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Cultural variation in the development of beliefs about conservation

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Abstract

Examining variation in reasoning about sustainability between diverse populations provides unique insight into how group norms surrounding resource conservation develop. Cultural institutions, such as religious organizations and formal schools, can mobilize communities to solve collective challenges associated with resource depletion. This study examined conservation beliefs in a Western industrialized (Austin, Texas, U.S.A.) and a Non-Western, subsistence agricultural community (Tanna, Vanuatu) among children, adolescents, and adults ($N = 171$; $n = 58$ 7-12-year-olds, $n = 53$ 13-17-year-olds, and $n = 60$ 18-68-year-olds). Participants endorsed or rejected four types of justifications for engaging in land and animal conservation: sustainability, moral, religious, or permissible. In both populations, participants endorsed sustainability justifications most frequently. Religious justifications increased with age in Tanna and decreased with age in Austin. Tannese participants were also more likely to endorse multiple justifications for conservation than Austin participants. Data across all justification types show a main effect of age in both communities; endorsement of conservation decreased with age in Austin, but increased with age in Tanna. Across age groups, participants were more likely to endorse the conservation of animals than land in Austin, yet equally as likely to endorse the conservation of land and animals in Tanna. Overall, these results reveal similarities and differences in the beliefs that supports the conservation of natural resources across populations.

Keywords: conservation; cross-cultural comparison; conceptual development; folk ecology; sustainability; Vanuatu

Cultural variation in the development of beliefs about conservation

1. Introduction

Over the last century, the global population has nearly quadrupled, from 2 to 7.8 billion people. As the human population has increased, so too has the demand for natural resources. This rising demand for limited natural resources requires sustainability practices, not only to preserve the environment but also for the well-being of human society (Milfont & Schultz, 2016). Resource scarcity is associated with societal unrest, increased poverty, large-scale migrations, and violence (Homer-Dixon, 2001). There is global concern about harmful human actions and support for prioritizing environmental protection and implementing pro-environment policies (Kennedy & Hefferon, 2019). According to aggregated 2005-2014 data from the 78-nation World Values Survey, there is widespread recognition of the value of "looking after the environment" (the median global raw score was 4.48/6) (Inglehart, et al., 2014).

Human-environment relations are mediated by culture (Kahn, 1999; Milfont & Schultz, 2016). Despite universal recognition of the value of environmental conservation, there is cultural variation in environmental risk perception, environmental concern, and pro-environmental behavior. A number of cognitive processes vary in predictable ways based on cultural and ecological variables and shape conservation-related beliefs and behavior (Milfont & Schultz, 2016). For example, likelihood distance (i.e., uncertainty), social distance (i.e., affecting others who are different from the self), temporal distance (i.e., future outcomes), and the construct of psychological distance generally (i.e., separation between self and other persons, places, events, and times), affect environmental risk perception and negatively impact pro-environmental behavior (Evans, Milfont, Lawrence, 2014; Kortenkamp & Moore, 2006; Spence, Poortinga, Pidgeon, 2012). Temporal distance may be particularly relevant to environmental behavior, in that future thinking

(i.e., focusing on long-term interests rather than immediate concerns) is associated with greater environmental concern across diverse populations (Arnocky, Milfont, & Nicol, 2014; Bain et al., 2016; Carmi & Arnon, 2014; Milfont, Wilson, & Diniz, 2012).

Values, beliefs, and emotions are also related to environmental concern. Biospheric (i.e., concern for the biosphere), social-altruistic (i.e., concern for others) and egoistic concerns (i.e., concern for self) are all associated with pro-environment attitudes (De Dominicis, Schultz, & Bonaiuto, 2017; de Groot & Steg, 2007). Self-conscious emotions such as pride, shame, guilt, and alignment between descriptive (i.e., perception of common behaviors) and injunctive social norms (i.e, socially acceptable or unacceptable behaviors) are also positively associated with pro-environmental concern (Milfont, Duckitt, & Wagner, 2010; Milfont, Sibley, & Duckitt, 2010, Schultz et al., 2005; Onwezen, Bartels, Antonides, 2014).

Human-environment interactions, which are culturally mediated by psychological distance, values, and beliefs, impact ecological knowledge. Ecological knowledge is the understanding that organisms and the abiotic environment are connected in a complex system that can be disrupted through overuse. Intergenerational transmission of the shared worldviews Berkes, Colding, & Folke, 2000) associated with traditional ecological knowledge (García-Quijano, 2007; Gómez-Baggethun, Corbera, & Reyes-García, 2013; Menzies & Butler, 2006; Mistry & Berardi, 2016) often results in the emergence of rules, taboos, and cultural institutions that can function to sustain resources (Johannes, 2002; Turner & Berkes, 2006).

Local ecological knowledge, psychological distance from nature, and cultural values, beliefs, norms, and institutions produce three distinct worldviews that impact human-environment relations. The emphasis of the first worldview is that humans, non-human animals, and the environment are interconnected, unified, and psychologically close (Unsworth et al., 2012; Watene &

Yap, 2015). This worldview is associated with sustainability beliefs, which prioritize preserving nature and diversity of species in their original state (Boeye-de Pauw & Petegem, 2013). Reasoning about sustainability is, however, complex and the exploitation of limited resources is commonplace. For example, extinctions of native animals in Melanesian archipelagos, such as Vanuatu – in which the current study was conducted, are well-documented, which suggests that ecological knowledge does not always result in environmental sustainability (White, Worthy, Hawkins, Bedford, & Spriggs, 2010).

The emphasis of the second worldview is that humans are separate and distant from the rest of nature, which can lead to justifications for human domination over nature. Beliefs about group dominance versus equality may explain beliefs about hierarchical relations between humans and nature. For example, countries in which individuals score higher on measures of social dominance score lower on measures of pro-environmental behavioral indicators (Milfont et al., 2013). This worldview may support utilization beliefs, which emphasize that it is right and necessary for nature to be used and altered for human objectives (Boeve-de Pauw & Petegem, 2013).

The emphasis of the third worldview is that humans are interdependent with nature. This worldview is based on the recognition that humans are reliant on the natural environment and therefore natural resources must be used responsibly. This discourages anthropocentric views towards nature, but does not fully embrace the interconnectivity between humans and the rest of the natural world (Hawcroft & Milfont, 2010; Hernandez, Suarez, & Corral-Verdugo, & Hess, 2012; Reyes, 2015). For example, individuals with extensive firsthand experience in an ecosystem, reason about the natural world through the relationships that exist between organisms (Busch, Watson-Jones, & Legare, 2018; Medin et al., 2006; Shafto & Coley, 2003; Unsworth et

al., 2012). This knowledge of the interdependence of species and the environment shapes how people reason about environmental risk and resource use. Systems of traditional ecological knowledge accumulate detailed information about baseline environmental conditions, such as weather patterns that can indicate the beginning and end of cyclone season, which helps communities make decisions about their use of natural resources (Leonard, Parsons, Olawsky, & Kofod, 2013).

Religious beliefs can have a profound impact on human-environment relations. They may act as a functional mechanism to promote conservation, particularly in environments where the limits on natural resources are obvious, such as small islands. Due to their minor geographic footprint, any changes to the ecology of islands are observable to the local inhabitants. Supernatural beliefs such as forbidden areas and tabooed species may function as resource management tools (Aniah et al., 2014; Rim-Rukeh et al., 2013; Singh, Youssouf, Malik, & Bussmann, 2017). Taboos of this kind are common and in many non-Western communities they play the same role as conservation groups in Western communities (Colding & Folke, 2001). The function of supernatural beliefs extends beyond resource conservation into other domains, such as food taboos among breast-feeding women (Henrich & Henrich, 2010; Legare et al., 2020), and prosocial behavior and cooperation within large, unrelated groups (Norenzayan et al., 2016).

The positive influence of religious belief on conservation in many non-Western populations stands in contrast with the apparently anthropocentric influence of religion in Western societies. Research with U.S. populations suggests that Judeo-Christian values have been used to justify the exploitation of the natural world by humans (White, 1967). The interaction between Christianity and environmental beliefs, however, is more complex – research suggests that increased reading of the Bible may actually lead to higher levels of fundamentalism, which in turn

is associated with lower concern for the environment (Bulbulia, Troughton, Greaves, Milfont, & Sibley, 2016). For example, individuals in the U.S. who are not affiliated with organized religion hold more environmentally oriented world-views than individuals who are affiliated with a Christian denomination (Peterson & Liu, 2008). These findings may be less about religious belief itself, however, and more about a particular ecological context in which the need for the sustainability of resources is less obvious (Kearns, 1996).

1.1 Current Study

The objective of this study was to examine variation in patterns of reasoning about resource conservation in two populations — Tanna, Vanuatu and Austin, Texas, U.S.A. — that vary in their ecology, mode of subsistence, proximity to and psychological distance from nature, and epistemological orientation in their beliefs about the nature and acquisition of knowledge (McGinnis, 2016). Tanna is a small and remote island with a population that lives predominantly via subsistence agriculture. Formal schooling in Tanna is unstructured and student attendance is irregular. The majority of people in Tanna are Christian. Despite the recent introduction of formal schooling and Christianity, most Tannese still maintain many aspects of *kastom,* or traditional ways of life. Austin, Texas is an urban industrialized city and is representative of many WEIRD (Western Educated Industrialized Rich and Democratic) populations (Henrich, Heine, & Norenzayan, 2010). The population of Austin is highly educated and predominantly Christian.

Our research objectives were threefold. First, we examined justifications for engaging in conservation practices between populations. We asked participants to endorse or reject three different types of justifications: sustainability, morality (normative), or religious. We also asked participants to indicate whether it was permissible not to conserve. These justification types were

based on previous research, which suggests that nature can be valued for different reasons (Pearson, 2016). The first reason is for utilitarian value. Humans derive benefits and resources from nature and thus, nature should be conserved to ensure that those resources remain available into the future. This type of reasoning is represented by what we refer to as sustainability justifications. The second reason is intrinsic; nature is perceived to have intrinsic value apart from human need and therefore it should be conserved as a moral imperative. This type of reasoning is represented by what we refer to as moral justifications and are associated with cultural norms and values. Finally, past research indicates that supernatural beliefs that support conservation are common in many societies around the world (Aniah, Aasoglenang, & Bonye, 2014; Colding & Folke 2001; Kearns, 1996; Rim-Rukeh, Irerhievwie, & Agbozu, 2013). We included a third justification to represent this type of reasoning about conservation, which we refer to as religious justifications. We were particularly interested in cultural variation in the use of religious justifications due to past research that suggests a dichotomy between WEIRD and non-WEIRD populations in religious beliefs supporting conservation (Colding & Folke, 2001; Peterson & Liu, 2008). We predicted that religious justifications would be endorsed more frequently in Tanna, a small island where the need for conservation is salient, than in the U.S. where the need for conservation of resources is obscured by the ostensibly infinite supply of material goods through industrialization and factory farming.

We were also interested in the extent to which people use multiple justifications, both religious and non-religious, to support conservation. People across highly diverse populations frequently endorse both natural and supernatural explanations for the same event (Busch, Watson-Jones, & Legare, 2016; Legare, Evans, Rosengren, & Harris, 2012; Legare & Gelman, 2008; Legare & Visala, 2011; Watson-Jones, Busch, & Legare, 2015; Watson-Jones, Busch, Harris, &

Legare, 2017). Thus, we examined whether individuals would endorse both religious and non-religious justifications for conservation and whether there was cultural variation in the use of multiple justifications.

Next we examined how beliefs about conservation change across the lifespan. In Tanna, children and adults engage in extensive direct interaction with the natural world. In most rural communities outside of Vanuatu's two main cities, Port Vila and Luganville, people live primarily from subsistence agriculture (Cox et al., 2007). Tanna operates on a semi-cash economy where the majority of resources are raised or harvested and not purchased at shops (Peck & Gregory, 2005). The importation of industrial resources is minimal—only 18% of imports in Vanuatu are foodstuffs, most of which are sent to cities on other islands (Hausmann et al., 2011; Simoes & Hidalgo, 2011). With little access to industrial commodities, children on Tanna learn about harvesting local resources from an early age. Tannese children participate in planting, caring for, and harvesting crops, as well as raising several types of domesticated animals (pigs, cows, chickens, dogs) and much of their time is spent outdoors. As a result of this subsistence lifestyle, the inhabitants of Tanna learn about resource use through first-hand experience across the lifespan. We predicted that Tannese participants would show higher levels of endorsement for conservation as they got older and attained more experience with resource use.

In contrast, much of what U.S. children and adults know about the environment is learned through formal education. The majority of children in our U.S. sample attended Austin Independent School District. Austin Independent School District is engaged in a number of initiatives to increase students' knowledge through an environmental stewardship advisory committee. This committee provides input on curricula surrounding renewable energy, water and air quality,

waste minimization and recycling, gardening, and sustainable agriculture. As a result of generational differences in learning about conservation in school, and having very little firsthand experience with the limits of natural resources, we predicted that participants in the U.S. would show lower levels of endorsement of conservation as they got older.

Finally, we examined variation in how people reason about the conservation of different types of resources between populations. The goal of conservation is to preserve an entire ecosystem (i.e., animals, plants, and abiotic components such as, soil, water, and air). Whereas there has been substantial research on the conservation of animal species, group norms designed to conserve land are less widely studied within the anthropological literature (Smith & Wishnie, 2000). Land conservation may be motivated by the need to maintain the productivity of the land for farming or as a habitat for game animals (Beckerman & Valentine, 1996; Chernela, 1989; Olofson, 1995). Because direct reliance on the environment for subsistence is high in Tanna, we predicted that Tannese participants would endorse the need to conserve both animal and land resources equally.

In the urban U.S., agricultural activities and firsthand experience with natural resources are rare. Obtaining resources through a market economy may obscure the importance of land conservation. At the same time, pet ownership in the U.S. is high, with 70% of households reporting owning at least one pet, the vast majority of which are cats and dogs (Growth from Knowledge, 2016). Furthermore, a study of ten major conservation organizations found that promotional materials intended to catalyze environmental action focused on large-bodied birds or mammals, for the most part ignoring invertebrates, fish, amphibians, reptiles, and plants (Clucas,

McHugh, & Caro, 2008). Because much of the population in the U.S. is exposed to such a narrow sample of conservation priorities, we predicted that our U.S. sample would show a preference to conserve animals over land resources.

2. Method

Across field sites, 171 participants including children (n = 58), adolescents (n = 53), and adults (n = 60) completed the study. Informed consent was obtained from all individual participants included in the study.

2.1 Participants Austin, Texas, U.S.A.

The urban U.S. sample was collected in Austin, Texas, a city of nearly 1 million people. Austin is one of the most highly educated metropolitan areas in the nation with 39% of the population over 25-years-old holding a Bachelor's degree. In total, 92 individuals completed the study in the U.S. The U.S. sample consisted of thirty-two children, ages 7-12 (M = 8.81, SD = 1.55), twenty-six adolescents, ages 13-17 (M = 14.62, SD = 1.27), and thirty-four adults, ages 18-68 (M = 27.70, SD = 16.84). Child data was collected on the campus of a large research university or in a quiet room at a local children's museum. Adolescent and adult data was collected on the university campus. Children and adolescents were recruited through a participant database maintained by the university. The adult sample was recruited two ways. Some of the adult participants were undergraduates fulfilling a psychology course research credit requirement at the university. The rest of the adult sample was recruited from parents bringing their children to the university to participate in other studies. As compensation, child participants in the U.S. received a small toy, adolescents received a candy bar, and adults received research credits or a candy bar.

2.2 Participants Tanna, Vanuatu.

The Ni-Vanuatu sample for this study was collected on the island of Tanna, part of the Melanesian archipelago of Vanuatu. Vanuatu is relatively isolated and is both culturally and linguistically diverse. Vanuatu has the highest linguistic density per capita of any country in the world (Norton, 1993). The island of Tanna has 29,000 inhabitants. Christianity was introduced to Tanna only relatively recently. Much of the population was converted to Presbyterianism between 1910-1930. During World War II the John Frum Cargo Cult emerged. Part of the message of this cult was that people should leave the churches and return to their custom ways of life and in return, they would receive cargo (Gregory & Gregory, 2002). Thus, despite the influence of Presbyterianism on the island, many villages have maintained *kastom* (custom), or "ancestrally enjoined rules for life" (Keesing, 1982, p. 360). In a recent survey on national identity in Vanuatu, maintaining kastom, as well as being Christian were considered two of the most important aspects of what it means to be from Vanuatu (Clarke, Leach, & Scambary, 2013). Based on interviews conducted in Tanna, most Ni-Vanuatu adopt a literal interpretation of scripture (Watson-Jones, Busch, & Legare, 2015).

In total there were 79 Tannese participants. The Tannese sample consisted of twenty-six children, 7-11 years old (M = 8.92, SD = 1.09), twenty-seven adolescents, 14-17 years old (M = 15.11, SD = .85), and twenty-six adults, 18-59 years old (M = 33.35, SD = 12.74). Child data was collected at a local primary school in the town of Lenakel, adolescent data was collected at the local secondary school in the town of Lenakel, and adult data was collected with community members around the town of Lenakel. A local research assistant conducted all interviews in the national language, Bislama. Participants in Vanuatu did not receive any direct compensation due to cultural norms surrounding gift giving.

2.3 Materials

To assess participants' beliefs about conservation practices we designed eight vignettes, each describing a relevant topic. Half of the vignettes concerned land conservation and half concerned animal conservation. For the land vignettes, two scenarios described a situation in which an individual cuts down the native forest to bolster their economic gain by planting coffee or kava. The other two land vignettes described violations of good agricultural practice by failing to rotate crops or walking on freshly planted seeds. For animal conservation, two vignettes described the overuse of native animal species, fish and fruit bats. The other two animal vignettes describe scenarios in which the subject considers eating a juvenile animal (see Appendix for full vignettes). We used vignettes with scenarios and flora and fauna specific to Vanuatu for two reasons: (1) We determined that whereas children in Vanuatu have limited exposure to non-native species, in the U.S. learning about a variety of plants and animals through school and media sources is commonplace; and (2) We wanted to keep the stimuli constant across participants for direct comparison.

After each vignette we asked participants to endorse or reject three possible justifications. *Sustainability* justifications asked participants whether they agreed that engaging in the behavior was necessary to preserve the resource for people to consume in the future (i.e. "There will not be any bats for people to eat in the future."). *Moral* justifications asked participants to agree or disagree with the statement that it is "wrong" not to engage in the behavior (i.e. "It is wrong to neglect rotating the crops."). *Religious* justifications asked participants to endorse or refute whether engaging in the behavior was necessary to avoid angering God (i.e. "God would be angry if all the forest land was used for kava."). Finally, because some people in the U.S. do not believe that environmental issues will impact them personally, it is possible that they believe conservation practices are unnecessary (Howe et al., 2015). For this reason, we asked participants if

they believed it was *permissible* not to conserve (i.e. "It's okay to eat the pig."). Participants could endorse or reject as many or as few justifications as they liked.

2.4 Procedure

Each participant was interviewed individually. Participants were first presented with one of the eight vignettes. All participants except for U.S. adults had the vignettes read to them by the experimenter. U.S. adults read the vignettes silently to themselves using the online survey platform Qualtrics. After hearing or reading the vignettes, the participants were asked the four follow-up questions in a random order. Vignettes were presented in a randomized order to control for order effects.

2.5 Coding

For each type of justification (sustainability, moral, religious, permissible) participants were given a 1 if they endorsed the justification by replying "yes" or a 0 if they rejected the justification by replying "no." The four different vignette types were coded into two broad domains, one for animal use, which included the vignettes describing the overconsumption of endemic animal species and the vignettes that described the consumption of pregnant animals. The second broad domain was that of land use, which included the vignettes describing the destruction of the forest for agriculture and the vignettes describing violations of good agricultural practice.

3. Results

We first present the results of mixed-effects logistic regression models examining differences in the odds of endorsement for each type of justification (sustainability, moral, religious, and permissible) for each domain (land use, animal use) by age (continuous) within each country (U.S., Vanuatu) individually. Next, we present the results of mixed-effects logistic regression

models examining differences in the odds of endorsement of each justification type between populations by domain and age (continuous). Finally, we present results for endorsement of multiple justifications types across populations, domain, and age (continuous). In these analyses we include subject as a random effect because we assume that the residuals of a single participant are related across trials. Including subject as a random effect controls for this non-zero covariance of residuals. All analyses were conducted in R 3.4.4 using the *lme4* package (Bates, Maechler, Bolker, & Walker, 2015; R Core Team, 2013).[1]

3.1 Within Country Analyses

United States. A mixed-effects logistic regression model was conducted on rates of endorsement for conservation for U.S. participants using age as a between-subjects predictor, and justification type (sustainability, moral, religious, and permissible) and domain (land use, animal use) as within-subjects predictors, subject was also included as a random effect. Controlling for age and domain, results show that participants in the U.S. were most likely to endorse sustainability justifications, 82% of the time. Sustainability justifications were endorsed more frequently than moral justifications (57%) $\beta = -1.36$ (SE = .13), OR = .26 (95% CI = .20 – .33), $p < .01$, religious justifications (26%) $\beta = -2.86$ (SE = .14), OR = .06 (95% CI = .04 – .08), $p < .01$, and permissibility statements (21%) $\beta = -3.16$ (SE = .14), OR = .04 (95% CI = .03 – .06), $p < .01$ (Fig. 1).

Next, we examined only justifications for engaging in conservation (sustainability, moral, religious), excluding the endorsement of permissibility statements. The data show that the odds of endorsement for conservation within the animal domain (60%) were significantly higher than

[1] Note: Odds ratios are used throughout the results section to indicate the relative odds of endorsement. 95% confidence intervals on the odds ratio are also presented as an estimate of the precision of the odds ratio. 95% confidence intervals which do not overlap with the null value of an odds ratio (null = 1) are suggestive of statistical significance.

the land use domain (50%) β = -.70 (SE = .11), OR = .50 (95% CI = .40 – .62), $p < .01$. Results from the U.S. also reveal a significant interaction between age and justification type where endorsement of religious justifications decreased with age compared to sustainability justifications, β = -.27 (SE = .03), OR = .76 (95% CI = .71 – .81), $p < .01$. There was also a general, main effect of age where endorsement of conservation across all types of justifications decreased with age, β = -.04 (SE = .01), OR = .97 (95% CI = .95 – .98), $p < .01$.

Examining only the endorsement of permissibility statements shows that endorsement was less common within the animal domain (16%) than the land use domain (25%) β = .65 (SE = .20), OR = 1.91 (95% CI = 1.29 – 2.83), $p < .01$. There was no effect of age on endorsement of permissibility statements, β = .01 (SE = .01), OR = 1.01 (95% CI = .99 – 1.03), $p = .42$.

Vanuatu. A mixed-effects logistic regression model was conducted on rates of endorsement for conservation for Tannese participants using age as a between-subjects predictor, and justification type (sustainability, moral, religious, and permissible) and domain (land use, animal use) as within-subjects predictors, subject was also included as a random effect. Controlling for age and domain, results show that participants in Vanuatu were most likely to endorse sustainability justifications. Sustainability justifications (84%) were endorsed more frequently than moral justifications (74%) β = -.60 (SE = .14), OR = .55 (95% CI = .41 – .73), $p < .01$, religious justifications (70%) β = -.81 (SE = .14), OR = .44 (95% CI = .33 – .58), $p < .01$, and permissibility statements (35%) β = -2.38 (SE = .14), OR = .09 (95% CI = .07 – .12), $p < .01$ (Fig. 2).

Next, we examined only justifications for conservation, excluding endorsement of permissibility statements. The data show that there was no difference in Tannese participants' endorsement of conservation in the land use domain (75%) versus the animal domain (77%) β = -.13 (SE = .12), OR = .88 (95% CI = .70 – 1.10), $p = .27$. There was an interaction between age

and justification type, where endorsement of sustainability justifications became more frequent with age whereas religious justifications did not, β = .04 (SE = .02), OR = 1.04 (95% CI = 1.01 – 1.07), p = .01. There was also a general, main effect of age, across all justification types participant were more likely to endorse conservation with age, β = .03 (SE = .01), OR = 1.03 (95% CI = 1.02 – 1.05), p < .01.

Examining the endorsement of only permissibility statements shows that endorsement was less common within the animal domain (31%) than the land use domain (40%) β = .47 (SE = .18), OR = 1.60 (95% CI = 1.12 – 2.27), p < .01. There was no effect of age on endorsement of permissibility statements, β = -.02 (SE = .01), OR = .98 (95% CI = .96 – 1.00), p = .10.

Fig. 1 Rate of endorsement of justification types by age in the U.S. Grey shading represents 95% CI's

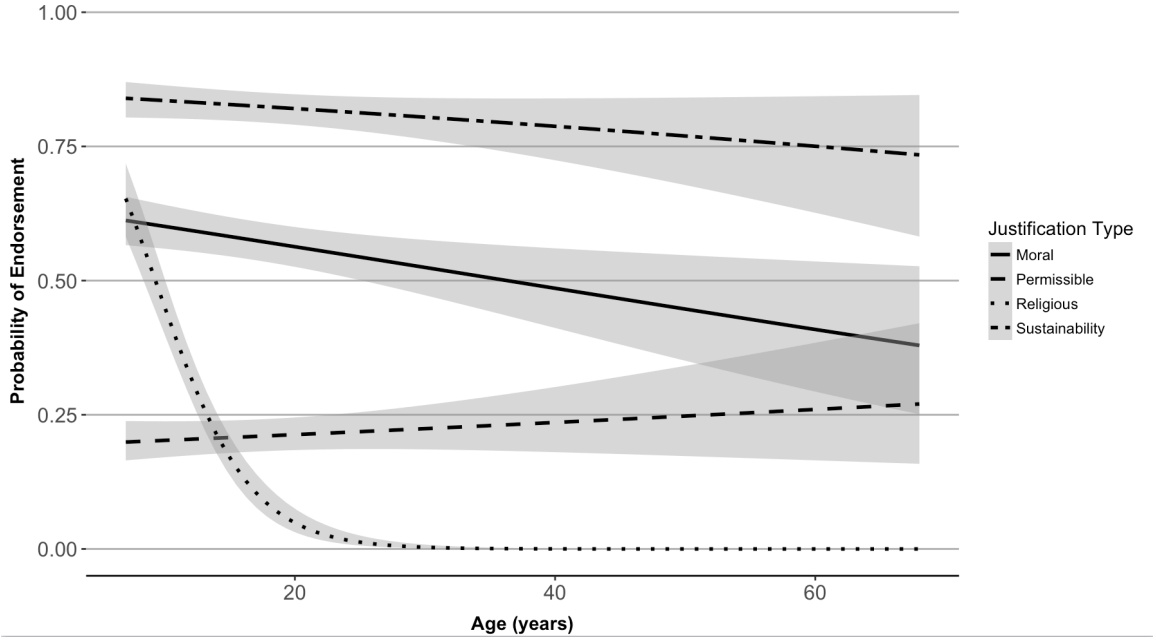
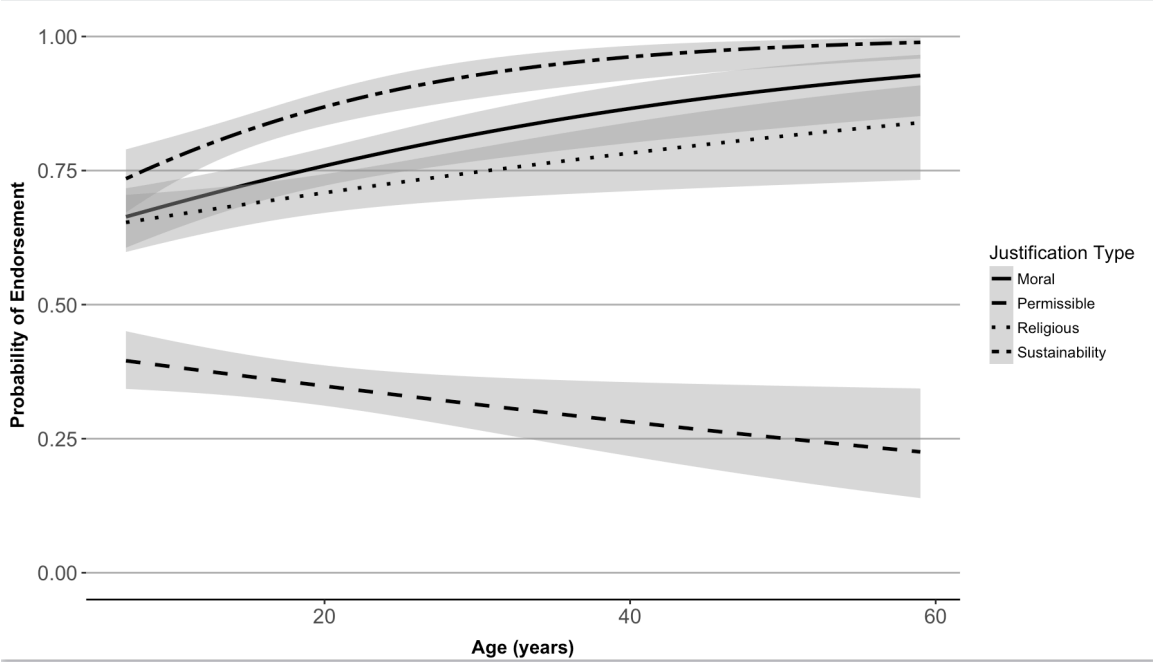


Fig. 2 Rate of endorsement of justification types by age in Vanuatu. Grey shading represents 95% CI's



3.2 Between Country Analyses

In the next set of analyses, we conducted mixed-effects logistic regression models to examine population differences in the rates of endorsement for each justification type. All models include age and country (U.S., Vanuatu) as between subjects predictors, and domain (land use, animal use) as the within subjects predictor, subject was included as a random effect.

Sustainability Justifications. For sustainability justifications, there was a significant interaction between country and age. Endorsement of sustainability justifications increased with age in Vanuatu, whereas endorsement decreased with age in the U.S., $\beta = .07$ (SE = .02), OR = 1.07 (95% CI = 1.03 – 1.12), $p < .01$. There was also a significant interaction between domain and country in the endorsement of sustainability justifications. Tannese participants endorsed more sustainability justifications for land use (87%) than animal use (80%), whereas U.S. participants

endorsed more sustainability justifications for animal use (83%) than land use (81%), β = .72 (SE = .32), OR = 2.05 (95% CI = 1.09 – 3.86), p = .03.

Moral Justifications. Results show that for moral justifications, there was a significant interaction between country and age. Participants in Vanuatu were more likely to endorse moral justifications with age, whereas U.S. participants were less likely to endorse moral justifications as they got older, β = .05 (SE = .01), OR = 1.06 (95% CI = 1.03 – 1.09), p < .01. There was no significant interaction between country and domain so the interaction was removed from the model, β = .48 (SE = .26), OR = 1.62 (95% CI = .98 – 2.68), p = .06. The data show a main effect of domain across cultures; endorsement of moral justifications were less common within the land use domain (57%) than the animal domain (73%), β = -1.02 (SE = .17), OR = .36 (95% CI = .26 – .50), p < .01.

Religious Justifications. There was a significant interaction between country and age. Religious justifications decrease with age in the U.S. whereas they increase with age in Vanuatu, when compared to the U.S., β = .39 (SE = .07), OR = 1.48 (95% CI = 1.29 – 1.70), p < .01. There was also a significant interaction between country and domain for religious justifications. This interaction was driven by a difference in endorsement of religious justifications between domains in the U.S. and Vanuatu. U.S. participants endorse more religious justifications for the animal use domain (30%) than the land use domain (22%). Tannese participants are more likely to endorse religious justifications for animal use (72%) than land use (68%), β = .77 (SE = .36), OR = 2.17 (95% CI = 1.07 – 4.39), p = .03.

Permissibility Statements. For endorsement of permissibility statements, the mixed-effects logistic regression model was run with 10,000 iterations to correct for non-convergence. Results show that there was no significant interaction between country and age, β = -.03 (SE =

.01), OR = .97 (95% CI = .95 – 1.00), p = .08. Nor was there a significant interaction between country and domain, β = -.16 (SE = .27), OR = .85 (95% CI = .50 – 1.43), p = .54. As a result, both interaction terms were excluded from the model. The data show a main effect of country: Tannese participants (35%) were more likely to endorse permissibility statements than U.S. participants (21%), β = .85 (SE = .19), OR = 2.33 (95% CI = 1.59 – 3.41), p < .01. Across cultures there was a main effect of domain; endorsement of permissibility statements was more common for land use (32%) than for animal use (23%), β = .55 (SE = .13), OR = 1.73 (95% CI = 1.33 – 2.24), p < .01. There was no effect of age on endorsement of permissibility statements, β = -.004 (SE = .01), OR = 1.00 (95% CI = .98 – 1.01), p = .59.

Multiple Justification Endorsement. We examined whether participants endorsed multiple types of justifications for each vignette. We conducted a regression on the number of justifications participants endorsed, from zero (rejecting all justifications) to three (endorsing sustainability, moral, and religious justifications), predicted by age, domain, and country. The results show that there was no effect of age on endorsing multiple justifications, χ^2 = .44, (1, N = 170), p = .51. Endorsement of multiple justification types was predicted by domain, χ^2 = 27.92, (1, N = 170), p < .01. Results show that participants were more likely to endorse multiple justifications for the conservation of animals (M = 2.04, SD = .38) than the conservation of land (M = 1.84, SD = .37). Tannese participants' endorsement of all three conservation justification types was high. The data show that Tannese participants (M = 2.28, SD = .37) were more likely than U.S. participants (M = 1.64, SD = .38) to endorse multiple justifications, χ^2 = 52.10, (1, N = 170), p < .01.

4. Discussion

The aim of this study was to examine variation in patterns of reasoning about resource conservation in two populations that vary in their ecology, mode of subsistence, proximity to and

psychological distance from nature, and epistemological orientation. First, we examined the kinds of justifications that support the conservation of land and animal resources. We found a number of broad similarities between the two populations. Participants of all ages were most likely to endorse sustainability justifications for conservation. This is consistent with widespread global support for beliefs that humans should co-exist with, rather than master, nature (Leiserowitz, Kates, & Parris, 2005). Furthermore, endorsement of moral justifications for conservation was high across populations and age groups and endorsement of the permissibility of not conserving resources was low.

The data also reveal cultural variation in the type of justifications used to support conservation between populations. While religious justifications did not significantly increase with age in Vanuatu when compared to the observed increase in sustainability justifications, they did increase significantly when compared to the U.S. As predicted, religious justifications were more common in Vanuatu than in the U.S., despite both populations being predominantly Christian (Alper & Sandstrom, 2016; Gregory & Gregory, 2002; Watson-Jones, et al., 2015). This finding suggests that cultural institutions may serve different functions in different contexts: Whereas conservation beliefs seem to be unrelated to religious justifications in the U.S., religion in Vanuatu may support conservation. This result is consistent with the proposal that religious beliefs are culturally transmitted because they solve adaptive problems (Henrich & Henrich, 2007; Norenzayan & Gervais, 2012) and is exemplary of the way solutions to issues of resource depletion can become integrated into cultural rules and institutions (Johannes, 2002; Turner & Berkes, 2006; Waring et al., 2016). Future research should continue to examine nuanced ways in which particular religious beliefs support or hinder conservation. For example, religious people may

have general beliefs about God wanting humans to be stewards of the planet, while rejecting particular sustainability behaviors.

Our results also show cultural variation in the pattern of conservation beliefs across the lifespan. As predicted, endorsement of conservation increased with age in Vanuatu and decreased with age in the U.S. for all three justification types (sustainability, moral, and religious). We propose that this pattern of beliefs about conservation may be the result of variation in how members of both communities learn about resources and the natural world. From a young age, residents on Tanna spend a large portion of their time engaged directly with the ecology of the island through farming, harvesting uncultivated resources, raising domesticated animals for consumption, or fishing and hunting small game. Children in Vanuatu attend school irregularly and the schooling environment is unstructured from a Western, formal schooling perspective. They are also expected to contribute resources to the family and accompany their parents in gathering food and slaughtering livestock. As a result of their reliance on the natural world, children learn about conservation through direct experience with resource use. The understanding that resources are limited and must be conserved is salient across the lifespan. This may serve to reduce psychological distance to environmental threats and increase environmental concern.

In contrast to the pattern of beliefs in Vanuatu, endorsement for the conservation of natural resources declined into adulthood in the U.S. This may be due to the fact that the limitations on natural resources are opaque to residents from an urban, industrialized environment, thus increasing psychological distance. As a result, much of what people in the U.S. know about resource conservation is from formal schooling. It is possible that due to cohort effects, many U.S. adults have received less education about environmental conservation than children do today. Another possibility is that as lessons from school fade, adults in the U.S. become less likely to

endorse conservation than children. Motivated reasoning may also play a role in the decline of conservation endorsement. It is possible that adults in the U.S. are incentivized to maintain a lifestyle that is incongruous with the actions required to conserve resources and thus become less likely to endorse the conservation of resources. The city of Austin places an emphasis on conservation in their educational curriculum, which may explain why children in the U.S. endorse conservation at similar rates to children in Vanuatu who are engaged more closely in direct utilization of resources. In this respect, the children who make up our urban U.S. sample may be particularly knowledgeable about conservation. Sampling residents from other cities in the U.S., would potentially reveal greater discrepancy in the endorsement of conservation of resources between urban industrialized communities and subsistence communities. Future research should examine the impact of formal science education on conservation beliefs by collecting data on educational experience and knowledge about the environment.

This study also reveals cultural variation in the way people reason about the conservation of different types of resources. U.S. participants show preference to conserve animals over land resources whereas Tannese participants endorse the conservation of both types of resources. This finding is consistent with previous research highlighting the focus on a select group of flagship animal species in conservation campaigns in the U.S. (Bakker et al., 2010; Clucas et al., 2008). In contrast, most Tannese have extensive firsthand experience with the use of land and animal resources. For this reason, changes in land use are of importance to all of the island's inhabitants who rely on the land for subsistence. The finding that Tannese value conservation of both land and animal resources is consistent with past research, which suggests that individuals living more closely to the land are better able to detect changes in the local ecology (Berkes, et al., 2000).

The need for resource conservation is increasing as the global population continues to rise. This study provides some reason for optimism for the future, revealing that participants from both communities show broad support for the conservation of resources for reasons of sustainability and morality. Beliefs often do not directly translate into action, however. Future research should examine the extent to which different cultural norms and institutions support engagement in conservation behavior. It also remains an open question which cultural institutions directly impact beliefs about conservation. Examining how conservation beliefs differ between communities that vary in firsthand experience with the natural world but are similar in their level of formal educational and religious beliefs about the role of humans within nature could be informative for understanding how direct interaction with the environment, in particular, impacts reasoning about conservation.

Culturally-specific institutions, social norms, and ecological beliefs can help or hinder conservation efforts. Our data support the proposal that conservation beliefs in the U.S. and Vanuatu reflect the cultural and ecological environment from which they emerge. In Vanuatu, where limitations on resources are more salient, religious beliefs may function to support conservation. The Tannese are more likely to endorse multiple justifications for conservation and show broad support for the conservation of both land and animal resources. They are also more likely to support conservation in adulthood as they attain greater knowledge that natural resources are finite. In the U.S., the perception is often that resources are ostensibly unlimited. This may explain why conservation is less supported by religious beliefs, declines with age, and is less often associated with multiple justifications. These findings are consistent with the proposal that cultural institutions can provide multiple solutions to problems of resource depletion (Kearns, 1996; Klein, et al., 2014) and suggest that conservation efforts need not be restricted to environmental

science classes. Instead, an ethos of sustainability can be built into many cultural institutions, as long as the limitation of natural resources is salient.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Appendix

Native Plants Vignettes:

1. Coffee beans are one crop that is grown in Vanuatu and can be sold for money. The following story describes a scenario that involves the farming of coffee and takes place in Vanuatu. Mark has a coffee plantation. He sells the coffee beans he grows to Joe to be sold around the country. Mark's coffee plantation has grown and grown and will require more and more land to sustain the demand for coffee beans. Some of the land he will require for the coffee beans will take over large parts of the forest. Why should Mark stop using more and more forestland for coffee?
    a. It is wrong to prioritize one type of crop over another. That is why Mark should stop using more and more land for coffee.
    b. God would be angry if all the forestland was used for coffee. That is why Mark should stop using more and more land for coffee.
    c. Using more land will kill much of the forest. That is why Mark should stop using more and more land for coffee.
    d. Mark does not need to stop using more and more land for coffee.
2. Kava is a plant whose root can be used to make a drink, which is consumed for ceremonial purposes. Kava can also be sold for money. The following story describes a scenario that involves farming kava and takes place in Vanuatu. Jack has a kava garden. He sells the kava root to many people. Jack's kava crop has grown and grown and will re-

quire more and more land to sustain the demand for kava. Some of the land he will require for the kava will take over large parts of the forest. Why should Jack stop using more and more land for kava?

a. It is wrong to prioritize one crop over another. That is why Jack should stop using more and more land for kava.
b. God would be angry if all of the forestland was used for kava. That is why Jack should stop using more and more land for kava.
c. Using more land will kill much of the forest. That is why Jack should stop using more and more land for kava.
d. Jack does not need to stop using more and more land for kava.

Agricultural Practices Vignettes:

1. Taro is a root vegetable and a staple of the diet in Vanuatu. Taro is grown on family farms. The following story describes a scenario that involves the farming of taro and takes place in Vanuatu. Alfred has a garden. Last year, Alfred did not rotate the taro in his garden and there were fewer taro roots than normal this year. Why should Alfred have rotated the crops?
    a. It is wrong to neglect rotating the crops. That is why Alfred should have rotated the crops.
    b. God would be angry if the taro was not rotated. That is why Alfred should have rotated the crops.
    c. To make sure there will be enough taro for this year. That is why Alfred should have rotated the crops.
    d. It is okay not to rotate the crops.

2. Manioc is a root vegetable, and a staple of the diet in Vanuatu. Manioc is grown on family farms. The following story describes a scenario that involves farming manioc and takes place in Vanuatu. Jim wants to go into his garden. The garden was recently replanted with new manioc seeds. In Vanuatu, it is a cultural taboo to enter a garden with newly planted seeds. Jim decides to go into the garden despite the taboo. During the harvest there is less manioc than normal. Why should Jim not have gone into the garden?
    a. It is wrong to disturb newly planted seeds. That is why Jim should not have gone into the garden.
    b. God would be angry if the new seeds were disturbed. That is why Jim should not have gone into the garden.
    c. To make sure that there will be enough manioc for next year. That is why Jim should not have gone into the garden.
    d. It is okay to disturb newly planted seeds.

Overuse of Animal Species Vignettes

1. Bats are one animal that is consumed, on occasion, in Vanuatu. Bats are not raised by the people of Vanuatu, rather they are caught in the wild using sling-shots. The following story describes a scenario that involves the hunting of bats and takes place in Vanuatu. There were once many bats in South Vanuatu. The people of South Vanuatu hunted many bats for many years. Now, there are very few bats on South Vanuatu. If the people of South Vanuatu continue hunting the bats there may be no more bats left. Why should the people of South Vanuatu stop killing the bats?
    a. It is bad to kill every bat. That is why the people of South Vanuatu should stop killing the bats.
    b. God would be angry if all of the bats were gone. That is why the people of South Vanuatu should stop killing the bats.
    c. There will not be any bats for people to eat in the future. That is why the people of South Vanuatu should stop killing the bats.
    d. The people of South Vanuatu do not need to stop hunting the bats.

2. Fish are one animal that is a staple of the diet in Vanuatu. Fish are not raised in fisheries by the people of Vanuatu, rather they are caught in the wild. The following story describes a scenario that involves fishing and takes place in the coastal area of Vanuatu. There were once many fish in the waters surrounding Vanuatu. The people of Vanuatu killed many fish for many years. Now there are very few fish in the waters. If the people of Vanuatu continue killing the fish there may be no more fish left. Why should the people of Vanuatu stop killing the fish?
    a. It is bad to kill all of the fish. That is why the people of Vanuatu should stop killing the fish.
    b. God would be angry if all of the fish were gone. That is why the people of Vanuatu should stop killing the fish.
    c. There will not be any fish for people to eat in the future. That is why the people of Vanuatu should stop killing the fish.
    d. It is okay to kill all of the fish.

Consumption of Young Animals Vignettes:

1. Pigs are one animal that is consumed, on occasion, in Vanuatu. Pigs are raised by individual families and not by large factory farms. The following story describes a scenario that involves the consumption of pork and takes place in Vanuatu. Joshua decided that he wanted to eat one of his pigs. He asked his young son, Ken, to pick a pig to kill. Ken picked a large female pig. Joshua told his son that the pig he picked was not a good choice. The pig that Ken picked was pregnant. Why should Ken not kill the pig?
    - **a.** It is bad to kill young animals. That is why Ken should not kill the pig.
    - **b.** God would be angry if young animals were killed. That is why Ken should not kill the pig.
    - **c.** If you kill the pig, the baby will die and there will be fewer pigs. That is why Ken should not kill the pig.
    - **d.** It is okay to kill the pig.

2. Crayfish are one animal that is consumed, on occasion, in Vanuatu. Crayfish are not raised by the people of Vanuatu, rather they are caught in the wild from local streams. The following story describes a scenario that involves the consumption of crayfish and takes place in Vanuatu. Stephen brought a crayfish to his grandmother to cook. Stephen's grandmother told him that, while she was happy he brought her something to cook, that he should not have taken this particular crayfish out of the stream. Stephen's grandmother

turned the crayfish over to show him all of the eggs the crayfish was carrying. Why did Stephen's grandmother not cook the crayfish?

a. It is bad to eat young animals. That is why Stephen's grandmother should not cook the crayfish.
b. God would be angry if young animals were eaten. That is why Stephen's grandmother should not cook the crayfish.
c. If she cooks the crayfish, the babies will die and there will be fewer crayfish. That is why Stephen's grandmother should not cook the crayfish.
d. It is okay to eat the crayfish.