiple reputation domains and cooperative behaviour in
441 two Latin American communities. *Phil. Trans. R. Soc. B* **370**, 20150009.

- 442 4. Barclay P. 2013 Strategies for cooperation in biological markets, especially for humans.
443 *Evolution and Human Behavior* **34**, 164–175. (doi:[10.1016/j.evolhumbehav.2013.02.002](https://doi.org/10.1016/j.evolhumbehav.2013.02.002))
- 444 5. Milinski M. 2016 Reputation, a universal currency for human social interactions.
445 *Philosophical Transactions of the Royal Society B: Biological Sciences* **371**, 20150100.
446 (doi:[10.1098/rstb.2015.0100](https://doi.org/10.1098/rstb.2015.0100))
- 447 6. Sugden R. 2005 *The Economics of Rights, Co-operation and Welfare*. Palgrave Macmillan
448 UK. (doi:[10.1057/9780230536791](https://doi.org/10.1057/9780230536791))
- 449 7. Henrich J, Gil-White FJ. 2001 The evolution of prestige: Freely conferred deference as a
450 mechanism for enhancing the benefits of cultural transmission. *Evolution and Human*
451 *Behavior* **22**, 165–196.
- 452 8. Buss DM, Durkee PK, Shackelford TK, Bowdle BF, Schmitt DP, Brase GL, Choe JC,
453 Trofimova I. 2020 Human status criteria: Sex differences and similarities across 14 nations.
454 *Journal of Personality and Social Psychology*, No Pagination Specified–No Pagination
455 Specified. (doi:[10.1037/pspa0000206](https://doi.org/10.1037/pspa0000206))
- 456 9. Glowacki L. 2020 The Emergence of locally adaptive institutions: Insights from
457 traditional social structures of East African pastoralists. *Biosystems*, 104257.
458 (doi:[10.1016/j.biosystems.2020.104257](https://doi.org/10.1016/j.biosystems.2020.104257))
- 459 10. Chudek M, Henrich J. 2011 Culture-gene coevolution, norm-psychology and the
460 emergence of human prosociality. *Trends Cogn Sci* **15**, 218–26.
461 (doi:[10.1016/j.tics.2011.03.003](https://doi.org/10.1016/j.tics.2011.03.003))
- 462 11. Gintis H. 2000 Strong Reciprocity and Human Sociality. *Journal of Theoretical Biology*
463 **206**, 169–179. (doi:[10.1006/jtbi.2000.2111](https://doi.org/10.1006/jtbi.2000.2111))
- 464 12. Subiaul F, Vonk J, Okamoto-Barth S, Barth J. 2008 Do chimpanzees learn reputation by
465 observation? Evidence from direct and indirect experience with generous and selfish
466 strangers. *Animal Cognition* **11**, 611–623. (doi:[10.1007/s10071-008-0151-6](https://doi.org/10.1007/s10071-008-0151-6))
- 467 13. Nowak MA, Sigmund K. 1998 Evolution of indirect reciprocity by image scoring. *Nature*
468 **393**, 573–577. (doi:[10.1038/31225](https://doi.org/10.1038/31225))
- 469 14. Macfarlan SJ, Remiker M, Quinlan R. 2012 Competitive Altruism Explains Labor
470 Exchange Variation in a Dominican Community. *Current Anthropology* **53**, 118–124.
471 (doi:[10.1086/663700](https://doi.org/10.1086/663700))
- 472 15. Hess NH, Hagen EH. 2006 Psychological adaptations for assessing gossip veracity.
473 *Human Nature* **17**, 337–354.
- 474 16. Giardini F, Wittek R. 2019 *The Oxford handbook of gossip and reputation*. New York:
475 Oxford University Press.

- 476 17. Enquist M, Ghirlanda S, Eriksson K. 2011 Modelling the evolution and diversity of
477 cumulative culture. *Philosophical Transactions of the Royal Society B: Biological Sciences*
478 **366**, 412–423. (doi:[10.1098/rstb.2010.0132](https://doi.org/10.1098/rstb.2010.0132))
- 479 18. Barclay P. 2004 Trustworthiness and competitive altruism can also solve the ‘tragedy of
480 the commons’. *Evolution and Human Behavior* **25**, 209–220.
481 (doi:[10.1016/j.evolhumbehav.2004.04.002](https://doi.org/10.1016/j.evolhumbehav.2004.04.002))
- 482 19. Panchanathan K, Boyd R. 2004 Indirect reciprocity can stabilize cooperation without
483 the second-order free rider problem. *Nature* **432**, 499.
- 484 20. Macfarlan SJ, Quinlan R, Remiker M. 2013 Cooperative behaviour and prosocial
485 reputation dynamics in a Dominican village. *Proceedings of the Royal Society B: Biological*
486 *Sciences* **280**, 20130557. (doi:[10.1098/rspb.2013.0557](https://doi.org/10.1098/rspb.2013.0557))
- 487 21. Lyle HF, Smith EA. 2014 The reputational and social network benefits of prosociality in
488 an Andean community. *Proceedings of the National Academy of Sciences* **111**, 4820–4825.
489 (doi:[10.1073/pnas.1318372111](https://doi.org/10.1073/pnas.1318372111))
- 490 22. Hawkes K, Bird RB. 2002 Showing off, handicap signaling, and the evolution of men’s
491 work. *Evolutionary Anthropology* **11**, 58–67.
- 492 23. Fiske ST, Cuddy AJC, Glick P. 2007 Universal dimensions of social cognition: Warmth
493 and competence. *Trends in Cognitive Sciences* **11**, 77–83. (doi:[10.1016/j.tics.2006.11.005](https://doi.org/10.1016/j.tics.2006.11.005))
- 494 24. Benard S. 2013 Reputation systems, aggression, and deterrence in social interaction.
495 *Social Science Research* **42**, 230–245. (doi:[10.1016/j.ssresearch.2012.09.004](https://doi.org/10.1016/j.ssresearch.2012.09.004))
- 496 25. Hess NH, Hagen EH. 2006 Sex differences in indirect aggression Psychological evidence
497 from young adults. *Evolution and Human Behavior* **27**, 231–245.
- 498 26. Hess NH, Hagen EH. 2019 Gossip, reputation, and friendship in within-group
499 competition: An evolutionary perspective. In *Handbook of Reputation and Gossip*, Oxford
500 University Press.
- 501 27. Buss DM, Dedden LA. 1990 Derogation of Competitors. *Journal of Social and Personal*
502 *Relationships* **7**, 395–422. (doi:[10.1177/0265407590073006](https://doi.org/10.1177/0265407590073006))
- 503 28. Davis A, Vaillancourt T, Arnocky S, Doyel R. 2019 Women’s Gossip as an Intrasexual
504 Competition Strategy. In *The Oxford Handbook of Gossip and Reputation* (eds F Giardini, R
505 Wittek), (doi:[10.1093/oxfordhb/9780190494087.013.16](https://doi.org/10.1093/oxfordhb/9780190494087.013.16))
- 506 29. Nowak MA. 2006 Five rules for the evolution of cooperation. *Science (New York, N.y.)*
507 **314**, 1560–1563. (doi:[10.1126/science.1133755](https://doi.org/10.1126/science.1133755))
- 508 30. Post ER, Macfarlan SJ. 2020 Tracking Cross-Cultural Gender Bias in Reputations. *Cross-*
509 *Cultural Research* **54**, 346–363. (doi:[10.1177/1069397120910429](https://doi.org/10.1177/1069397120910429))

- 510 31. Mukhopadhyay CC, Higgins PJ. 1988 Anthropological studies of women's status
511 revisited: 1977-1987. *Annu Rev Anthropol* **17**, 461-95.
512 (doi:10.1146/annurev.an.17.100188.002333)
- 513 32. Abu-Lughod L. 1990 Can There Be A Feminist Ethnography? *Women & Performance: a*
514 *journal of feminist theory* **5**, 7-27. (doi:10.1080/07407709008571138)
- 515 33. Ember CR. 2007 Using the HRAF Collection of Ethnography in Conjunction With the
516 Standard Cross-Cultural Sample and the Ethnographic Atlas. *Cross-Cultural Research* **41**,
517 396. (doi:10.1177/1069397107306593)
- 518 34. Garfield Z, Macfarlan S, Schacht R, Post E, Ingram D, Uehling A. 2021
519 Zhgarfield/reputationdiversitydata: Initial release of the reputationdiversitydata package.
520 (doi:10.5281/zenodo.4740791)
- 521 35. Syme KL, Garfield ZH, Hagen EH. 2015 Testing the bargaining vs. Inclusive fitness
522 models of suicidal behavior against the ethnographic record. *Evolution and Human*
523 *Behavior* **37**, 179-192. (doi:10.1016/j.evolhumbehav.2015.10.005)
- 524 36. Garfield ZH, Hubbard H Robert, Hagen EH. 2019 Evolutionary models of leadership:
525 Tests and synthesis. *Human Nature* **30**, 23-58. (doi:10.1007/s12110-019-09338-4)
- 526 37. Bates D, Mächler M, Bolker B, Walker S. 2015 Fitting linear mixed-effects models using
527 lme4. *Journal of Statistical Software* **67**, 1-48. (doi:10.18637/jss.v067.i01)
- 528 38. Burnham KP, Anderson DR, Huyvaert KP. 2011 AIC model selection and multimodel
529 inference in behavioral ecology: Some background, observations, and comparisons.
530 *Behavioral Ecology and Sociobiology* **65**, 23-35. (doi:10.1007/s00265-010-1029-6)
- 531 39. Burnham KP, Anderson DR, editors. 2002 *Model selection and multimodel inference: A*
532 *practical information-theoretic approach*. Springer New York. (doi:10.1007/b97636)
- 533 40. Suzuki R, Shimodaira H. 2015 *Pvclust: Hierarchical Clustering with P-Values via*
534 *Multiscale Bootstrap Resampling*. See <https://CRAN.R-project.org/package=pvclust>.
- 535 41. Zou H, Hastie T. 2005 Regularization and variable selection via the elastic net. *Journal of*
536 *the Royal Statistical Society: Series B (Statistical Methodology)* **67**, 301-320.
537 (doi:10.1111/j.1467-9868.2005.00503.x)
- 538 42. Tomasello M, Carpenter M, Call J, Behne T, Moll H. 2005 Understanding and sharing
539 intentions: The origins of cultural cognition. *Behavioral and Brain Sciences* **28**, 675-691.
540 (doi:10.1017/S0140525X05000129)
- 541 43. MacLean EL. 2016 Unraveling the evolution of uniquely human cognition. *Proceedings*
542 *of the National Academy of Sciences* **113**, 6348-6354. (doi:10.1073/pnas.1521270113)
- 543 44. Hawkes K *et al.* 1993 Why Hunter-Gatherers Work: An Ancient Version of the Problem
544 of Public Goods [and Comments and Reply]. *Current Anthropology*, 341-361.

- 545 45. Smith JE, Ortiz CA, Buhbe MT, van Vugt M. 2020 Obstacles and opportunities for female
546 leadership in mammalian societies: A comparative perspective. *Special issue on Evolution*
547 *and Biology of Leadership* **31**, 101267. (doi:[10.1016/j.leaqua.2018.09.005](https://doi.org/10.1016/j.leaqua.2018.09.005))
- 548 46. Rosaldo MZ. 1980 The use and abuse of anthropology: Reflections on feminism and
549 cross-cultural understanding. *Signs* **5**, 389–417.
- 550 47. Lin N. 2000 Inequality in Social Capital. *Contemporary Sociology* **29**, 785–795.
551 (doi:[10.2307/2654086](https://doi.org/10.2307/2654086))
- 552 48. von Rueden C, Alami S, Kaplan H, Gurven M. 2018 Sex differences in political leadership
553 in an egalitarian society. *Evolution and Human Behavior*
554 (doi:[10.1016/j.evolhumbehav.2018.03.005](https://doi.org/10.1016/j.evolhumbehav.2018.03.005))
- 555 49. Campbell A. 2002 *A mind of her own: The evolutionary psychology of women*. Oxford
556 University Press Oxford.
- 557 50. Garfield ZH, Hagen EH. 2020 Investigating evolutionary models of leadership among
558 recently settled Ethiopian hunter-gatherers. *Special issue on Evolution and Biology of*
559 *Leadership* **31**, 101290. (doi:[10.1016/j.leaqua.2019.03.005](https://doi.org/10.1016/j.leaqua.2019.03.005))
- 560 51. Dahlberg F. 1981 *Woman the gatherer*. New Haven: Yale University Press.
- 561 52. Low BS. 2005 Women's lives there, here, then, now: A review of women's ecological and
562 demographic constraints cross-culturally. *Evolution and Human Behavior* **26**, 64–87.
563 (doi:[10.1016/j.evolhumbehav.2004.08.011](https://doi.org/10.1016/j.evolhumbehav.2004.08.011))
- 564 53. Schacht R, Borgerhoff Mulder M. 2015 Sex ratio effects on reproductive strategies in
565 humans. *Royal Society Open Science* **2**, 140402. (doi:[10.1098/rsos.140402](https://doi.org/10.1098/rsos.140402))
- 566 54. von Rueden C, Jaeggi AV. 2016 Mens status and reproductive success in 33
567 nonindustrial societies: Effects of subsistence, marriage system, and reproductive strategy.
568 *Proceedings of the National Academy of Sciences*, 201606800.
- 569 55. Schacht R, Bell AV. 2016 The evolution of monogamy in response to partner scarcity.
570 *Scientific Reports* **6**, 32472. (doi:[10.1038/srep32472](https://doi.org/10.1038/srep32472))
- 571 56. Schacht R, Rauch KL, Borgerhoff Mulder M. 2014 Too many men: The violence problem?
572 *Trends Ecol Evol* **29**, 214–22. (doi:[10.1016/j.tree.2014.02.001](https://doi.org/10.1016/j.tree.2014.02.001))
- 573 57. Hames R, Garfield ZH, Garfield M. 2017 Is Male Androphilia a Context-Dependent Cross-
574 Cultural Universal? *Archives of Sexual Behavior* **46**, 63–71. (doi:[10.1007/s10508-016-0855-](https://doi.org/10.1007/s10508-016-0855-7)
575 [7](https://doi.org/10.1007/s10508-016-0855-7))
- 576 58. Malinowski B. 1932 *The sexual life of savages*. London: Routledge.
- 577 59. Hrdy SB. 2000 The optimal number of fathers. Evolution, demography, and history in
578 the shaping of female mate preferences. *Ann N Y Acad Sci* **907**, 75–96.

- 579 60. Van Vugt M, Smith JE. 2019 A Dual Model of Leadership and Hierarchy: Evolutionary
580 Synthesis. *Trends in Cognitive Sciences* **23**, 952–967. (doi:[10.1016/j.tics.2019.09.004](https://doi.org/10.1016/j.tics.2019.09.004))
- 581 61. Cheng JT. 2019 Dominance, Prestige, and the Role of Leveling in Human Social
582 Hierarchy and Equality. *Current Opinion in Psychology* (doi:[10.1016/j.copsy.2019.10.004](https://doi.org/10.1016/j.copsy.2019.10.004))
- 583 62. Cheng JT, Tracy JL, Foulsham T, Kingstone A, Henrich J. 2013 Two ways to the top:
584 Evidence that dominance and prestige are distinct yet viable avenues to social rank and
585 influence. *J Pers Soc Psychol* **104**, 103–25. (doi:[10.1037/a0030398](https://doi.org/10.1037/a0030398))
- 586 63. Von Rueden C. 2014 The roots and fruits of social status in small-scale human societies.
587 In *The psychology of social status* (eds JT Cheng, JL Tracy, C Anderson), pp. 179–200.
588 Springer.
- 589 64. von Rueden CR, Redhead D, O’Gorman R, Kaplan H, Gurven M. 2019 The dynamics of
590 men’s cooperation and social status in a small-scale society. *Proceedings of the Royal Society*
591 *B: Biological Sciences* **286**, 20191367. (doi:[10.1098/rspb.2019.1367](https://doi.org/10.1098/rspb.2019.1367))
- 592 65. Earle TK. 1997 *How chiefs come to power: The political economy in prehistory*. Stanford
593 University Press.
- 594 66. Curry OS, Mullins DA, Whitehouse H. 2019 Is It Good to Cooperate?: Testing the Theory
595 of Morality-as-Cooperation in 60 Societies. *Current Anthropology* **60**, 47–69.
596 (doi:[10.1086/701478](https://doi.org/10.1086/701478))
- 597 67. Durkee PK, Lukaszewski AW, Buss DM. 2020 Psychological foundations of human status
598 allocation. *Proceedings of the National Academy of Sciences* **117**, 21235–21241.
599 (doi:[10.1073/pnas.2006148117](https://doi.org/10.1073/pnas.2006148117))
- 600 68. Garfield ZH, Syme KL, Hagen EH. 2020 Universal and variable leadership dimensions
601 across human societies. *Evolution and Human Behavior* **41**, 397–414.
602 (doi:[10.1016/j.evolhumbehav.2020.07.012](https://doi.org/10.1016/j.evolhumbehav.2020.07.012))
- 603 69. Pietraszewski D. 2020 The evolution of leadership: Leadership and followership as a
604 solution to the problem of creating and executing successful coordination and cooperation
605 enterprises. *Special issue on Evolution and Biology of Leadership* **31**, 101299.
606 (doi:[10.1016/j.leaqua.2019.05.006](https://doi.org/10.1016/j.leaqua.2019.05.006))
- 607 70. Hill K, Barton M, Hurtado AM. 2009 The emergence of human uniqueness: Characters
608 underlying behavioral modernity. *Evolutionary Anthropology: Issues, News, and Reviews* **18**,
609 187–200. (doi:[10.1002/evan.20224](https://doi.org/10.1002/evan.20224))
- 610 71. Boyd R, Richerson P. 1985 *Culture and the Evolutionary Process*. Chicago: University of
611 Chicago Press.
- 612 72. Henrich J, Boyd R. 1998 The Evolution of Conformist Transmission and the Emergence
613 of Between-Group Differences. *Evolution and Human Behavior* **19**, 215–241.
614 (doi:[10.1016/S1090-5138\(98\)00018-X](https://doi.org/10.1016/S1090-5138(98)00018-X))

- 615 73. Bowles S. 2006 Group Competition, Reproductive Leveling, and the Evolution of Human
616 Altruism. *Science* **314**, 1569–1572. (doi:10.1126/science.1134829)
- 617 74. Glowacki L, Wilson ML, Wrangham RW. 2020 The evolutionary anthropology of war.
618 *Journal of Economic Behavior & Organization* **178**, 963–982.
619 (doi:10.1016/j.jebo.2017.09.014)
- 620 75. Gavrillets S, Fortunato L. 2014 A solution to the collective action problem in between-
621 group conflict with within-group inequality. *Nature communications* **5**, 3526.
- 622 76. Henrich J, Chudek M, Boyd R. 2015 The Big Man Mechanism: How prestige fosters
623 cooperation and creates prosocial leaders. *Phil. Trans. R. Soc. B* **370**, 20150013.
- 624 77. Singh M, Kaptchuk TJ, Henrich J. 2020 Small gods, rituals, and cooperation: The
625 Mentawai water spirit Sikameinan. *Evolution and Human Behavior*
626 (doi:10.1016/j.evolhumbehav.2020.07.008)
- 627 78. Singh M. 2017 The cultural evolution of shamanism. *The Behavioral and brain sciences*
628 **2017**, 1–83.
- 629 79. Lightner AD, Heckelsmiller C, Hagen EH. 2021 Ethnoscience expertise and knowledge
630 specialisation in 55 traditional cultures. *Evolutionary Human Sciences*, 1–52.
631 (doi:10.1017/ehs.2021.31)
- 632 80. Rosaldo MZ. 1974 Woman, culture, and society: A theoretical overview. In *Woman,*
633 *culture and society* (eds MZ Rosaldo, L Lamphere), pp. 17–43. Stanford, CA: Stanford
634 University Press.
- 635 81. United Nations Sustainable Development. In press. Gender equality and women’s
636 empowerment. See <https://www.un.org/sustainabledevelopment/gender-equality/>
637 (accessed on 27 June 2021).
- 638 82. Chapais B. 2014 Complex Kinship Patterns as Evolutionary Constructions, and the
639 Origins of Sociocultural Universals. *Current Anthropology* **55**, 751–783.
640 (doi:10.1086/678972)