Hadza hunter-gatherers are not deontologists and do not prefer deontologists as social partners

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Abstract

Researchers hypothesize that social selection resulting from partner choice may have shaped deontological moral reasoning in humans. People in Western societies judge deontologists to be more trustworthy than utilitarians and prefer them as cooperative partners. We test if the preference for deontologists as social partners generalizes to the Hadza, hunter-gatherers residing in Tanzania. We presented 134 Hadza participants with three ecologically-relevant sacrificial dilemmas and asked them to judge whether the actor should sacrifice one person to save five. We then randomly assigned participants to hear that the actor made either a deontological or utilitarian decision and asked them to make partner choice judgments about the actor in the dilemma. Compared to 249 US Mechanical Turk participants, Hadza participants were more likely to think the actor should choose the utilitarian option. Regardless of what option they thought the actor should choose, Hadza participants showed no preference for the deontological or utilitarian decision-maker, whereas Mechanical Turk participants who thought the actor should choose the deontological option had a strong preference for the deontological actor. These results suggest the preference for deontological decision-makers as cooperative partners is culturally variable.

Keywords: moral dilemma; deontology; utilitarian; partner choice; moral character; person perception

1. Introduction

People may face a moral dilemma of whether to follow a rule (deontology) or to bring about an outcome with better consequences (utilitarianism). A well-known example of this is the trolley problem: a trolley is hurtling toward five people on a track and someone can redirect the trolley to another track with one person on it. Choosing to redirect the trolley because of the greater number of lives saved is the utilitarian option, whereas allowing the trolley to continue is the deontological option because causing another person's death violates a rule (Mikhail, 2007). People from Western countries tend to judge the deontological decisions as more permissible than utilitarian decisions (Cushman et al., 2006; Greene et al., 2001); this tendency is found cross-culturally, including online samples across the globe (Awad et al., 2020), student samples from East Asia (Gold et al., 2014; Tännsjö & Ahlenius, 2012), rural Mayans (Abarbanell & Hauser, 2010), and Yali horticulturalists in Western Papua (Sorokowski et al., 2020).

Judging certain actions and choices as impermissible, regardless of the consequences, is a puzzling feature of human morality (DeScioli & Kurzban, 2009) because it can lead to undesirable and nonpreferred outcomes (Baron, 1994). However, one evolutionary explanation is that moral psychology is adapted for partner choice for cooperative partners and, as such, moral judgments are based on the presumed psychology underlying actors' choices, rather than the consequences of their choices (Baumard et al., 2013; Tooby & Cosmides, 1996). Someone who makes decisions based on the consequences of their actions may defect on partners when the benefit to themselves is sufficiently high (Hoffman et al., 2015, 2016). Conversely, someone who makes decisions in dilemmas based on duties or obligations, rather than consequences, may be a more reliable partner. Moreover, the utilitarian option in sacrificial dilemmas may violate fairness-based principles. For instance, intervening to change the course of a trolley by

sacrificing one person violates respect for one's possessions (i.e., safety from the trolley) and impartiality (i.e., some lives are not favored more than others) (Baumard & Sheskin, 2015).

Thus, deontologist decision-makers may be viewed as better social partners for these reasons.

Consequently, the competition to be seen as a valued cooperative social partner may have led to the selection of deontological moral decision-making in humans.

Consistent with the partner choice account, not only do people judge deontological options in sacrificial dilemmas as permissible, but they also judge deontological decision-makers as moral, trustworthy, and cooperative. For example, US online workers and Dani horticulturalists in Western Papua judge deontological decision-makers to be more predictable social partners (Turpin et al., 2020). And, in US online samples, people choose to play with and trust deontological more than utilitarian decision-makers in economic games (Bostyn & Roets, 2017; Everett et al., 2018; Rom et al., 2017). This preference is especially pronounced when deontological decisions are made intuitively (Everett et al., 2016), possibly because quick or “easy” decisions are more indicative of dispositional traits (Rand et al., 2014). US online workers accurately determine that they will be judged more favorably for making deontological decisions when being evaluated on emotional competence and report more deontological decisions when imagining answering in public than in private (Rom & Conway, 2018). These findings suggest that there is a reputational penalty for making utilitarian decisions, and support the evolutionary account that selection via partner choice favored deontological morality (Baumard et al., 2013; Everett et al., 2018).

The partner choice account for the evolution of deontological moral decision-making proceeds in two steps. First, people prefer deontologists as social partners because such decisions are a cue that the person will reliably cooperate regardless of consequences (Hoffman et al.,

2015) and will not harm partners in order to achieve goals (Kahane et al., 2018). Second, competition for cooperative partners selects for deontological moral preferences. That is, in social markets where individuals freely choose their partners, deontologists would fare better than utilitarians. Because competitive market dynamics lead to assortative cooperative pairings (Noë & Hammerstein, 1995), deontologists would secure more cooperative partners and thus receive more benefits from these highly cooperative partnerships. If deontological morality evolved genetically via mechanisms of partner choice because it promoted the success of its bearers, both the tendency to make deontological decisions and the preference for deontologists as social partners, is expected to be universal and observed cross-culturally.

While there is considerable evidence for these phenomena in industrialized populations across the globe (Awad et al., 2020; Bostyn & Roets, 2017; Everett et al., 2018), there is far less evidence in small-scale societies, and the evidence available is mixed. While horticulturalists in Nicaragua are more likely to make utilitarian decisions (Winking & Koster, 2020), rural Mayans (Abarbanell & Hauser, 2010) and horticulturalists in Western Papua (Sorokowski et al., 2020) tend to make deontological decisions like Western participants. However, unlike Westerners, rural Mayans did not distinguish between actions and omissions in their judgements of permissibility suggesting that cultural differences exist. Apart from work showing that participants from Western Papua judge deontologists to be more predictable (Turpin et al., 2020), we know of no studies that have examined how individuals in small-scale societies perceive and judge decision-makers in sacrificial dilemmas. In this experiment, we test whether Hadza hunter-gatherers of Tanzania prefer deontological options in sacrificial dilemmas and deontologists as social partners. Our goal is to examine whether there are differences between Hadza and US participants in these preferences. While our experiment does not test explanations for any

potentially observed differences, we offer two reasons to expect differences between the two populations: higher kin intensity and lower variance in willingness to cooperate. These two forces change the dynamics of partner choice markets, possibly affecting the importance of drawing and using moral judgments as cues of value of potential cooperative partners.

Societies vary on how and what extent social norms structure to social relationships. For example, throughout most of human history, and in many societies today, norms dictating cooperative interactions were largely organized around kinship and prescribed ritual relationships (Henrich, 2020; Henrich & Muthukrishna, 2020; McNamara & Henrich, 2017). Such societies are considered *kin intensive*, where practices such as cousin marriage, polygyny, and endogamy, lead to higher levels of relatedness within kin groups and decreased freedom to choose social partners (Henrich, 2020; Schulz et al., 2019). In contrast, various cultural institutions present in Western societies today, including markets and churches, promote the expansion of voluntary relationships. This greater relational freedom to choose your friends, spouses, neighbors, and business partners has been associated with a number of psychological traits (Henrich, 2020). In particular, there is evidence to suggest that moral psychology changes in response to differing levels of kin intensity. In societies with high kinship intensity, individuals attend less to mental states and rely more on outcomes when judging the wrongness of actions (Barrett et al., 2016; Curtin et al., 2020). In these societies, it is hypothesized that intentions may matter less for predicting behavior since individual actions tend to be more constrained by social relationships, obligations, and debts (Henrich, 2020). In societies with less kin intensity it may be helpful to distinguish between intentional and unintentional moral violations as these can be diagnostic of a person's future behavior (Cushman, 2015; Martin & Cushman, 2015). Because competition for social partners is stronger in societies with less kin

intensity, individuals may be more likely to act according to deontological principles to win over partners. In this way, moral preferences may be culturally-variant.

Kin intensity is related but distinct from relational mobility. Relational mobility is a general term describing the ease at which people can forge new relationships (Thomson et al., 2018). In societies with low relational mobility, it is difficult for people to switch partners and recover from reputational penalties. Accordingly, it has been proposed that low relational mobility would create more pressure to be seen as cooperative by one's current social partners since the costs of losing them would be high. Note that this prediction contrasts with biological market theory where partners exchange commodities for mutual benefit. Here, formal modeling predicts that when the costs of switching partners is high, relationships become more stable and long-lasting and consequently there is less pressure to be seen as cooperative (Noë & Hammerstein, 1994). In line with the former prediction, cross-cultural research using a voluntary online sample found that participants in countries with low relational mobility, are more deontological compared to populations with high relational mobility (Awad et al., 2020).

Another reason the Hadza might not prefer deontologists as social partners is because their society is characterized low variance in cooperation (Apicella et al., 2012; Smith et al., 2018). Such conditions may reduce the benefits of having a partner who is generous and willing to cooperate since everyone is expected to cooperate. Norms of cooperation reduce variance in observed levels of cooperation within Hadza camps (Apicella et al., 2012; Smith & Apicella, 2020b). The only predictor of a person's level of cooperation at any given time in economic games is how much their current campmates give (Smith et al., 2018), and they disagree on who are the most cooperative people, suggesting low variance in observations of cooperativeness (Smith & Apicella, 2020b). When variance on a trait, such as willingness to cooperate is low,

other fitness-relevant traits, such as foraging ability become more valued in potential partners (Barclay, 2016; Eisenbruch & Krasnow, 2019). And historically, the Hadza had a stronger preference to live in camps with better hunters (Smith & Apicella, 2020a; Wood, 2006) or with people who are more physically fit (Apicella et al., 2012), which may predict hunting ability (Apicella, 2014; Stibbard-Hawkes et al., 2018). If willingness to cooperate is not a valued trait in potential social partners, then the Hadza may not attend to or condition their partner preferences on cues of being a reliable cooperator, such as whether a person makes deontological decisions in moral dilemmas.

While contemporary hunter-gatherers differ from ancestral foragers, they provide the only opportunity to examine psychological phenomena in populations without regular access to agriculture and many of the cultural institutions found in large-scale societies (Marlowe, 2005). As such, studying psychological phenomena in contemporary hunter-gatherers is an opportunity to study them in maximally-different populations from English-speaking student and online workers, providing a strong test for their universality. While we have offered some theoretical reasons for why variation in partner choice preferences for moral decision-makers might vary across cultures, our goal was to determine whether there is any variation observed.

2. Method

2.1. Hadza sample

2.1.1. Population

The Hadza are an ethnolinguistic population in Tanzania. There are about 1,000 people who speak Hadzane and identify as Hadza, but only about 300 who maintain a foraging lifestyle (Blurton-Jones, 2016; Marlowe, 2010). Hadza life is characterized by high-levels of cooperation

with camp members, including sharing of food and childcare (Apicella & Crittenden, 2016).

Despite these high levels of cooperation, Hadza will sometimes attempt to conceal food, waiting until nightfall to return with a kill (Marlowe, 2010), and bend rules to benefit themselves in anonymous economic games (Apicella, 2018; Marlowe, 2004a).

The Hadza have a fission-fusion social grouping, living in temporary residence bands called camps. Camps move location regularly as local resources are depleted and people move freely between camps. In one longitudinal study, individuals were found to be living with one-fifth of their campmates from the previous years (Smith et al., 2018). And it is estimated that an individual interact with about one-fifth of the population in a year (Hill et al., 2014). Hadza then have plenty of opportunities to switch camps if unhappy. In global comparison, the Hadza have moderate levels of kin intensity, with higher levels than residents in industrialized nations and lower levels than pastoralists or horticulturalists (Curtin et al., 2020).

2.1.2 Sample

KMS and assistants visited 11 camps in September and October of 2019 and sampled camps using a snowball sampling procedure where members of the current camp would provide directions to the next nearest camp. There was no pre-determined target sample size, rather the study continued until supplies were exhausted. Data were not examined until study completion. A total of 135 adults with a mean estimated age of $M = 37.7$ ($SD = 14.7$) years old participated. Sixty-nine participants were men and 99 were married. No participants were excluded.

2.1.3. Procedure

Interviews were conducted by a Tanzanian research assistant fluent in Swahili and English and a Hadza research assistant fluent in Hadzane, Swahili, and English. Materials were translated from English to Swahili by the Tanzanian research assistant; however, during the first

few interviews, participants asked that they be conducted in Hadzane and we complied, and conducted all the subsequent interviews in Hadzane. Materials are available in English and Swahili at <https://osf.io/crfhs/>; translations in Hadzane are not available.

Participants were read three stories, each describing a focal actor facing a sacrificial dilemma: The Lion, Dik-dik, and Datoga stories. After hearing each story, participants were asked whether the actor *should* choose the utilitarian option. The participant was then told that either the actor chose the deontological option or utilitarian option, which was determined by a coin flip. Afterwards, participants were asked six questions: was the chosen option bad, should the actor be punished, does the actor have a good heart, which the Hadza report is a measure of moral character (Purzycki et al., 2018; Smith & Apicella, 2020b), and would the participant share food with the actor, trust the actor, and sleep in the same camp as the actor. The *bad* and *punish* questions were used to assess moral judgments of the actions, and the *heart*, *share*, *trust*, and *sleep* questions were used to assess whether the participant viewed the person as a valuable social partner. Participants could respond “yes,” or “no;” some participants would respond with “don’t know” if they did not understand the question. Likert-scale ratings were not used because Hadza have difficulty understanding and using scales, a common problem in cross-cultural research (Bernal et al., 1997; Flakerud, 2012; Hruschka et al., 2018). The stories and questions were always delivered in the same order.

2.1.4. Materials

We created three ecologically-relevant sacrificial dilemmas. In each dilemma, the focal actor must decide between breaking a rule (do not commit battery, do not break a promise/fail to reciprocate, do not lie) to save five people and killing another person or not breaking the rule and letting five people die. Because the focus of the study is how the judgments of the actors differs

between utilitarian and deontological options within each story, other elements of sacrificial dilemmas (e.g., means/end distinction, personal/impersonal force) were not matched or manipulated across stories. In the Lion story, one man must choose whether to push another man out of a tree toward a lion to let five women run away. In the Dik dik story, one man must choose whether to break a promise to feed his starving friend to feed five starving Hadza. And in the Datoga story, one man must choose whether to lie and say one man stole a Datoga man's beer so that the Datoga kills only him instead of the five perpetrators. The Hadza have previous experience in making judgments of hypotheticals presented in vignettes (Barrett et al., 2016).

2.2. US Sample

2.2.1. Sample

We recruited a target sample of 250 adults from Amazon Mechanical Turk on June 3rd, 2021, from 15:54 to 17:24 US EDT. Using Cloud Research (Litman et al., 2017), we restricted the sample to IP addresses in the US, workers who had completed at least 100 HITs and at least a 99% approval rate. Participants were paid \$3 for completing the survey, and all participants who completed the survey were automatically approved and paid. Two hundred sixty-four participants started the survey, and 254 participants completed the survey. We excluded participants that completed the survey in less than 90 seconds, for a final sample of 249 participants. Among those who finished and were not excluded, the median time of completion was 271 seconds, for an average hourly wage of \$39.82. The sample was mostly men (157 men, 90 women, 2 nonbinary), White (205 White, 18 Asian or Pacific Islander, 18 Black, 7 Hispanic, 1 Native American), and had a mean age of $M = 38.9$ ($SD = 10.9$) years-old.

2.2.2. Procedures and materials

Creating the sacrificial dilemmas to be ecologically-relevant for the Hadza involved a number of changes from prototypical dilemmas, such as the trolley problem, so we compare the results from the Hadza to the Mechanical Turk sample to ensure the US sample responds to these new dilemmas in the same way. As such, procedures were adopted to online surveys with as few changes as possible. Participants were presented each story one at a time, were asked whether the actor should choose the utilitarian option, randomly assigned to either the utilitarian and deontological ending, and then answered six questions about their judgments of the actor. The order of the stories and questions were the same as the Hadza sample. The stories were nearly identical, except English names were used in place of Hadza names, and in the Dik dik story the animal is referred to as an antelope to avoid distracting participants. Some of the judgment questions were changed to make them more applicable to Mechanical Turk participants. The *heart* question was changed to is the actor a *good* person, the *sleep* question was changed to whether the participant would be a *friend* to the actor, and the *share* question was changed to would the participant help the actor if he was in need. Like the Hadza sample, participants could respond “yes” or “no.” All materials were presented in English.

2.3 Data analysis

2.3.1 Exclusions

Hadza participants could also answer “don’t know” to questions. Because “don’t know” responses were too few for any meaningful analysis (3.4% of possible responses), we dropped these responses from analyses. We dropped all responses to a story if the participant answered “don’t know” to the *should* question, which was three. We then dropped individual responses of “don’t know” for each question; five *bad*, fifteen *punish*, twelve *heart*, six *trust*, one *share*, and two *sleep* responses were dropped. No participant was completely excluded.

Some Mechanical Turk participants did not respond to some questions; individual nonresponses were dropped from the analyses. No *should* responses were dropped; two *good*, one *trust*, and one *help* responses were dropped.

2.3.2 Analytical approach

We analyzed the data using multilevel Bayesian regression modeling.¹ Bayesian analyses estimate the posterior distributions of the probabilities that a particular value of the parameter would generate the observed data (Kruschke & Liddell, 2018b; McElreath, 2016). Put simply, a Bayesian model counts the different ways data are compatible with a range of possible parameter values and assigns higher probabilities to parameter values that are more compatible with the data, producing a probability distribution over the range of the possible parameter values. Bayesian analyses then provide a way to estimate parameters and describe the uncertainty, using the highest density interval (HDI), around those estimates over a range of hypothesized values (Kruschke & Liddell, 2018a). A strength of the Bayesian approach is using joint posterior distributions to estimate expected values from multiple parameters, such as interactions; values computed from multiple parameters have multiple sources of uncertainty and standard frequentist approaches may underestimate this uncertainty, especially for nonlinear values like probabilities. Throughout, we report the median of the posterior distribution, the 90% HDI, and the probability of direction (*pd*)—the proportion of the posterior distribution of the values that greater than or less the comparison point (e.g., 0.50 or 0).

We fit two models to estimate responses to the different kinds of questions asked. The first model estimated responses to the *should* question ($n = 1,149$ observations) to examine whether participants thought the actor should choose the utilitarian option. The second model (n

¹ For an accessible reference to the basics of Bayesian estimation and testing, see Kruschke & Liddell (2018a; b).

= 6,855 observations) estimated responses to the judgment questions, coded so that positive responses are 1 and negative responses are 0. To answer our research question, we estimate the probability of giving a positive judgment (i.e., answering “no” to *bad* and *punish* questions and answering “yes” to all other questions), then compute the difference between the deontological and utilitarian conditions as a “utilitarian penalty,” such that positive values indicate more positive judgments of deontological compared to utilitarian decision-makers. We treat the judgments as a random factor with varying intercepts and slopes; by doing this, we allow the model to adaptively determine to what extent the questions should be treated as one judgment or multiple distinct judgments. That is, if the responses to the judgments are weakly correlated, the model will estimate more divergent values for each judgment, but if the judgments are moderately correlated, the model will estimate more similar values for each judgment (see the supplementary materials for estimated probabilities by judgment). We used a Bernoulli distribution (a special case of the binomial distribution in which the number of trials is one) as the likelihood function to estimate the probability of responding yes to the questions. We used weakly regularizing, noninformative priors, which are centered at zero and limit overfitting while improving computation (McElreath, 2016).

2.4 Transparency and ethics

The study design and data analysis plan were not preregistered. Raw data, processed data, R scripts, and statistical output are publicly available at <https://osf.io/crfhs/>. We have reported all measures, manipulations, and exclusions. Study protocols were approved by the IRB at the University of Pennsylvania and permission to conduct research in Tanzania was approved by COSTECH. Permission to work in a camp was granted by each camp as a group and verbal consent was obtained from each participant.

3. Results

Tables 1 and 2 presents the descriptive statistics of responses by condition, whether the participant endorsed the utilitarian option, and by story for the Hadza and Mechanical Turk samples, respectively. Tables 3 and 4 present correlations between responses on each question, controlling for subject and story as random factors, for the Hadza and Mechanical Turk samples, respectively.

Table 1. Descriptive Statistics of Responses for Each Story by Condition for the Hadza Sample

Story	Should	Condition	<i>n</i>	Bad	Punish	Heart	Share	Trust	Sleep
Lion	No	Deon	24	0.33	0.29	0.83	0.83	0.79	0.83
(battery)		Util	33	0.76	0.47	0.56	0.67	0.59	0.61
	Yes	Deon	40	0.49	0.74	0.74	0.82	0.75	0.80
		Util	37	0.42	0.69	0.63	0.70	0.64	0.70
Dik-dik	No	Deon	38	0.49	0.62	0.65	0.71	0.66	0.71
(Break		Util	31	0.60	0.69	0.60	0.58	0.57	0.58
promise)	Yes	Deon	32	0.56	0.56	0.78	0.84	0.84	0.84
		Util	34	0.59	0.45	0.76	0.79	0.76	0.73
Datoga	No	Deon	41	0.68	0.77	0.59	0.56	0.54	0.54
(Lie)		Util	33	0.70	0.88	0.48	0.52	0.48	0.52
	Yes	Deon	27	0.78	0.89	0.58	0.63	0.59	0.63
		Util	32	0.78	0.87	0.45	0.44	0.41	0.41

Note. *Should* refers to whether the participant thought the actor should choose the utilitarian

option prior to being assigned to a condition. *Condition* refers whether the person in the story

made the deontological (deon) or utilitarian (util) decision. *N* is the number of participants who

decided yes or no for should and assigned to that condition. Values for the remaining columns

are the proportion that answered yes to each question. Because of data exclusions by question,

the denominator for the proportion is not always the same as the value under *n*.

Table 2. Descriptive Statistics of Responses for Each Story by Condition for the Mechanical Turk Sample

Story	Should	Condition	<i>n</i>	Bad	Punish	Good	Help	Trust	Friend
Lion	No	Deon	100	0.03	0.06	0.91	0.96	0.96	0.95
(battery)		Util	90	0.94	0.72	0.20	0.42	0.04	0.12
	Yes	Deon	29	0.28	0.10	0.90	0.90	0.72	0.79
		Util	30	0.50	0.13	0.87	0.83	0.63	0.80
Dik-dik	No	Deon	98	0.04	0.01	0.97	0.96	0.98	0.97
(Break		Util	75	0.80	0.24	0.55	0.64	0.28	0.39
promise)	Yes	Deon	35	0.31	0.09	0.89	0.89	0.83	0.83
		Util	41	0.20	0.07	0.93	0.95	0.68	0.85
Datoga	No	Deon	106	0.03	0.02	0.97	0.94	0.96	0.93
(Lie)		Util	115	0.85	0.68	0.25	0.42	0.11	0.18
	Yes	Deon	18	0.39	0.22	0.78	0.72	0.61	0.67
		Util	10	0.50	0.30	0.90	0.90	0.70	0.70

Note. *Should* refers to whether the participant thought the actor should choose the utilitarian

option prior to being assigned to a condition. *Condition* refers whether the person in the story

made the deontological (deon) or utilitarian (util) decision. *N* is the number of participants who

decided yes or no for should and assigned to that condition. Values for the remaining columns

are the proportion that answered yes to each question. Because of data exclusions by question,

the denominator for the proportion is not always the same as the value under *n*.

Table 3. Correlation Between Responses to Each Question for Hadza Sample

	Bad	Punish	Heart	Share	Trust	Sleep
Bad	-	0.19	-0.07	-0.11	-0.10	-0.13
Punish		-	-0.19	-0.17	-0.20	-0.13
Heart			-	0.55	0.71	0.57
Share				-	0.76	0.90
Trust					-	0.83

Note. Values are Pearson's correlations between responses for each story for each participant with "yes" coded as 1 and "no" coded as 0. Correlations were computed correcting for random factors of subject and story.

Table 4. Correlation Between Responses to Each Question for Mechanical Turk Sample

	Bad	Punish	Good	Help	Trust	Friend
Bad	-	0.58	-0.67	-0.51	-0.76	-0.73
Punish		-	-0.65	-0.52	-0.56	-0.59
Good			-	0.66	0.70	0.75
Help				-	0.58	0.63
Trust					-	0.82

Note. Values are Pearson's correlations between responses for each story for each participant with "yes" coded as 1 and "no" coded as 0. Correlations were computed correcting for random factors of subject and story.

3.1 Do participants think the actor should choose the utilitarian option?

We first estimated the probability participants would respond “yes” to the question of whether the actor *should* choose the utilitarian option. The model included random intercepts for sample, story, subject, and sample by story. Hadza participants did not prefer the actor to choose the deontological option, $Med. = 0.53$, 90% HDI: 0.36, 0.71, $pd = 0.388$, while the Mechanical Turk participants did prefer the actor to choose the deontological option, $Med. = 0.22$, 90% HDI: 0.09, 0.44, $pd = 0.965$ (see Figure 1). The Hadza sample was more likely to prefer the actor to choose the utilitarian option than the Mechanical Turk sample, $Med. \Delta = 0.30$, 90% HDI: 0.03, 0.47, $pd = 0.961$.

Figure 1. Probability of participants saying the actor should choose the utilitarian option by story and sample. Points are the median estimates of the posterior distribution and intervals are the 67% and 90% highest density intervals (HDI).

3.2. *Do participants prefer the deontological decision-maker as a social partner?*

We next estimated the probability of participants positively responding to the actor's decision. We modeled as a function of what the actor chose to do, whether the participant thought the actor should choose the utilitarian option, and their interaction, with random intercepts for subject, and random intercepts and slopes for story, judgment, and sample. From the model, we computed the probability of giving a positive judgment by sample, should, and condition; we then computed a "utilitarian penalty" by taking the difference between the deontological and utilitarian conditions for each sample and should judgment, such that a positive value indicates favoring the deontological decision-maker; reported values are summaries of the posterior distribution of the utilitarian penalty.

The Hadza sample did not prefer deontological decision-makers, whether they thought the actor should choose the utilitarian option, *Med.* = -0.01. 90% HDI: -0.22, 0.22, *pd* = 0.475, or not, *Med.* = 0.04. 90% HDI: -0.19, 0.25, *pd* = 0.627 (see Figure 2). Mechanical Turk participants who thought the actor should choose the utilitarian option also did not prefer the deontological decision-maker, *Med.* = -0.02. 90% HDI: -0.14, 0.1, *pd* = 0.373; however, Mechanical Turk participants who thought the actor should not choose the utilitarian option did prefer the deontological decision-maker, *Med.* = 0.66. 90% HDI: 0.44, 0.86, *pd* = 1. Among participants who thought the actor should not choose the utilitarian option, the penalty for deontological decision-makers was larger in the Mechanical Turk sample than the Hadza sample, *Med. Δ* = 0.61. 90% HDI: 0.45, 0.77, *pd* = 1. Across the different judgments, Mechanical Turk participants had a stronger preference for deontologists over utilitarians compared to the Hadza participants (see Supplementary Figures 1 and 2).

Figure 2. Probability of giving a positive judgment of the actor by sample, the actor's decision, and whether the participant thought the actor should choose the utilitarian option. Points are the median estimates of the posterior distribution and intervals are the 67% and 90% highest density intervals (HDI).

4. Discussion

Hadza participants were about equally likely to believe that actors should choose the utilitarian option as not and showed no strong preference for deontological decision-makers as social partners. In contrast, Mechanical Turk participants showed a strong preference for deontological options, with those preferring the deontological options also preferring deontological decision-maker as social partners. These findings demonstrate cultural variation in how individuals judge sacrificial dilemmas, as well as the actors in such dilemmas.

We suggest two possible explanations for the different judgments between the Hadza and Mechanical Turk participants. In societies with relatively higher kin intensity, such as in the Hadza, the partner choice benefits that mentalizing affords, may not outweigh the cognitive demands it imposes. Indeed, societal variation in people's reliance on mental states during moral judgments is explained, in part, by societal levels of kinship intensity (Curtin et al., 2020). Consistent with this, prior work suggests that the Hadza attend less to intentions when making moral judgments (Barrett et al., 2016). This suggests that Hadza may simply make less inferences about future behavior from previous immoral actions. The other explanation is that the strong norms of sharing and helping that exemplify Hadza daily life reduce variance in cooperation, thus diminishing the value of cooperativeness as a trait in others (Smith et al., 2018; Smith & Apicella, 2020a, 2020b). If true, then the benefit of assessing cooperativeness in others, including via moral reasoning, would be trivial. These two explanations are not mutually exclusive, and in fact, both suggest that the norms that structure our social relationships may affect our moral psychology.

While Hadza participants showed no strong preference for utilitarian or deontological actors as cooperative partners, it is possible they could have preferred the deontological or

utilitarian actors in other contexts. For example, US undergraduates prefer deontological actors as long-term romantic partners because they are perceived as more trustworthy and less likely to commit infidelity (Brown & Sacco, 2019). Good character is cited as an important trait for selecting mates in the Hadza (Marlowe, 2004b) yet we find no differences in how the Hadza perceive deontological and utilitarian actors on this trait or on trustworthiness. Possibly, the Hadza could prefer utilitarian actors in domains of competence and leadership. Indeed, US online workers judge utilitarian actors to be more logical, more competent, and better leaders than deontological actors (Rom et al., 2017; Rom & Conway, 2018; Uhlmann et al., 2013), and it is possible the Hadza could similarly prefer utilitarian actors in domains of competence and leadership. However, the Hadza are egalitarian and do not have formal leadership structures (Marlowe, 2010; Woodburn, 1982). Similarly, it is unclear how Hadza perceptions of another's overall competence might be influenced by how they respond to sacrificial dilemmas. The most pertinent domain of competence for the Hadza is foraging ability, which they accurately infer from upper-body strength (Apicella, 2014; Stibbard-Hawkes et al., 2018), and is unclear how moral decision-making would be relevant.

Our results suggest that Hadza participants are more likely to think the utilitarian option is acceptable compared to the Mechanical Turk sample. These findings corroborate other work in small-societies (Winking & Koster, 2020) and provide further evidence that deontological ethics are not an obligate feature of human psychology. These cultural differences may, instead, reflect a moral psychology that is more facultative in nature. In this way, partner choice may still play a role in the expression of moral preferences, but which moral preferences are expressed, may depend on the traits that are valued in a given social context. For instance, in environments where intelligence and competence are prized, utilitarian decision-making may be preferred and

expressed (Rom & Conway, 2018). Likewise, in environments where cooperativeness and other warm traits are valued in social partners, deontological decision-making may be preferred and expressed. Moral decision-making is also likely influenced by a number of factors other than reputational concerns which may explain why Hadza do not think the deontological option is more acceptable.

Hadza participants might have also showed no preference for either option because all answers were made in private. When responding in public versus private, online and student participants are more likely to respond with whichever option would be socially preferred in a given context (Bostyn & Roets, 2017; Rom & Conway, 2018). However, in most studies with Western or industrialized participants, including the current the Mechanical Turk sample, the deontological option is preferred even when responses are given in private (Mikhail, 2007). While manipulating the privacy of decisions among the Hadza would be an interesting avenue for future research, the decisions made privately in this study are still relevant for testing the partner choice hypothesis. This is because the partner choice hypothesis for moral decision-making explains why, even in the absence of contextual cues, people prefer the deontological option. Because privacy and anonymity were rarer in the small-group settings in which humans evolved, some evolutionary psychologists hypothesize that humans often behave *as if* their interactions are observed or repeated (Delton et al., 2011; Hagen & Hammerstein, 2006) because privacy and anonymity are rare in the small-scale societies in which humans evolved. Because in ancestral hunter-gatherers potential partners could be observing any action, human moral psychology likely defaults to assume decisions and behaviors will be observed by others, even when made in private.

Another possibility is that we failed to find a meaningful difference in conditions because participants did not understand the story and were responding randomly. We did not include comprehensions questions to avoid participant fatigue, so we are unable to definitively rule out this explanation. However, the Hadza have experience with making moral judgments to hypothetical dilemmas (Barrett et al., 2016; Curtin et al., 2020). And while the Hadza participants did not show a strong difference between preference for utilitarian and deontological social partners, their responses to whether the actor should choose the utilitarian option did differ between stories, suggesting they were attending to differences in the stories. Finally, they also tended to respond “yes” to the social partner questions, which is in line with their norm to always welcome other Hadza into their camp.

Research on moral psychology among people from industrialized countries shows that moral judgments influence and, in turn, are shaped by partner choice concerns (Awad et al., 2020; Baumard et al., 2013; Everett et al., 2018; Landy & Uhlmann, 2018). This observation led to the hypothesis that human morality evolved because of the competition to be a valuable social partner (Baumard et al., 2013; Everett et al., 2018). Our results qualify this hypothesis. The Hadza did not think the deontological option was more acceptable nor did they show a preference for deontological actors. Differences in partner choice concerns may explain the disparate findings between the Hadza participants in this study and participants from other societies. The Hadza have relatively higher levels of kinship intensity and strong norms facilitating high levels of cooperation. For these reasons, the payoffs for finding and identifying cooperative partners are relatively low and, accordingly, the competition to be seen as cooperative is also low. In this way, the results presented here can be reconciled within a partner choice framework – moral preferences are shaped by context-dependent, socially-valued traits,

though alternative explanations may exist. We hope research in understanding how partner choice influences human moral psychology continues. This will, undoubtedly, lead to a richer understanding of both the nature and diversity of human moral decision-making.

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Supplementary Material

Description of stories and relevance to the Hadza

Lion story

In the Lion story, Kaunda and Gongga are walking when they come across a lion. They scramble up a baobab tree to safety, but Kaunda sees five women gathering who cannot escape the lion. Kaunda can decide to push Gongga from the tree toward the lion, killing Gongga but giving the five women time to escape or Kaunda can do nothing letting Gongga live and the five women be eaten by the lion. Historically, the Hadza report encountering lions frequently, and some Hadza claim that lion attacks resulting in deaths were not uncommon (Blurton-Jones, 2016). Encounters have been much less common as the local lion population has shrunk. However, in several camps, lions (and other predators) can still be heard nearly nightly just outside of camp and Hadza often discuss hearing lions the next morning. So, while the exact situation described is unlikely to occur, the Hadza have some experience with lion attacks and reason to be wary of them.

Dik-dik story

In the Dik-dik story, Juma and Daudi are too weak with hunger to hunt. Daudi offers Juma the last of his meat so he can hunt and Juma promises to return with a kill for Daudi to eat. After killing a dik dik, Juma encounters five very hungry Hadza. Juma can give the dik dik to the five hungry Hadza, breaking his promise to reciprocate food to Daudi and resulting in Daudi starving to death, or Juma can give the dik dik to Daudi, saving Daudi but letting the five hungry Hadza starve to death. While there are no reports of Hadza starving to death, most Hadza report concern about having enough food to eat in the next month (Apicella, 2018), so Hadza may at least have experience with extreme hunger.

Datoga Story

In the Datoga story, Paulo and Saidi come across five Hadza who had stolen beer from a Datoga man (Datoga are a pastoralist population occupying the same territory as the Hadza). Saidi decides to join the five Hadza in drinking the beer and Paulo walks away. When Paulo returns, an angry Datoga man is threatening to kill whoever stole his beer and asks Paulo to name the culprit. Paulo can lie and say Saidi stole it, saving the five Hadza but letting Saidi be killed by the Datoga, or Paulo can tell the truth, sparing Saidi but letting the five Hadza be killed by the Datoga. Hadza relationships with Datoga are at times tense and Hadza report a small number of homicides committed by Datoga, sometimes by young men as a way to enhance status (Blurton Jones et al., 2002). This particular situation probably does not occur, but Hadza recognize Datoga men as a potential source of physical threat.

Software and computation

We conducted the analyses in R (R, 2017) using the ‘brms’ (Bürkner, 2017) package for estimation, the ‘tidybayes’ (Kay, 2018) package for summaries of posterior distributions, and the ‘tidyverse’ (Wickham et al., 2019) package for data wrangling and visualization. The ‘brms’ package uses the programming language Stan (Carpenter et al., 2017) to implement Monte Carlo Markov Chains to sample estimates from the posterior distribution. For Stan parameters, all models used four chains of 10,000 iterations, and 5,000 of those iterations were warmup for 10,000 iterations used in estimation, with a step parameter of $\delta = 0.90$. None of the models had any divergent transitions, and in all models every fixed-effect parameter had $N_{Effective} / N > 0.10$ samples and $\hat{R} < 1.01$. Visual inspection of chains confirmed they were well-mixed and sampled the posterior efficiently.

Supplementary Figure 1. Probability of giving a positive judgment by the actor's decision, whether the participant thought the actor should choose the utilitarian option, and judgment for the Hadza sample. For "bad" and "punish," responses were reverse-coded so that a 1 is a positive value. Points are the median estimates of the posterior distribution and intervals are the 67% and 90% highest density intervals (HDI).

Supplementary Figure 2. Probability of giving a positive judgment by the actor's decision, whether the participant thought the actor should choose the utilitarian option, and judgment for the Mechanical Turk sample. For "bad" and "punish," responses were reverse-coded so that a 1 is a positive value. Points are the median estimates of the posterior distribution and intervals are the 67% and 90% highest density intervals (HDI).

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