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## **A 21<sup>st</sup> century cognitive portrait of the Himba, a remote people of Namibia**

The advent of psychological science has made it possible to sketch the cognitive portrait of human beings, from their reasoning and decision-making styles, to their beliefs and their quest for happiness, amongst other dimensions. Several recent studies, however, have emphasized that most research in psychological science – up to 96% according to recent estimates (Arnett, 2008) – has been carried out in countries which represent less than 15% of the world population, and mostly with participants coming from Western, Educated, Industrialized, Rich and Developed (WEIRD) societies (Henrich et al., 2010). Worst, samples of participants taking part in psychological studies have most often consisted of psychology students. Such an observation calls for the need to be cautious in generalizing the results of studies carried out in WEIRD countries to the whole human population, and for the importance of studying non-WEIRD populations to draw a richer picture of human cognition. The present research is rooted in this perspective, and aims to sketch the cognitive portrait of a non-western, non-industrialized and remote population, the Himba people of Northern Namibia.

Although they are quite scarce, studies which have explored cognitive functioning in non-Western samples do exist. Ever since the start of the 20<sup>th</sup> century, some research has outlined the importance of taking cultural variations into account in the exploration of cognitive functioning. Seminal research has primarily investigated cultural variation in perception. For instance, it was shown that the Toda people, an ethnic community living in Southern India, are less sensitive to the Müller-Lyer illusion than British people (Rivers, 1905). Similar differences were observed later between the Banyankole, from Southwestern Uganda, and British people (Davis & Carlson, 1970).

Over the last few decades, multiple researchers have documented important cultural effects not only regarding perception (Caparos et al., 2012; Davidoff, Fonteneau, & Fagot, 2008; Davidoff, Fonteneau, & Golfstein, 2008; Kitayama et al., 2010; Nisbett & Miyamoto, 2005), but also regarding attention (Boduroglu, Shah, & Nisbett, 2009; Cramer, Dusko, & Rensink, 2016), memory (Nisbett et al., 2001; Wang, 2016), or judgment and reasoning (Nisbett & Masuda, 2003; Norenzayan et al., 2002). Therefore, a growing body of literature now takes into account the impact of cultural and experiential factors on psychological functioning, from low-level to high-level cognition (for a discussion of the need to take culture into account, and a substantial list of recent cultural studies, see Wang, 2016).

Importantly, however, most of the recent explorations of cross-cultural differences in cognition have focused on Western-Eastern comparisons (Boduroglu, Shah, & Nisbett, 2009; Cramer, Dusko, & Rensink, 2016; Nisbett & Masuda, 2003; Nisbett & Miyamoto, 2005; Nisbett et al., 2001; Norenzayan et al., 2002). The Eastern samples taken into consideration in these studies have mostly consisted of participants from educated, industrialized, rich and developed backgrounds (i.e., participants coming from urban China or Japan). Yet, as of today, most of the human population comes from countries with low to middle income, and are none of these things. The present research aims to explore the cognition of non-educated and non-industrialized people.

Another motivation for this study is to explore cognitive processes which have been little explored in non-industrialized countries. Specifically, the studies of cognition in remote populations have been mostly interested in cross-cultural differences in information sampling, namely, color perception (Davidoff, Davies, & Roberson, 1999), perceptual bias (Davidoff et al., 2008), and attention (Linnell et al., 2013).

Cross-cultural research with non-WEIRD populations such as the Himba aims to test for the existence or absence of differences across cultural groups. This can contribute to a new

understanding of the beliefs and behaviors of human beings. While the cognitive apparatus seems to follow common directions, which are not systematically modulated by the environment, there is evidence for the existence of fundamental psychological differences across cultures. An absence of difference suggests that the investigated mechanism may be (at least partly) immune to experiential or cultural factors. A presence of a difference leads to further studies aiming to explore the contextual and environmental factors which explain the development of these cross-cultural effects. In the present study, our aim was to set a precedent in testing a non-WEIRD, non-educated population and explore high-level cognitive mechanisms that are little studied outside the Western world. In order to do so, we explore several dimensions of the cognitive functioning of a people who have already been the object of extensive research in the past twenty years: the Himba of Northern Namibia (Africa).

### **The case of the Himba of Namibia**

The Himba are a semi-nomadic people living in Northern Namibia. They belong to the remaining few human cultures living in non-industrialized societies, which are still little influenced by Western standards. They predominantly speak a dialect of the Otjiherero language (known as Otjihimba), have limited formal education, and use no written language. The Himba can be described as a collectivist society, in that they do not own their land, they live in large family structures and cohesive groups, and they make decisions collectively (Hofstede, 2011).

Until now, the studies that included Himba participants have predominantly focused on cross-cultural differences in perception and attention. These studies have shown that the Himba have a better ability to focus their attention and ignore irrelevant information. In addition, they present a local bias, prioritizing the processing of local information over global/contextual information (“they see the trees before the forest”). Until today, little research has evaluated high-level cognitive processes in Himba participants. To our

knowledge, there is only one such study (Pope et al., 2019), which showed that, in a simple problem-solving task, Himba participants were less subject to cognitive set (Luchins, 1942), and were better able to figure out an alternative solution than undergraduate university students in the United-States. In other words, they seemed to show greater cognitive flexibility in problem solving. The current research aims to explore other dimensions of high-level cognition, more specifically dimensions related to cognitive reflection and thinking style, namely, the propensity to engage into intuition versus deliberation, and the correlates that thinking style can have in terms of morals, beliefs, and happiness.

### **The current research**

With this project, our aim was twofold: to contrast Himba with Western participants and to test, in each group, whether similar patterns of relationships were observed between the different dimensions that we measured. We explored 5 main dimensions: (1) cognitive reflection and thinking style (intuitive versus deliberative), (2) moral judgement, (3) cooperation, (4) belief in the paranormal, and (5) orientation to happiness.

An important dimension that we measured was the cognitive-reflective style of the participants. The prominent dual-process model (Epstein, 1994; Evans & Stanovich, 2013; Kahneman, 2011) suggests that individuals can engage two different types of processes when they reflect. They can process information using intuitions (e.g., by applying heuristics), a type of thinking – commonly referred to as System 1 – which requires little effort, is fast, and comes at low cognitive cost. Second, they can process information using deliberation (e.g., by applying algorithms, calculations, and formal rules). This type of thinking – commonly referred to as System 2 – requires a greater effort, is slow and cognitively costly.

Given that System 2 – or deliberation – is promoted by formal education (Aarnio & Lindeman, 2005), we expect Himba participants to rely less strongly on System 2 – or deliberation – and more strongly on System 1 – or intuition – compared to Western

participants (**Hypothesis 1a**). Another question concerns the variability of thinking patterns *within* the Himba sample. We explored whether a set of socio-demographic variables predicted cognitive reflection and thinking style (**Hypothesis 1b**), namely, age, education, stress, and alcohol consumption (we also included sex in the analyses). The first two variables have been shown to be related to thinking style in Western samples, with older and less educated participants being more likely to rely on intuition (System 1; Thornton & Dumke, 2005; Aarnio & Lindeman, 2005). Stress and alcohol consumption, however, are thought to be related to cognitive capacity (e.g., Kalmijn et al., 2002; Steinhäuser et al., 2007), and as such may impact the levels of reliance on System 1. Traditionally, Himba people have been little educated and spared from alcohol consumption, and they live in a relatively peaceful and stress-free environment. However, in the past twenty years, their society has been evolving, with the advent of mobile schools and tourism, allowing Western artefacts (among which alcohol) to permeate their society. We were also interested in replicating previously observed relationships between reasoning style and other cognitive dimensions, namely, beliefs, moral judgement, cooperation, and orientations to happiness.

First, propensity to believe in God and, more generally, in the spiritual (cast as epistemically suspect or unwarranted beliefs; Pennycook 2015), has been studied under the dual-process framework. Research has shown that intuitive thinkers tend to be less skeptical about the ‘unseen’, and adhere more easily to spiritual and religious beliefs (Pennycook et al., 2012). Given that France is one of the countries in the world with the highest proportion of atheists/agnostics (see World Economic Forum data in 2019: <https://www.weforum.org/agenda/2019/03/this-is-the-best-and-simplest-world-map-of-religions>), that religion is deemed much more important to populations of developing countries than to those of developed ones (see PEW forum data on religion importance in 2018, <https://www.pewforum.org/2018/06/13/how-religious-commitment-varies-by-country-among->

people-of-all-ages/), and that beliefs in witchcraft and black magic are widespread among the Himba (Vranckx, 1999), we can confidently predict that Himba participants will more strongly adhere to spiritual and religious ideas (**Hypothesis 2a**). We also tested whether this higher propensity to beliefs was related to a higher susceptibility to engage into intuitive thinking (**Hypothesis 2b**).

Second, a growing body of literature has shown how cognitive reflection and thinking style take part in moral judgement activities (see Greene et al, 2001; 2008; Moore et al., 2008; Patil et al., 2020; Paxton et al., 2011; but see Baron & Gürçay, 2017; Gürçay & Baron, 2017; McGuire et al., 2009, for challenging conclusions). A famous fictitious moral dilemma is the Trolley problem (Foot, 1967) in which people are facing a runaway trolley barreling down a railway tracks and which will hit 5 people who are standing on the track. People are given the possibility to deviate the trolley to another track where only one person is standing or do nothing. Deviating the trolley is congruent with utilitarian principles (killing one to save five; i.e., maximizing aggregate well-being) and is thought to rely on System 2 (analytical) processes, while refusing to deviate the trolley is congruent with deontic principles (i.e., one should not kill) and is thought to rely more strongly on System 1 (heuristic) processes (Greene et al, 2001; 2008; Moore et al., 2008).

We predicted that Himba participants would be more prone than Western participants to make deontic choices in moral-reasoning problems (**Hypothesis 3a**). This difference may be driven by cognitive reflection/thinking style (**Hypothesis 3b**; Pennycook et al. 2012), and/or because Himba participants are more likely to believe in divinities (**Hypothesis 3c**). Accordingly, such beliefs have been proposed to explain the higher reliance on deontic reasoning of Papua individuals: some participants explained their deontic choices on the basis that “people should not interfere with the divine decision about someone’s life and death” (Sorokowski et al., 2020).

Fourth, the next variable that we were interested in is orientation to happiness. Although there is no true consensus as to what being happy means, a recent model defines happiness as the combination of three dimensions: pleasure, engagement and meaning (Seligman et al., 2004). Previous work has shown that thinking style relates to happiness, such that thinkers who rely more strongly on intuition have a higher propensity to report being happy (Stevenson & Hicks, 2016), and so do individuals with stronger religious/spiritual beliefs (Sillick & Cathcart, 2014). Given the prediction that Himba participants are more prone to intuitive thinking and to religious/spiritual beliefs, compared to Westerners, we predicted that they should exhibit higher happiness scores (**Hypothesis 4a**), and that happiness should be positively related to both intuition and religious beliefs (**Hypothesis 4b**). Also, given that the link between religious belief and happiness is mediated by purpose in life (Sillick & Cathcart, 2014), we further predicted that the difference between Himba and Western participants may be largest for the engagement and meaning dimensions of happiness (**Hypothesis 4c**).

Finally, we also explored cooperation. There is recent evidence that cooperation is substantially influenced by culture (Gächter et al., 2010). For instance, it was reported that Machiguenga males (from the Peruvian Amazon) gave smaller amounts than UCLA students in an ultimatum game (Henrich, 2000). These differences, to our knowledge, are not yet heavily explained (but see Discussion section for additional point about this issue); as a result, the exploration of cooperation was explorative in the present research. Recent results suggest that cooperative behaviors would be intuitive in nature (see the social heuristic hypothesis; Rand et al., 2014; the meta-analysis by Rand, 2016; but see Kvarven et al., 2020, for null conclusions). That is, the use of time pressure (with the aim to prevent people thinking too much) was observed to increase cooperation. Although we did not manipulate deliberative thinking (that is commonly done by manipulating time pressure or adding interfering



cognitive load), we were interested in exploring whether individual differences in cognitive reflection and thinking style predicted cooperation in French and Himba participants.

According to the social heuristic hypothesis, one may expect to observe, in both samples, that participants who rely more on intuitions are also more cooperative (**Hypothesis 5**).

## **Method**

### **Participants**

A total of 124 Himba (76 females, 48 males, mean age = 26.5 yrs, SD = 9.0, range = 14-62 yrs) were recruited during a 2-week research visit to Namibia in June 2018. Experiments took place in traditional Himba villages, inside testing tents, with the participants sitting next to a research assistant. The Himba received compensation for their participation (maize meal, sugar, and soap). The villages were located between 50 to 100 km from the only town in the area (Opuwo, ~12 000 inhabitants). A typical village is inhabited by 20 to 40 adults, and villagers who live traditionally seldom visit Opuwo (Caparos et al., 2012). In the sample, 76 participants (61%) reported not having attended school. Those who went to school (48 participants, 39%) had been schooled for an average of four years. The relationship between age and education was not significant,  $r(124) = -.098, p = .277$ .

In addition, a total of 123 French participants (72 females, 46 males, 5 unspecified, mean age = 35.0 yrs, SD = 9.2, range = 20-68 yrs) were recruited via social networks to fill out an online questionnaire designed on the Qualtrics software.

### **Material**

In designing the tasks that we used in the present study, we kept in mind that the abstract materials used had to be understandable by both cultural groups. For this reason, we chose to use candies in the dictator game, given that both groups afford utility to sweet food (unlike

fiduciary money which is not used in the Himba society, and goats and cows which are not used in the French society). In addition, we decided to use only verbal problems in the CRT, and we excluded problems requiring complicated calculations (such as the famous bat and ball problem which requires mathematical skills and reads as follows: “If a bat costs 1\$ more than a ball, and the bat and ball together cost 1.10\$, how much does the ball cost?”) . Also, we assessed age using an approximate method given that Himba participants do not record their age, and we chose to collect French data online in order to obtain a more diverse group of French participants (see the report of the board of scientific affairs' advisory group on the conduct of research on the internet – Kraut et al., 2004 – for a discussion, among others, about the representativeness of samples in online research). Although some studies have suggested that non-educated participants can experience difficulties understanding Likert scales (Apicella, 2018; Bernal et al., 1997; Flakerud, 2012; Hruschka et al., 2018a), our previous research experience with the Himba suggested this not to be the case and we chose to keep the questionnaires the way they are used with WEIRD groups. The distributions of the questionnaire data, which are mostly similar across Himba and French participants in this study (see Results section below), indeed suggest that Likert scales can readily be used with non-WEIRD non-educated participants. Below, we briefly present how each dimension of interest was measured. The full presentation of the tasks and measures is displayed in Table 1.

*Cognitive reflection* was assessed using two problems adapted from the Cognitive Reflection Test (CRT; Frederick, 2005), relevant to both Western and Himba cultures (see Table 1). Each problem triggers an intuitive response, which rapidly comes to mind but is incorrect. Participants have to inhibit it and deliberate in order to reach the correct response.

*Thinking disposition* was assessed using 3 items adapted from the Need For Cognition (NFC) questionnaire (Cacioppo & Petty, 1982), which directly queries the participants as to their preferred way of thinking, and 2 items adapted from the Faith in Intuition (FI)

questionnaire (Epstein et al., 1992), which targets the extent to which people rely on intuition and previous experiences to make decisions.

*Paranormal beliefs* were measured with an adaptation of the Paranormal Belief Scale (PBS; Tobacyk, 2004). Three dimensions (out of the seven from the original version of the scale) were assessed. Two items assessed religious beliefs, three items assessed beliefs in witchcraft, and three items assessed spiritualism.

*Utilitarian tendencies* were measured using the use of two sacrificial dilemmas. These dilemmas commonly feature a situation in which a participant can kill someone in order to save a greater number of persons. Agreeing to kill the person echoes utilitarian principles, according to which an action is moral if it increases aggregate well-being. Refusing to kill the person echoes deontic principles, according to which one does not have the right to actively kill someone, even for the greater good (see also the introduction section).

*Cooperation* was measured using an adapted version of the dictator game. Participants were given 6 real candies (Namibian participants) or 6 fictitious candies (French participants) and were given the possibility to give part or all their candies to a randomly selected person.

*Orientation to happiness* was measured using an adapted version of the Orientation to Happiness scale (Peterson et al., 2005). Three dimensions were assessed: life of meaning (3 items) which targets people's thoughts about the true meaning of life; life of pleasure (3 items), which targets the extent to which people look for pleasure; life of engagement (3 items), which targets how much people are engaged when performing an activity.

All the measures and questionnaires were first designed (or adapted from existing versions) in English language and were then translated into Otjiherero by the three research assistants, who discussed optimal translation for each item. The measures and questionnaires for the French participants were translated from English. Himba participants were recruited and tested in their village by the research assistants, after initial authorization was obtained

from the chief of the village. Testing of Himba participants took place inside testing tents set up outside the village. The experimental runs were individual, and the participant was alone with the research assistant. All the tasks and questionnaires for the Himba participants were designed and administered using the Eprime Software (Schneider et al., 2002). French participants took part in the study online on Qualtrics platform.

Table 1. Tasks and measures used in the study (English version).

Measure	Number of items included	Items	Range of ratings	N respondents	Reliability*	
Cognitive Reflection Test	2	— You are running with a group of men. You pass the person in second place. What place are you in? — A man had 5 sheep and all but 3 died. How many are left?	0-1	146	French = .39 Himba = -.36	
Thinking Style	Need For Cognition	3	— I do not like to have to do a lot of thinking (R). — I prefer complex to simple problems. — Thinking hard and for a long time about something gives me little satisfaction (R).	1-5	207	French = .67 Himba = .41
	Faith in Intuition	2	— I trust my initial feelings about people. — I can usually feel when a person is right or wrong even if I can't explain how I know.	1-5	208	French = .51 Himba = .34
Paranormal Beliefs	8	<i>Traditional Religious Beliefs:</i> — The soul continues to exist though the body may die. — I believe in God.	1-5	200	French = .90 Himba = .67	
		<i>Witchcraft:</i> — (Black) magic really exists. — Witches do exist. <i>Spiritualism:</i> — Through the use of formulas and incantations, it is possible to cast spells on persons. — Your mind or soul can leave your body and travel. — Reincarnation does occur. — It is possible to communicate with the dead.				

Utilitarian tendencies	2	<p><i>Medication:</i> X is coming back from the hospital with a medication. If he does not take the full medication, then he will die. 5 other people in the village also need this medication, but a smaller dose would save them all: the medication brought by X would be enough to save either X, or all the other 5 people. Unfortunately, there is not enough medication to save the six people. If you leave X with the medication, he will be saved but the other five people will die. If you redirect the medication to the 5 other people, they will be saved but X will die. What would you do?</p> <p><i>Savannah:</i> You live in a small village in a remote region, with 6 other men. You leave the village with one of the men, to collect food located far away. After hours walking, you find the food. There is almost nothing and nobody else around you. At one time, the man accompanying you falls and get injured. To save him, you must fix a splint and help him get back, but this will take a long time. If you help the injured man, he will be saved but the five men in the village will die of starvation. If you leave the injured man and go back to your village with food, the five men in the village will be saved but the injured man will die. What would you do?</p>	0-1	215	French = .18 Himba = .38
Cooperation (Dictator game)		<p>We give you 6 candies. They are yours now. However, you can decide whether giving some, the totality, or none of these 6 candies to someone in the village that I will select. You cannot decide which person is selected to receive the candies if you decide to give, I will decide. You are free to decide what you want. What do you do?</p>	0-6	157	—
Orientations to Happiness	9	<p><i>Life of meaning</i></p> <ul style="list-style-type: none"> <li>— My life serves a higher purpose.</li> <li>— In choosing what to do, I always take into account whether it will benefit other people.</li> <li>— What I do matters to my community.</li> </ul> <p><i>Life of pleasure</i></p> <ul style="list-style-type: none"> <li>— Life is too short to postpone the pleasures it can provide.</li> <li>— In choosing what to do, I always take into account whether it will be pleasurable.</li> </ul>	1-5	196	French = .51 Himba = .75

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— For me, the good life is the pleasurable life.

*Life of engagement*

— Regardless of what I am doing, time passes very quickly.

— I am always very absorbed in what I do.

— I am rarely distracted by what is going on around me.

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\*Where a scale consists in only two items, we rely on the Spearman-Brown indicator, which is better suited for dealing with these cases than the Cronbach's alpha.

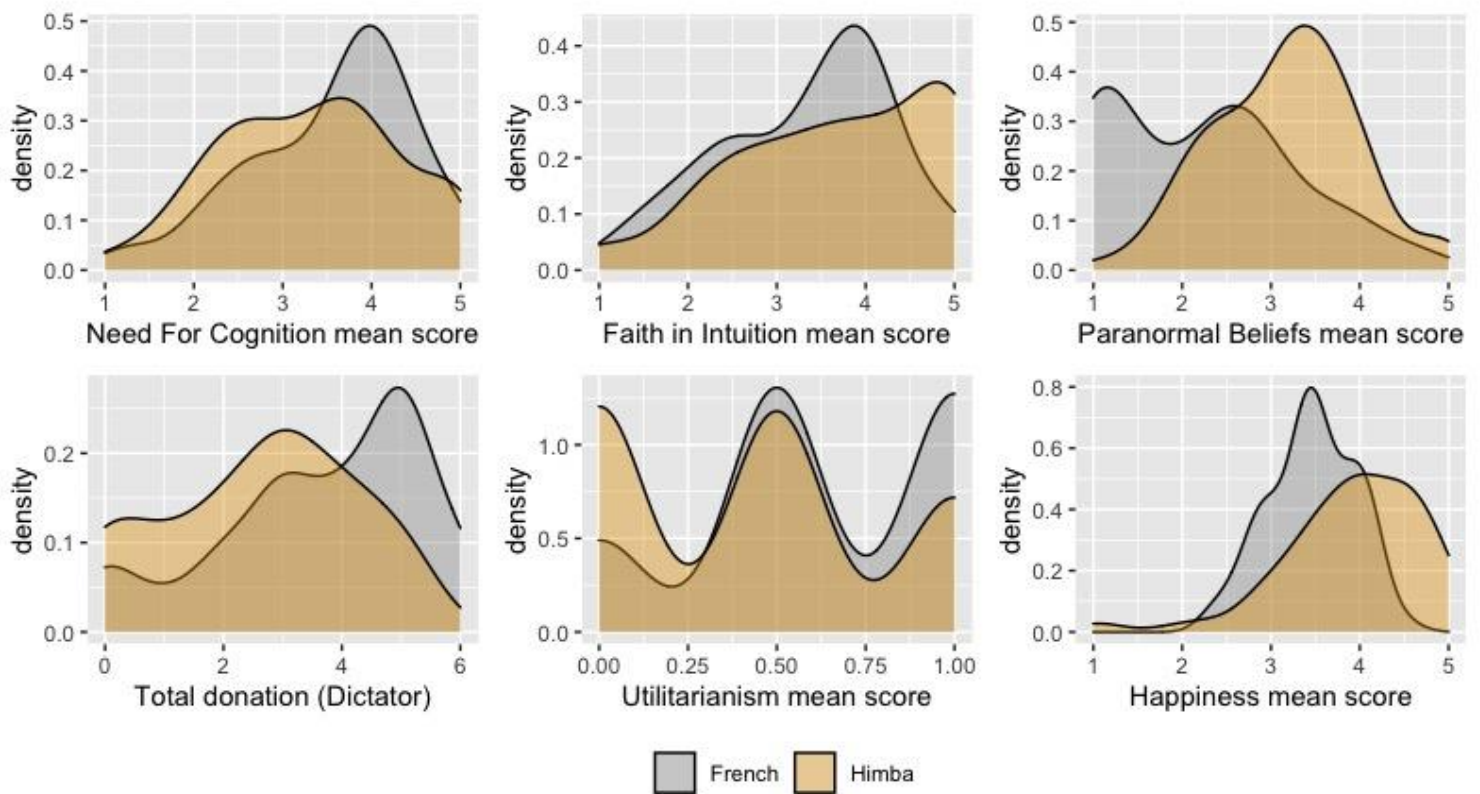
*Sociodemographics.* We collected participants' age (which was estimated for Himba participants), gender, number of years of education, alcohol-consumption habit ("how often do you drink alcohol? Never, rarely, often, every day"), and experience of daily stress ("how much stress are you generally experiencing in your daily life? I am: Never stressed, sometimes stressed, often stressed, always stressed").

### **Statistical analysis**

Data were analyzed using the R and JASP (for running the Bayesian analyses) software. Data and R scripts are publicly available on OSF ([osf.io/z4svr/](https://osf.io/z4svr/)). As it is visually displayed in Figure 1, the distributions did not meet the normality criterion, and it was confirmed by Shapiro-Wilk tests (with all  $p$ s < .001). To address this issue, and even though we have an important sample size, we complement our classical analyses with increasingly popular permutation tests (see Good, 2006), which do not rely upon strict parametric assumptions and can handle non-parametric distributions. When possible, exact  $p$  values were explored by generating all the possible combinations. Where exact permutation tests were not possible (because of memory depletion in the R software), we ran the analysis requesting 10 000 permutations.

In addition, because  $p$ -values cannot quantify support in favor of the null hypothesis, we conducted additional Bayesian analyses. A  $BF_{01}$  which is greater than 1 indicates that the

data are more likely to occur under H0 than under H1 while a  $BF_{01}$  lower than 1 indicates that the data are more likely to occur under H1 than under H0 (BFs between 1 and 3 are interpreted as ambiguous, BF between 3 and 10 and larger are interpreted as moderate, and strong support, respectively; see Etz & Vandekerckhove, 2016).



*Figure 1.* Distribution of Himba and French samples on the measures of Need For Cognition (NFC), Intuition (FI), Paranormal Beliefs, Utilitarianism, Dictator game (donation), and Happiness.

## Results

### Measurement invariance

Because the dynamics between items for a same latent construct may vary across groups, we first assessed measurement invariance between our two groups, using the Lavaan package in the R software. Since our factors are not assumed to systematically covary (as they are not part of the same unitary construct), we refrained from running a model including all the factors, and we analyzed each factor independently. We found that metric invariance was reached for two out of the three factors for which we could test it (i. e., factors including more than two items), namely, “Need For Cognition”,  $p = .33$ , and “Happiness”,  $p = .39$ , but not “Paranormal Beliefs”,  $p = .02$ . Scalar invariance, however, was not observed (all  $ps < .001$ ), calling for the need to be cautious when interpreting absolute differences between our two groups of participants.

### **Cultural differences**

For the sake of completeness, and although we failed to observe scalar invariance between our two groups, we nevertheless explored the differences between the Himba and French samples, using two sets of analyses. The first one relied on a multivariate analysis of variance (MANOVA), including culture as the IV, and scores to the CRT, NFC, FI, dictator game, utilitarian dilemmas, paranormal beliefs, and happiness, as the DVs. The advantage of the MANOVA is to take the covariations between our DVs into account. However, because only 26 Himba participants took part in all the different measures (see Table 2)<sup>1</sup> and because the MANOVA included only these 26 participants in the Himba sample, we also report a second set of analyses relying on independent t-tests and two-sample Fisher-Pitman permutation tests that included all the participants who were tested on each measure (see Table 3; note that the  $N$ s in each group vary across measures due to missing data).

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<sup>1</sup> Due to a coding error, data were recorded for only 46 Himba participants in the CRT task, and only 57 Himba participants in the Dictator game.



The MANOVA showed a significant effect of Culture  $F(7, 109) = 6.53, p < .001, \text{Eta}^2_p = .30$  (permutation test  $p < .001$ ). All the DVs were affected by culture, except for Utilitarianism and Faith in Intuition, for which the difference was only marginal (see Table 2 for the descriptive statistics and the detailed results). Compared to French participants, Himba participants gave significantly less in the Dictator game, believed more in the paranormal, were happier, had a less analytic thinking style, performed worse on the CRT, believed marginally more in their intuitions and were marginally less utilitarian. The independent t-tests confirmed all the findings observed with the MANOVA (see Table 3).

Table 2. Parameter estimates from the MANOVA ( $N_{\text{Himba}} = 26; N_{\text{French}} = 91$ ).

Measure	Population	M (SD)	t	ES	$\text{Eta}^2_p$	p	95%CI
CRT	Himba	0.48 (0.30)	4.28	.07	0.14	< .001	[0.16, 0.45]
	French	0.79 (0.33)					
NFC	Himba	3.01 (0.66)	2.67	.20	0.06	.01	[0.14, 0.92]
	French	3.54 (0.94)					
FI	Himba	3.77 (1.27)	-1.95	.23	0.03	.05	[-0.92, 0.01]
	French	3.31 (0.99)					
Paranormal beliefs	Himba	3.07 (0.70)	-4.02	.22	0.12	< .001	[-1.30, -0.44]
	French	2.20 (1.04)					
Utilitarianism	Himba	0.48 (0.39)	1.66	.08	0.03	.10	[-0.03, 0.30]
	French	0.62 (0.36)					
Dictator	Himba	2.96 (1.46)	2.06	.37	0.04	.04	[0.03, 1.48]
	French	4.67 (1.80)					
Happiness	Himba	3.97 (0.83)	-3.98	.13	0.12	< .001	[-0.77, -0.26]
	French	3.45 (0.49)					

Table 3. Results from the independent t-tests and the two-sample Fisher-Pitman permutation test comparisons between the Himba and the French groups (applying Bonferroni adjustment for multiple comparisons).

Measure	Population	N	M (SD)	t	p	$d_{\text{Cohen}}$	95%CI	$Z_{\text{perm}}$	$p_{\text{perm}}$	BF <sub>01</sub>
CRT	Himba	46	0.41 (0.32)	6.32	< .001	1.14	[0.26, 0.48]	5.61	< .001	$3.38^{e-7}$

	French	100	0.78 (0.33)							
NFC	Himba	105	3.32 (0.66)	1.72	.61	0.28	[-0.03, 0.47]	1.71	.09	1.65
	French	102	3.55 (0.94)							
FI	Himba	105	3.68 (1.14)	2.44	.011	0.34	[0.07, 0.65]	-2.41	.12	0.42
	French	102	3.32 (0.99)							
Paranormal beliefs	Himba	106	3.14 (0.70)	6.93	< .001	1.04	[0.66, 1.18]	-6.31	< .001	4.17 <sup>e-9</sup>
	French	94	2.22 (1.04)							
Utilitarianism	Himba	121	0.42 (0.39)	4.00	< .001	0.56	[0.10, 0.31]	3.86	< .001	.004
	French	94	0.63 (0.36)							
Dictator	Himba	57	2.61 (1.62)	3.68	< .001	0.62	[0.48, 1.59]	3.54	< .001	.013
	French	100	3.65 (1.74)							
Happiness	Himba	103	3.92 (0.83)	4.87	< .001	0.68	[0.27, 0.65]	-4.61	< .001	1.59 <sup>e-4</sup>
	French	93	3.46 (0.49)							

### Cognitive Reflection and Reasoning Thinking style

French participants had a higher CRT score than Himba participants, and they reported relying more on reflection (NFC) and less on intuition (FI) than Himba participants (see Tables 2 and 3). The group differences observed on these three variables confirm that Himba participants are overall more intuitive than French participants, confirming **Hypothesis 1a**.

*Socio demographic predictors.* Assessing whether socio-demographic variables predict cognitive reflection and thinking style in our two samples, we conducted multiple linear regressions including sex, age, alcohol consumption, education, and stress as predictors, and cognitive reflection and thinking style as separate dependent variables, for each of our samples. For the sake of clarity, all regressions coefficients and associated statistics for each predictor are detailed in Table 4. The model significantly predicted about 8% of the variance on the cognitive reflection measure for French participants (adjusted  $R^2 = .076$ ,  $p = .029$ ), while it was non-significant for Himba participants ( $p = .97$ ). For French participants, sex and age independently predicted cognitive reflection, and stress was a marginal negative predictor (see Table 4). The models did not predict thinking style, either for the French or Himba participants (all  $ps > .25$ ), partly invalidating **Hypothesis 1b**.

Table 4. Multiple linear regressions on the prediction of cognitive reflection and thinking style, and reported  $p$  values from equivalent permutation tests.

DV	Sample	Covariate	B	ES	$\beta$	$t$	$p$	$p_{perm}$	BF <sub>inclusion</sub>	Fit
Cognitive Reflection	French	(Constant)	1.42	0.28		5.16	< .001			$R^2 = .123^*$ 95% CI[.00,.21]
		Sex	-0.15	0.07	-0.22	-2.18	.03	.02	1.85	
		Age	-0.01	0.00	-0.20	-2.00	.05	.03	1.44	
		Education	0.00	0.02	0.00	-0.04	.97	.82	0.44	
		Stress	-0.07	0.04	-0.18	-1.67	.10	.11	0.99	
		Alcohol	0.02	0.06	0.05	0.44	.66	.67	0.46	
	Himba	(Constant)	0.51	0.25		2.06	.05			$R^2 = .021$ 95% CI[.00,.01]
		Sex	-0.08	0.11	-0.12	-0.75	.46	.56	0.17	
		Age	0.00	0.01	-0.02	-0.10	.92	.96	0.15	
		Education	0.01	0.03	0.07	0.43	.67	.65	0.16	
		Stress	0.05	0.11	0.09	0.48	.63	.68	0.16	
		Alcohol	-0.04	0.12	-0.06	-0.34	.73	.74	0.15	
NFC	French	(Constant)	4.09	0.79		50.2	< .001			$R^2 = .085$ 95% CI[.00,.16]
		Sex	-0.37	0.19	-0.19	-10.8	.06	.04	0.76	
		Age	0.01	0.01	0.06	0.56	.57	.49	0.27	
		Education	-0.11	0.07	-0.16	-10.6	.11	.12	0.46	
		Stress	-0.04	0.12	-0.04	-0.37	.72	.98	0.24	
		Alcohol	0.18	0.16	0.127	10.2	.24	.24	0.40	
	Himba	(Constant)	2.68	0.49		50.4	< .001			$R^2 = .076$ 95% CI[.00,.16]
		Sex	0.37	0.22	0.23	10.7	.10	.16	0.35	
		Age	-0.01	0.01	-0.09	-0.62	.54	.43	0.21	
		Education	0.01	0.06	0.01	0.10	.92	.65	0.20	
		Stress	0.14	0.23	0.09	0.62	.54	.53	0.21	
		Alcohol	-0.18	0.16	-0.16	-10.1	.26	.26	0.26	
FI	French	(Constant)	40.0	0.86		40.6	< .001			$R^2 = .021$ 95% CI[.00,.05]
		Sex	0.02	0.22	0.01	0.10	.92	.64	0.10	
		Age	-0.01	0.01	-0.03	-0.26	.80	.81	0.10	
		Education	-0.02	0.07	-0.03	-0.32	.75	.74	0.10	
		Stress	-0.01	0.13	-0.01	-0.10	.92	.62	0.10	
		Alcohol	-0.20	0.17	-0.13	-10.2	.24	.24	0.18	
	Himba	(Constant)	30.7	0.71		50.3	< .001			$R^2 = .033$ 95% CI[.00,.07]
		Sex	-0.24	0.33	-0.10	-0.73	.47	.40	0.17	
		Age	0.01	0.02	0.05	0.32	.75	.92	0.14	
		Education	0.09	0.09	0.13	0.93	.36	.41	0.17	
		Stress	-0.22	0.33	-0.09	-0.66	.52	.50	0.15	
		Alcohol	-0.05	0.23	-0.03	-0.23	.82	.82	0.15	

Note. \* < .05; BF<sub>inclusion</sub>: A BF<sub>inclusion</sub> of 1.85 indicates that the data have increased prior odds

for including the given variable as a predictor by a factor of 1.85. A BF<sub>inclusion</sub> of 0.44

indicates that the data have decreased prior odds for including the given variable as a predictor by a factor of  $1/0.44 = 2.27$ .

### Paranormal beliefs

French participants endorsed paranormal beliefs less than Himba participants (see Tables 2 and 3), thus confirming **Hypothesis 2a**. This difference was observed for the Traditional Religious Belief dimension,  $t(177.5) = -8.16, p < .001$ , Cohen's  $d = -1.17$  ( $BF_{01} = 2.91 \times 10^{12}$ , 95% CI [-1.439, -0.839];  $Z_{perm} = -7.17, p < .001$ ), and the Witchcraft dimension,  $t(200) = 8.87, p < .001$ , Cohen's  $d = 1.25$  ( $BF_{01} = 1.07 \times 10^{13}$ , 95% CI [-1.522, -0.915];  $Z_{perm} = -7.51, p < .001$ ). No difference was observed for the Spiritualism dimension,  $t(186) = -0.77, p = .44$ , Cohen's  $d = -0.11$  ( $BF_{01} = 4.91$ , 95% CI [-0.371, 0.165];  $Z_{perm} = -0.78, p = .45$ , suggesting moderate support for the null hypothesis).

Exploring the possibility that Himba participants endorse paranormal beliefs more (as compared to French participants), because they rely more on intuition, we tested mediation models using the Preacher and Hayes' non-parametric resampling procedure with 5000 bootstrap resamples with a 95% BCa confidence interval, including culture as the predictor, faith in intuition as the mediator, and paranormal belief as the dependent variable (Faith in Intuition was the only thinking variable which correlated with paranormal beliefs; see Table 5). Faith in intuition partially mediated the culture-paranormal belief relationship (indirect effect = .08, SE = .08, Bootstrap 95% CI [0.015, .159]), supporting **Hypothesis 2b**.

Table 5. Bivariate Spearman correlations in the Himba sample.

r (N)	1	2	3	4	5	6	7	8	9	10
	Age	Edu.	Alc.	Str.	CRT	NFC	FI	Par	Uti.	Dic.
2. Education	<b>-.17<sup>†</sup></b> (124)									
3. Alcohol	<b>.29**</b> (79)	-.04 (79)								

4. Stress	.15† (123)	.37** (123)	.17 (79)							
5. Cognitive Reflection	-.04 (46)	.01 (46)	.00 (46)	.02 (46)						
6. Need for Cognition	-.03 (105)	.01 (105)	-.14 (61)	.16 (105)	-.03 (45)					
7. Faith in Intuition	.00 (106)	.01 (106)	-.02 (62)	-.06 (106)	-.06 (45)	.25** (104)				
8. Paranormal beliefs	.10 (109)	.15 (109)	.30* (65)	-.07 (109)	-.05 (45)	.13 (105)	.18* (104)			
9. Utilitarianism	.12 (121)	.07 (121)	-.06 (77)	-.09 (121)	.01 (46)	-.12 (105)	.03 (105)	.08 (109)		
10. Dictator Game	.38** (57)	-.14 (57)	.18 (57)	.32* (57)	.26 (26)	-.03 (42)	-.20 (42)	-.04 (46)	-.10 (57)	
11. Happiness	.011 (103)	.08 (103)	-.09 (59)	-.03 (103)	-.12 (45)	.17† (103)	.42** (103)	.34** (103)	.10 (103)	-.03 (40)

Note: \*\*  $p < .01$ ; \*  $p < .05$ ; †  $p < .10$

### Utilitarian tendencies

French participants were more utilitarian than Himba participants (see Tables 2 and 3), confirming **Hypothesis 3a**. None of our thinking style or cognitive reflection variables were associated with utilitarianism, in either sample (all  $r$ s  $< .16$ , all  $p$ s  $> .12$ , see Tables 5 and 6;  $BF_{01 \text{ Himba}} = 5.34$ ;  $BF_{01 \text{ French}} = 3.76$ ; moderate support for H0), invalidating **Hypothesis 3b**. In addition, we observed a null association between paranormal belief and utilitarian tendencies, for both French and Himba participants (see Tables 5 and 6;  $BF_{01 \text{ Himba}} = 4.34$ ;  $BF_{01 \text{ French}} = 5.83$ ; moderate support for H0). A deeper examination of our results showed that religious beliefs were marginally positively associated with utilitarianism ( $r = .17$ ,  $p = .09$ ;  $BF_{01} = 1.96$ ; ambiguous support for H0) for Himba participants, while no association was observed for French participants ( $r = .03$ ,  $p = .77$ ;  $BF_{01} = 7.35$ ; moderate support for H0). The unexpected direction of the effect in Himba participants, as well as the absence of effect in French participants, invalidate **Hypothesis 3c**.

Table 6. Bivariate Spearman correlations in the French sample.

r (N)	1	2	3	4	5	6	7	8	9	10
	Age	Edu.	Alc.	Str.	CRT	NFC	FI	Par	Uti.	Dic.
2. Education	.04 (105)									
3. Alcohol	.03	-.04								

	(114)	(106)								
4. Stress	.08	<b>-.15†</b>	<b>.31**</b>							
	(105)	(106)	(106)							
5. Cognitive Reflection	-.07	-.03	.11	-.13						
	(99)	(100)	(100)	(100)						
6. Need for Cognition	.15	-.08	.15	-.02	<b>.23*</b>					
	(101)	(102)	(102)	(102)	(100)					
7. Faith in Intuition	.05	-.03	-.11	-.03	-.05	-.13				
	(101)	(102)	(102)	(102)	(100)	(102)				
8. Paranormal beliefs	<b>-.24*</b>	<b>-.26*</b>	<b>-.21*</b>	.04	<b>-.19†</b>	-.08	<b>.25</b>			
	(93)	(94)	(94)	(94)	(94)	(94)	(94)			
9. Utilitarianism	.17	.07	.13	-.04	.11	.16	-.02	.08		
	(93)	(94)	(94)	(94)	(94)	(94)	(94)	(92)		
10. Dictator Game	<b>-.20*</b>	<b>-.34**</b>	.07	.09	-.04	.13	-.08	.13	-.02	
	(99)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(94)	
11. Happiness	.16	-.11	<b>-.19†</b>	<b>-.18†</b>	-.15	-.01	.12	<b>.20†</b>	-.09	.08
	(92)	(93)	(93)	(93)	(93)	(93)	(93)	(93)	(93)	(93)

Note: \*\*  $p < .01$ ; \*  $p < .05$ ; †  $p < .10$

## Happiness

Himba participants reported being more happy than French participants (see Tables 2 and 3), supporting **Hypothesis 4a**. Happiness was positively associated with religious/paranormal beliefs in both Himba and French participants (see Tables 5 and 6). In addition, faith in intuition was associated with happiness in Himba participants (but not in French participants;  $BF_{01} = 3.54$ , 95%CI [-0.073; 0.322]; moderate support for H0). The data thus partly supported **Hypothesis 4b**. Finally, the happiness difference between Himba and French participants was driven by the Life of Meaning dimension,  $t(193) = 4.10$ ,  $p < .001$ , Cohen's  $d = 0.58$  ( $BF_{01} = 0.004$ , 95%CI [-0.832, -0.267]), and by the Life of Engagement dimension,  $t(200) = 8.32$ ,  $p < .001$ , Cohen's  $d = 1.16$  ( $BF_{01} = 3.82^{e-12}$ , 95%CI [-1.437, -0.836]). No difference was observed for the Life of Pleasure dimension,  $t(181) = 0.47$ ,  $p = .64$ , Cohen's  $d = 0.07$  ( $BF_{01} = 5.86$ , 95%CI [-0.209; 0.331]; moderate support for H0). Taken together, these results support **Hypothesis 4c**.

## Cooperation (Dictator Game)

First, French participants were more cooperative than Himba participants (see Tables 2 and 3). This result is largely due to an assumed weakness in our protocol, in which the French participants played in a fictitious way, while the Himba participants received real incentives. Hence, rather than focusing on the difference between the two samples, we were more interested in exploring the way in which cooperation was related to the other variables within each group.

In the French sample, older participants and more educated ones were less generous (see Table 6). In the Himba sample, age was also associated with cooperation, but in the opposite, positive direction, with older participants being more generous at the dictator game. In addition, higher alcohol consumption and higher stress predicted more generosity (see Table 5). Given the range of correlation patterns found in the Himba group, we conducted multiple linear regression in the Himba sample exploring the extent to which these sociodemographic variables independently explained cooperation (see Table 7, which also reports the same model for French participants for the sake of comparability). Stress and age were positive marginal predictors of cooperation in the Himba sample. Neither cognitive reflection nor thinking style were associated with cooperation, in either sample, thus invalidating **Hypothesis 5**.

Table 7. Multiple linear regressions on the prediction of cooperation (Dictator game).

Sample	Predictor	<i>beta</i>		<i>sr</i> <sup>2</sup>		<i>r</i>	<i>p</i> <sub>perm</sub>	BF <sub>inclusion</sub>	Fit
		<i>beta</i>	95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	95% CI [LL, UL]				
French	(Intercept)								<i>R</i> <sup>2</sup> = .126* 95% CI[.00,.22]
	Sex	0.14	[-0.06, 0.34]	.02	[-.03, .07]	.15	.12	0.57	
	Age	-0.10	[-0.30, 0.09]	.01	[-.03, .05]	-.08	.44	0.49	
	Education	-0.30	[-0.49, -0.10]	.08	[-.02, .19]	-.30**	.003	6.01	
	Stress	0.02	[-0.19, 0.22]	.00	[-.01, .01]	.08	.62	0.36	
	Alcohol	0.10	[-0.11, 0.31]	.01	[-.03, .04]	.06	.35	0.44	
Himba	(Intercept)								

Sex	0.02	[-0.24, 0.28]	.00	[-.01, .01]	.06	.60	0.45	$R^2 = .191^*$ 95% CI[.00,.31]
Age	0.24	[-0.04, 0.52]	.05	[-.05, .15]	.34**	.01	1.82	
Education	0.02	[-0.25, 0.28]	.00	[-.01, .01]	.01	.65	0.44	
Stress	0.26	[-0.01, 0.52]	.06	[-.05, .17]	.31*	.06	1.58	
Alcohol	0.12	[-0.16, 0.40]	.01	[-.04, .06]	.23	.39	0.65	

*Note.* A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights.  $s^2$  represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

$BF_{inclusion}$ : A  $BF_{inclusion}$  of 5.39 indicates that the data have increased prior odds for including the given variable as a predictor by a factor of 5.39. A  $BF_{inclusion}$  of 0.54 indicates that the data have decreased prior odds for including the given variable as a predictor by a factor of  $1/0.54 = 1.85$ .

\* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

## Discussion

The purpose of the present study was to explore high level cognitive functioning in a sample of remote people, the Himba of Northern Namibia, and to compare them to a sample of “WEIRD” participants, namely, individuals who are Western, Educated, and from Industrialized, Rich, and Developed countries (Henrich et al., 2010), recruited in France through an online survey. Our results showed both similarities and differences between Himba and French participants (see Tables 2 and 3).

Regarding similarities across samples, it is worth noting that most of them are present because of the failure to observe previously assumed associations between sets of variables. This was the case for the predicted association between sociodemographic variables (age, education, stress, and alcohol consumption) and cognitive reflection/thinking style. Although these variables have previously been shown to correlate (Aarnio & Lindeman, 2005; Casbon et al., 2003; Curtin, & Fairchild, 2003; Steinhauser et al., 2007; Thornton & Dumke, 2005), we did not observe a relationship, neither in the French nor in the Himba sample. The same conclusion applies for the null relationship between cognitive reflection/thinking style and



utilitarianism, and between cognitive reflection/thinking style and cooperation, in both samples. We will comment on this lack of relationships later in the discussion.

With regard to the observed group differences, most of them were consistent with our predictions. First, the Himba reported relying more on intuition, and less on reflection, compared to the French participants. This translated into a more biased/intuitive performance on the Cognitive Reflection Test. Given that reflection and deliberation (System 2; Evans & Stanovich, 2013; Kahneman, 2011) are heavily promoted by education (Aarnio & Lindeman, 2005), this finding is unsurprising. Interestingly, however, the differences across Himba and French participants were relatively modest (this translated into small effect sizes). None of the socio-demographic variables that we measured predicted cognitive style, in neither the French nor the Himba sample.

Second, paranormal beliefs were more pronounced in the Himba sample than in the Western sample. Consistent with previous findings in the literature, this difference was in part mediated by reliance on intuition (Pennycook et al., 2012, 2015). The paranormal-belief construct was divided into three dimensions (Religion, Witchcraft, and Spiritualism). The Himba participants reported being more religious (Cohen's  $d = 1.17$ ) and believing more in Witchcraft (Cohen's  $d = 1.25$ ) than the French participants. Surprisingly, however, the two groups did not differ significantly on the Spiritualism dimension (Cohen's  $d = 0.11$ ). It is possible that spirituality, which in our questionnaire addressed questions related to "death" and "the soul", is more resilient to cultural variations. Although the French participants reported lower religious and magical beliefs compared to the Himba participants, it is possible that the spirituality of French participants expresses itself in other domains which were not measured in this questionnaire. Accordingly, the French population has massively moved away from religion in the past 50 years and, as of 2020, they are one of the least religious people in the world (see <https://worldpopulationreview.com/country-rankings/least-religious->

countries). Had the Himba been contrasted to other Western groups (e.g., US-Americans), the cultural difference in religiosity would most probably have been lower.

In parallel, while there was a negative association between cognitive reflection and paranormal beliefs in the French sample, a commonly informed phenomenon in Western populations (Pennycook et al., 2012; Svedholm, et al., 2013; Trémolière & Djeriouat, 2019), there was no such association in the Himba sample. Although this null finding may be due to the smaller size of the Himba sample (due to a coding error, the CRT data were recorded for only 46 Himba participants), a closer look at the results showed a Spearman's  $r$  coefficient close to 0 in this group, suggesting a strong independence between the two variables.

Although we take great caution in speculating on this finding, an explanation might come from the lack of formal education (i.e., schooling) in the Himba sample and, thereby, from a reduced habit of appealing to critical thinking. As a result, cognitive reflection may be lesser used to debunk epistemically suspect beliefs (e.g., religious/paranormal beliefs), possibly all the more when these beliefs are an important component of people's identity (see Royalty, 1995, for a discussion on the distinction between critical thinking skills and the disposition to apply them).

The third finding of this study was that the Himba participants were less utilitarian (or more deontic) than the French participants when facing a moral dilemma. This finding echoes the results of Marczak et al. (2020), who observed a similar trend when comparing Canadian to Papua individuals on a trolley-like dilemma. One of the explanations provided by the authors was that the cost for an individual who kills another individual is very high: not only the perpetrator is killed, but her family is also in danger given that the relative must compensate by killing the same or even a greater number of persons (Koch, 1974). Because we did not ask justifications in our sample, we refrain from discussing our results in light of this explanation. Another explanation would be that the Himba are more deontic due to their

higher religiosity (Piazza, 2012; Piazza & Landy, 2013; Piazza & Souza, 2014). Looking into our data, however, there was no reliable association between religious belief and utilitarianism (see also McPhetres et al., 2018; Piazza & Landy, 2013; Randolph-Seng & Nielsen, 2007; for consistent conclusions). Neither was there a relationship between utilitarianism and cognitive style, which is inconsistent with the dual process view of moral judgment (see Baron & Gürçay, 2017; Gürçay & Baron, 2017; McGuire et al., 2009, for consistent conclusions).

Fourth, the Himba had a higher score at the Orientation to Happiness questionnaire, compared to the French participants. Some trends, in both groups, suggest that more intuitive and more religious individuals reported being happier, which is consistent with previous findings in the literature (Sillick & Cathcart, 2014; Stevenson & Hicks, 2016). When we examined the different dimensions of the questionnaire, we observed that the Himba had a higher score than the French at the ‘meaning’ and ‘engagement’ dimensions. Their higher score at the meaning dimension (e.g., “My life serves a higher purpose”) is consistent with their stronger religiosity (see above). In addition, their higher score in engagement is consistent with previous work showing that the Himba can focus their attentional resources and engage into a task to a better extent than Western individuals, and are better able to resist distraction (De Fockert et al., 2011; Linnell et al., 2013; Linnell et al., 2014). This finding is interesting, because it shows that the objective performance of the Himba on focused-attention tasks (e.g., De Fockert et al., 2011) is consistent with their subjective, phenomenological experience (e.g., “I am always very absorbed in what I do”). Finally, when it came to pleasure and life of enjoyment, the two groups had similar scores. This finding shows that, in two societies as different as the French and Himba societies, the sensory dimension of happiness (e.g., “Life is too short to postpone the pleasures it can provide”) is equally important, suggesting that this specific dimension shares a universal degree of

importance. This finding will need to be replicated, including with other Western and non-Western samples of participants.

Finally, we found that the Himba participants appeared to be less cooperative than the French participants. This difference is however difficult to interpret due to a methodological weakness, namely, that the Himba were given real candies when the French were ‘given’ virtual ones. Most importantly, we found no association between cognitive reflection/thinking style and cooperation. The absence of relationship does not support the social heuristic hypothesis, according to which cooperation relies more on intuition than on reflection (Rand et al., 2014; Rand, 2016). However, individual indifferences may not be sufficient to capture an association between reasoning, on the one hand, and cooperation, on the other. A manipulation aimed at preventing people from relying on deliberative thinking, such as cognitive load, may be necessary. A previous study has successfully used cognitive load manipulation with Himba participants (Linnell et al., 2013), and such manipulation in the context of cooperation may be attempted in the future. In parallel, future research should investigate social factors (e.g., markets, frequent interaction with strangers, payoffs to cooperation, etc.) to get more insight into the role of cooperation in the Himba and possible differences in cooperation (for a detailed discussion, see Feygina, & Henry, 2015).

In summary, the Himba participants tested in this study reported being more intuitive, more religious, happier, less utilitarian and less cooperative. We remain cautious when interpreting the differences that we observed across samples. We are aware that the tasks and measures used on the two samples have been designed to assess people from WEIRD countries, raising the concern that such a material may not be adapted for pure comparison. There are difficulties associated with relevancy and translatability of WEIRD-oriented materials (see Greenfield, 1997; Medin et al., 2010). In addition, Himba participants are not used to giving responses using Likert scales, an issue already shown in non-WEIRD or in

low-literate populations (Apicella, 2018; Bernal et al., 1997; Flakerud, 2012; Hruschka et al., 2018a). However, given the general similarities in the distribution of the samples, and the modest effect sizes when there were differences, we argue that it is possible to use WEIRD-oriented materials in remote populations and to compare WEIRD to non-WEIRD samples (see also the Method section for consisting discussion about the design of the material).

Beyond a mere documentation of the Himba population, this study demonstrates that a variety of higher-level processes can be readily studied using standard protocols initially designed for WEIRD participants. The adaptation requirements were mostly limited to choosing culturally understandable storylines (e.g., in order to measure analytical thinking, we used the “running” CRT item, which is verbal and does not require mathematical skills, instead of the “bat and ball problem”; see Mirota et al., 2021). The patterns of data showed that, although there were magnitude differences across groups, the means and distributions of the data were comparable. In sum, while we report several magnitude differences across Himba and French participants, we do not report any finding suggesting that one of the processes we measured is fundamentally different in one group versus the other. This study sets a precedent in applying well-known measures of high-level cognition (using both reasoning problems and questionnaires) in non-WEIRD populations, to further explore the laws and properties of these processes. Although we must remain cautious in the interpretation of the data, we believe that cross-cultural investigations like the one presented in this study help develop a more exhaustive picture of psychological processes across all of humanity.

In conclusion, we align with the recent call to study well-established phenomena in populations from low- and middle-income countries, who are the object of very little research in cognitive psychology (Henrich et al., 2010, Marczak et al., 2020). Many effects, even robust ones, may be culturally shaped. Research in psychology should continue exploring

which mechanisms are fundamental or universal to humanity, and which are influenced or determined by culture (Hruschka et al., 2018b). In addition, when there are cross-cultural differences, it should explore why these differences exist. This will help us develop a richer and wider picture of the Human mind, and it will allow us to understand the mechanisms behind the variety of human psychological experiences of the world.

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