

The effects of dissociation on willingness to eat meat are moderated by exposure to unprocessed meat: A cross-cultural demonstration



Jonas R. Kunst^{*},¹, Christian Andrés Palacios Haugestad¹

Department of Psychology, University of Oslo, Norway

ARTICLE INFO

Article history:

Received 5 June 2017

Received in revised form

17 September 2017

Accepted 18 September 2017

Available online 23 September 2017

Keywords:

Dissociation

Meat consumption

Unprocessed meat

Disgust

Empathy

Culture

ABSTRACT

Dissociating meat from its animal origins helps consumers deal with the cognitive dissonance resulting from liking meat but disliking causing pain to animals. Extending previous research, we tested whether dissociation would play less of a role for meat consumption in a country where average consumers are more frequently exposed to unprocessed meat (i.e., Ecuador) than where such exposure is rare (i.e., the US). Specifically, we randomly showed Ecuadorians and US Americans a pork roast with the head present or removed. Showing the head led to less dissociation, and subsequently more disgust and empathy for the killed animal in both countries, but to significantly larger degrees in the US. Follow-up analyses with participants' self-reported exposure to unprocessed meat supported the notion that these cross-cultural variations indeed reflected differences in unprocessed meat exposure. In contrast, disgust and empathy, in turn, predicted a lower willingness to eat meat and a higher willingness to choose a vegetarian alternative dish equally in both countries. Because the dissociation part of our model was substantially stronger in the US, it explained about double as much variance in willingness to eat meat and vegetarian choice in the US (63–72%) as compared to Ecuador (30–32%). In sum, the potency of the dissociation mechanism seems to depend on how used consumers in a country are to seeing unprocessed meat, whereas the subsequent affective mechanisms universally influence meat consumption.

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Meat is a central component of people's diets in many parts of the world (OECD, 2014; Smil, 2013). Yet, meat consumers often have an ambivalent attitude towards eating meat. They enjoy its taste, but dislike the hurting of animals that meat production inevitably involves. As becoming vegetarian often is considered an unpopular choice (Graça, Oliveira, & Calheiros, 2015), to deal with the cognitive dissonance resulting from this *meat paradox* (Loughnan, Haslam, & Bastian, 2010), consumers employ several alternative strategies. For instance, they reduce their concern for animals by downplaying their moral status, capacity of sensation and intelligence (Bastian, Loughnan, Haslam, & Radke, 2012; Bratanova, Loughnan, & Bastian, 2011; Piazza & Loughnan, 2016; Rothgerber, 2013), or justify their meat consumption with hedonistic, social, political, nutritional or evolutionary arguments (Bohm, Lindblom, Åbacka, Bengs, & Hörnell, 2015; Dhont & Hodson, 2014; Graça, Calheiros, & Oliveira, 2015; Piazza et al., 2015; Rothgerber, 2013; de Boer, Schösler, & Aiking, 2017). However, especially in consumer situation where people are directly

confronted with the opportunity to eat meat, people seem to avoid the meat paradox entirely by simply *dissociating*, that is, mentally separating meat from its animal origins (Kunst & Hohle, 2016; Rothgerber, 2013; Tian, Hilton, & Becker, 2016). This dissociation process as a way of avoiding the displeasure of linking meat with animals has been discussed in common discourse and scholarly thinking (Foer, 2010; Singer, 1995; Smil, 2013), but only recently been tested empirically (Rothgerber, 2013, 2014).

The maybe most comprehensive experimental test was provided by Kunst and Hohle (2016). In a series of experiments, the authors showed that dissociation processes could explain consumers' willingness to eat meat across various consumer choice situations because it reduced disgust and empathy for the animal that was killed (also see Zickfeld, Kunst, & Hohle, 2018 for a recent replication). Conversely, the authors showed that interrupting dissociation substantially reduced willingness to eat meat. For instance, showing the head of a pork roast decreased consumers' dissociation, which subsequently led to more empathy towards the killed animal and more disgust. These two emotions, in turn, explained why lowering dissociation decreased consumers' willingness to eat meat, but increased their willingness to consider a

^{*} Corresponding author.

E-mail address: j.r.kunst@psykologi.uio.no (J.R. Kunst).

¹ Both authors contributed equally to the research.

vegetarian alternative.

As compelling these results may be, an apparent limitation of Kunst and Hohle's (2016) experiments is that most of their studies were conducted in the United States, a context where consumers seldom are personally involved in food production processes, mostly consume highly processed food, and rarely are exposed to animal carcasses in consumer choice situations. This limitation leads to the question whether their findings can be generalized to contexts where people are more frequently exposed to animal carcasses and other types of unprocessed meat. Using a cross-cultural design with samples drawn from the US and Ecuador, the present study empirically aimed to address this limitation. Specifically, we predicted that dissociation processes should be less pronounced in a South American context than in a North American context, precisely because South American consumers are generally more exposed to, and used to see, unprocessed meat.

1. Exposure to unprocessed meat as potential moderator of the effects of dissociation

In many parts of the world, people are steadily less involved in the production of meat and this seems to be especially the case in more developed societies (e.g., in many Western countries; Foer, 2010; Leroy & Praet, 2017). The increasing industrialized production of meat and the greater division of labor has created a larger distance between the average consumer and the production process itself (Leroy & Degreef, 2015; Magdoff, Foster, & Buttel, 2000). In developed countries and big industrialized cities, most people therefore have very little interaction with living animals, are not involved in their actual killing for meat production, and also do not take part in later processing steps. Because this processing classically involves the removal of animal characteristics from the carcasses (Lerner & Kalof, 1999), the final meat product, which consumers can buy, looks very different from the animal it came from and often hardly resembles it at all. Hence, most meat products accessible to consumers in western societies are packed, presented and sold in ways that render the production process invisible and, thus, facilitates disconnecting meat from animals (Kunst & Hohle, 2016; Leroy & Degreef, 2015).

Indeed, visual presentation is one key factor facilitating dissociation of meat in consumers' daily lives. Compared to dairy products, it is quite unusual to find meat products displaying pictures of animals, for instance at normal supermarkets in Western societies (Grauerholz, 2007). This presentation style seems to further increase the distance between the consumer and the animal from which the meat was produced as well as the production process itself (Rogers, 2008). Conversely, presenting cues of animal origins of the meat can interrupt the process of dissociation, making people less willing to consume it. Knowledge of products' origins can increase people's rejection of them (Rozin & Fallon, 1980; Rozin, 2006). For instance, people dislike meat and generally try to avoid talking about it when it is not dissociated from its animal origins (Hoogland, de Boer, & Boersema, 2005). Especially when it comes to seeing animal characteristics such as their heads, limbs, or blood, people experience distress and try to avoid meat (Kubberød, Ueland, Tronstad, & Risvik, 2002). Two affective pathways have been proposed to explain why dissociation influences meat consumption (Kunst & Hohle, 2016). First, it seems to reduce the empathy for the animal that was killed, which otherwise would have led to a reduction in willingness to eat meat (Cerjak, Karolyi, & Mesić, 2011; Rothgerber & Mican, 2014). Second, dissociation seems to reduce feelings of disgust, an evolutionary mechanism helping people to avoid potentially contaminated food such as meat (Rozin & Fallon, 1980; Rozin, Markwith, & Stoess, 1997). In fact, simply asking people to actively reflect on the psychological

attributes of the animal used to produce meat increases disgust and reduces willingness to eat meat (Ruby & Heine, 2012), arguably because it interrupts the process of dissociation (Kunst & Hohle, 2016; Martins & Pliner, 2006).

However, while current evidence supports the role of dissociation processes for meat consumption in Western societies, we predict that it might play less of a role in societies where people are more accustomed to the animal-meat link. Indeed, recent research suggests that the cues of meat's animal origins may have less of an impact on consumer behavior in non-Western societies. For instance, in a study by Tian et al. (2016), Chinese (as compared to French) participants seemed less affected by stimuli linking meat to animals. Similarly, reminding consumers about animals' psychological attributes led to more disgust in North America (i.e., Canada or the US) than in Asia (i.e., China or India) in a study by Ruby and Heine (2012). While the underlying processes were not tested in the latter studies, we argue that different exposure to unprocessed meat may explain such cross-cultural differences. A large body of research shows that repeated exposure to stimuli may weaken or even extinguish the initial response to them, including affective reactions such as disgust (Powers & Emmelkamp, 2008; Smits, Telch, & Randall, 2002). Thus, repeated exposure to animal products that contain cues of animal origins (e.g., the head, feathers or claws) may reduce the extent to which showing such cues prospectively interrupt dissociation and, subsequently, increase disgust and empathy. Here, processes of evaluative conditioning (Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010; Jones, 1924; Schweckendiek et al., 2013), in this case, pairing of initially negative stimuli with positive stimuli, may further contribute to extinguishing these effects. For instance, repeated pairing of cues that remind the customer of the animal origins of a meat dish with positive outcomes (i.e., good taste and smell, communal sharing) may extinguish the initially negative responses to them (Rozin, 2006).

To investigate whether previous exposure to unprocessed meat moderates the potency of the dissociation process, we conducted a cross-cultural experiment with participants from the US and Ecuador. This comparison of countries was chosen because average US American and Ecuadorian consumers differ in the degree to which they are exposed to unprocessed meat. Before describing the specific hypotheses of the present research, we present a brief description of the US American and Ecuadorian food contexts in which our experiments were conducted.

2. Exposure to unprocessed meat in the US and Ecuador

The annual meat consumption of US Americans is estimated to 91.7 kg per person of which 20.8 kg are pork (OECD, 2014). With factory farming being the most common way of producing meat (Foer, 2010), the US is a good example of a culture where the meat-production process has been largely distanced from the consumer. This production process creates convenient products to suit consumer demands while minimizing the degree to which the meat resembles the former animal. Moreover, due to a fast food culture and increasing habits of dining outside the home, US Americans are further distanced from the slaughtering of animals and the production of meat (Ogle, 2013). Hence, because US Americans are living in an environment that facilitates dissociation and are seldom exposed to cues reminding them of meat's animal origins, this should make them especially sensitive to such cues in consumer choice situations.

Meat is also an essential part of most people's diet in Ecuador, with an approximate annual consumption of 51 kg per person (Ministro de Agricultura, 2013). Especially in recent years, a positive economic development has made meat more affordable and available to the general population (Bermudez & Tucker, 2003). However, in contrast to US Americans, it is common for Ecuadorians

to see animal carcasses or even the live slaughtering of animals for the production of meat at markets or traditional restaurants. In addition, meat dishes often still resemble the animal to larger extents. For instance, a very common traditional dish is the so called “Hornado”, which is a pork roast usually presented whole (Sánchez-Llaguno, Neira-Mosquera, Pérez-Rodríguez, & Moreno Rojas, 2013). Last but not least, a strong communal tradition for family gatherings and religious holidays involves the shared participation in the slaughter of an animal for the preparation of food for a feast (Borrero, Naranjo, & Yáñez, 2007). Hence, as the average Ecuadorian consumer is frequently exposed to cues that connect meat with its animal origins, their consumer habits should be less influenced by such cues.

3. The present research

The purpose of the present research was to experimentally investigate whether culturally variant exposure to unprocessed meat moderates the effects that dissociation has on willingness to eat meat. Specifically, building on recent research by Kunst and Hohle (2016), we presented participants living in a country where exposure to unprocessed meat is less common (i.e., the US) and participants living in a country where such exposure is relatively common (i.e., Ecuador) with a pork roast. This pork roast was experimentally altered either to include the animal head or to have no head. Previously, Kunst and Hohle (2016) demonstrated with samples of US American participants that presenting the head substantially reduced dissociation, thereby increasing disgust and empathy for the killed animal. As a result of these processes, the reduced dissociation decreased consumers' willingness to eat meat while increasing their willingness to consider a vegetarian alternative.

In the present research, we predicted that (a) showing the animal head should reduce dissociation to less of a degree in Ecuador than in the US and (b) that this reduced dissociation should lead to more disgust and empathy particularly in the US. Consequently, we expected the dissociation model proposed by Kunst and Hohle (2016) to have more explanatory power in the US than in Ecuador. In addition to comparing the model between countries, we also directly assessed participants' exposure to unprocessed meat. This measure we used to test whether it indeed is exposure to unprocessed meat (rather than other cultural differences) that moderates the effects of dissociation.

4. Method

4.1. Participants

Ecuadorian sample. In total 202 Ecuadorian participants were recruited through snowball sampling on social online networks. The research was described as dealing with “food habits” (“hábitos alimenticios”). The average age was 26.8 years ($SD = 9.07$) and gender was relatively equally distributed (women: 58%; men: 42%). Asked about their ethnicity, 90.7% reported to be Mestizo, 7.1% White/Caucasian, 1.6% Indigenous, and 0.5% reported other ethnic backgrounds. While 94% of the participants reported to be omnivores, 3% reported to be pescetarians, 2% to be vegetarians and 1% to be vegan. Due to the focus on meat consumption in the present study, only participants who reported to eat meat were included in analyses², resulting in a final sample of 183 participants. In this sample, the reported meat consumption in general (including fish) was 5.97 days per week ($SD = 1.86$), and pork meat specifically 2.37

days per week ($SD = 1.11$). Only a small number of participants ($n = 6$ or 3.3%) reported to live in the countryside, while all other participants lived in a city.

US American sample. A sample of 201 US Americans was recruited via Amazon MTurk as in Kunst and Hohle (2016). As for Ecuadorians, the study was described as regarding “food habits.” In the US sample, the mean age was 35.5 years ($SD = 11.39$) and gender was relatively evenly distributed (women: 42%; men: 58%). Asked about their ethnicity, 75.3% reported to be White/Caucasian, 10.7% Asian, 4.5% African American, 5.1% Hispanic, 1.7% Native American, and 2.8% specified other ethnicities. Of all participants, 89% reported being omnivores, 6% pescetarians, 3% vegetarians, and 2% vegan. After excluding participants who did not report to eat meat, the final sample consisted of 178 participants. In this sample, the mean days of meat consumption (including fish) per week was 5.98 ($SD = 1.93$), and for pork specifically 2.41 days per week ($SD = 1.27$). Only a small, albeit larger number of participants than in the Ecuadorian sample, reported to live in the countryside ($n = 46$ or 26.1%), while all other participants lived in a city. The US and Ecuadorian samples differed neither in their general meat consumption, $t(359) = -0.02$, $p = 0.981$, nor pork consumption, $t(359) = -0.31$, $p = 0.758$.

4.2. Procedure

The original English questionnaire of Kunst and Hohle's (2016) experiment was forward-translated to Spanish by a native speaker. Next, the questionnaire was translated back to the original language by another bilingual speaker. Discrepancies between the translated and original version were reviewed and changes were made to the Spanish translation accordingly.

In the experiment, participants were randomly assigned to one of two conditions. In both conditions, participants were told that they were going to be presented with a picture of a pork roast. In the *head condition*, the pork roast's head was visible, while it was removed using photo-editing software in the *beheaded condition* (see the [supplementary online materials](#) or Table 1 of Kunst & Hohle, 2016, for the stimuli). For both conditions, the picture was identical in all respects except for the difference that the head was shown or not shown. As in the original experiment (Kunst & Hohle, 2016), the stimuli (i.e., picture of the pork roast) was present at all times during the questions, except from the section regarding the demographics, exposure to unprocessed meat, the informed consent form and the debriefing at the end. State dissociation, disgust, empathy, willingness to eat meat, and willingness to choose vegetarian were measured as in the original study (Kunst & Hohle, 2016). At the end, in the demographics section, participants reported how often they were exposed to unprocessed meat in their daily lives.

Dissociation. To measure the degree of dissociation in reaction to the stimuli, the 3-item scale from Kunst and Hohle (2016) was used. First, on a 7-point Likert scale ranging from 1 (*totally disagree*) to 7 (*totally agree*), participants rated their agreement with the statement, “The first thing I thought about when I saw the picture above was a living being.” Second, they rated on a 7-point scale ranging from 1 (*very difficult*) to 7 (*very easy*) how difficult or easy it was to imagine that the meat “displayed in the picture once was part of a living being.” In the last question, “How much does the picture above remind you of a living being?”, responses were rated on a 7-point scale ranging from 1 (*not at all*) to 7 (*very much*). Responses on each item were reverse-scored before a mean score was calculated, such that higher scores indicated more dissociation. The 3-item scale showed acceptable reliability in both samples (Ecuador: $\alpha = 0.61$; US: $\alpha = 0.77$).

Empathy. As in Kunst and Hohle (2016), participants were asked to rate their agreement with five statements on a 7-point Likert

² In addition 5 participants were excluded from the study for being under 18 years of age.

Table 1
Results from analyses of variance.

Independent Variable	Dependent Variable	df1	df2	F	p	η^2_p
Experimental Condition	Dissociation	1	356	80.64	<0.001	0.185
	Disgust	1	356	49.96	<0.001	0.123
	Empathy	1	356	44.01	<0.001	0.110
	Willingness to Eat Meat	1	356	23.77	<0.001	0.063
	Vegetarian Choice	1	356	30.91	<0.001	0.080
Country	Dissociation	1	356	25.54	<0.001	0.067
	Disgust	1	356	29.27	<0.001	0.076
	Empathy	1	356	6.88	0.009	0.019
	Willingness to Eat Meat	1	356	7.60	0.006	0.021
	Vegetarian Choice	1	356	0.80	0.373	0.002
Condition * Country	Dissociation	1	356	15.04	<0.001	0.041
	Disgust	1	356	21.80	<0.001	0.058
	Empathy	1	356	12.92	<0.001	0.035
	Willingness to Eat Meat	1	356	14.70	<0.001	0.040
	Vegetarian Choice	1	356	4.86	0.028	0.013

scale ranging from 1 (*totally disagree*) to 7 (*totally agree*). Two of these questions were reversed to avoid response bias. The presented statements were the following: “When I see the picture above, I feel sorry for the animal that was slaughtered”, “Thinking about the animal that was slaughtered to produce the meat displayed above does not disturb me a great deal” (reversed), “Seeing the picture makes me feel pity for the animal that was slaughtered”, “I feel sad for the animal that died to produce the meat above” and, “I do not really feel very sorry for the animal that had to die” (reversed). The mean scale had satisfactory reliability in both samples (Ecuador: $\alpha = 0.86$; US: $\alpha = 0.98$).

Disgust. A scale by Horberg, Oveis, Keltner, and Cohen (2009) measured the extent to which participants felt the emotions “grossed out”, “disgusted” and “queasy, sick to my stomach” when seeing the picture on a 7-point scale ranging from 0 (*not at all*) to 6 (*a great deal*). The scale had satisfactory reliability in both samples (Ecuador: $\alpha = 0.91$; US: $\alpha = 0.96$).

Willingness to eat meat and to choose vegetarian. Participants completed the question, “Hypothetically speaking, how negative or positive do you feel about eating the meat in the picture”, on a sliding-response scale ranging from 0 (*extremely negative*) to 100 (*extremely positive*). Moreover, on a sliding-response scale ranging from 0 (*very unlikely*) to 100 (*very likely*), participants completed the question, “If there would be an vegetarian alternative dish, how likely would you be to choose it instead of the roast?”

Exposure to unprocessed meat. At the end of the survey in the demographics section, participants were asked, “How often per month do you see meat products that still show the animal’s head (for instance at markets, stores or similar)?” Responses were rated on a 7-point scale ranging from 1 (*never*) to 7 (*very often*).

5. Results

As expected, participants from Ecuador reported a substantially higher exposure to meat products that still show the animal’s head, $M = 2.63$, $SD = 1.96$, than participants from the US did, $M = 0.87$, $SD = 1.28$; $t(304.71) = 10.11$, $p < 0.001$, 95% CI of the difference [1.42, 2.11], Cohen’s $d = 1.06$. This supported the expectation that participants from both cultures differed markedly in their exposure to unprocessed meat. For exploratory reasons, we tested whether participants differed in their exposure to unprocessed meat products as a consequence of whether they lived in a city or the countryside, but these differences were non-significant in both countries ($ps > 0.520$).

5.1. Comparing the experimental effects in Ecuador and the US

Multivariate Analyses of Variance (MANOVA) were conducted for the dependent variables with the experimental manipulation (head vs. no head), country (Ecuador vs. the US) and the interaction between both as predictors. As shown in Table 1, the interactions between the experimental and country factors were significant for all dependent variables. Simple slopes illustrating the interactions are displayed in Fig. 1. For both Ecuadorian and US participants, presenting the head decreased dissociation, led to more empathy and disgust and a higher willingness to choose vegetarian. However, these effects were less marked in the Ecuadorian sample than in the US American sample. The maybe strongest cross-cultural difference was observed in terms of willingness to eat meat. Here, presenting the head led to lower willingness to eat meat among US Americans, but not among Ecuadorians.

5.2. Comparing the experimental effects among participants with high and low exposure to unprocessed meat

To test whether the cross-cultural differences observed above indeed can be explained by differences in exposure to unprocessed meat, we ran equivalent moderated regression models replacing the country moderator with the variable measuring exposure to unprocessed meat. As displayed in Table 2, experimental effects on all variables except for willingness to choose vegetarian were moderated by exposure to unprocessed meat. Simple slopes calculated using the Process Macro (Hayes, 2013) showed that the results were highly similar to those when country was treated as moderator (compare Fig. 2 to Fig. 1). Presenting the head of the pork roast led to less dissociation, more disgust and more empathy for participants reporting high (+1 SD), but especially for those reporting low (−1 SD) exposure to unprocessed meat. Moreover, presenting the head led to a decreased willingness to eat meat among participants with low exposure to unprocessed meat but not among those with high exposure (see Fig. 2).

5.3. Testing the full model: comparing Ecuador to the US

Unconstrained model. In the next step, a multi-group path model with manifest variables was estimated in Mplus 7 (Muthén & Muthén, 2015) testing the dissociation model proposed by Kunst and Hohle (2016) in Ecuador and the US. The unconstrained model fitted the data well, $\chi^2(N = 361, df = 30) = 18.74$, $p = 0.095$, $RMSEA = 0.056$, 90% CI [0.000, 0.102], $CFI = 0.994$, $sRMR = 0.035$. Still, the US sample contributed to the chi-square value to lower extent ($\chi^2 = 5.05$), than the sample from Ecuador did ($\chi^2 = 13.69$),

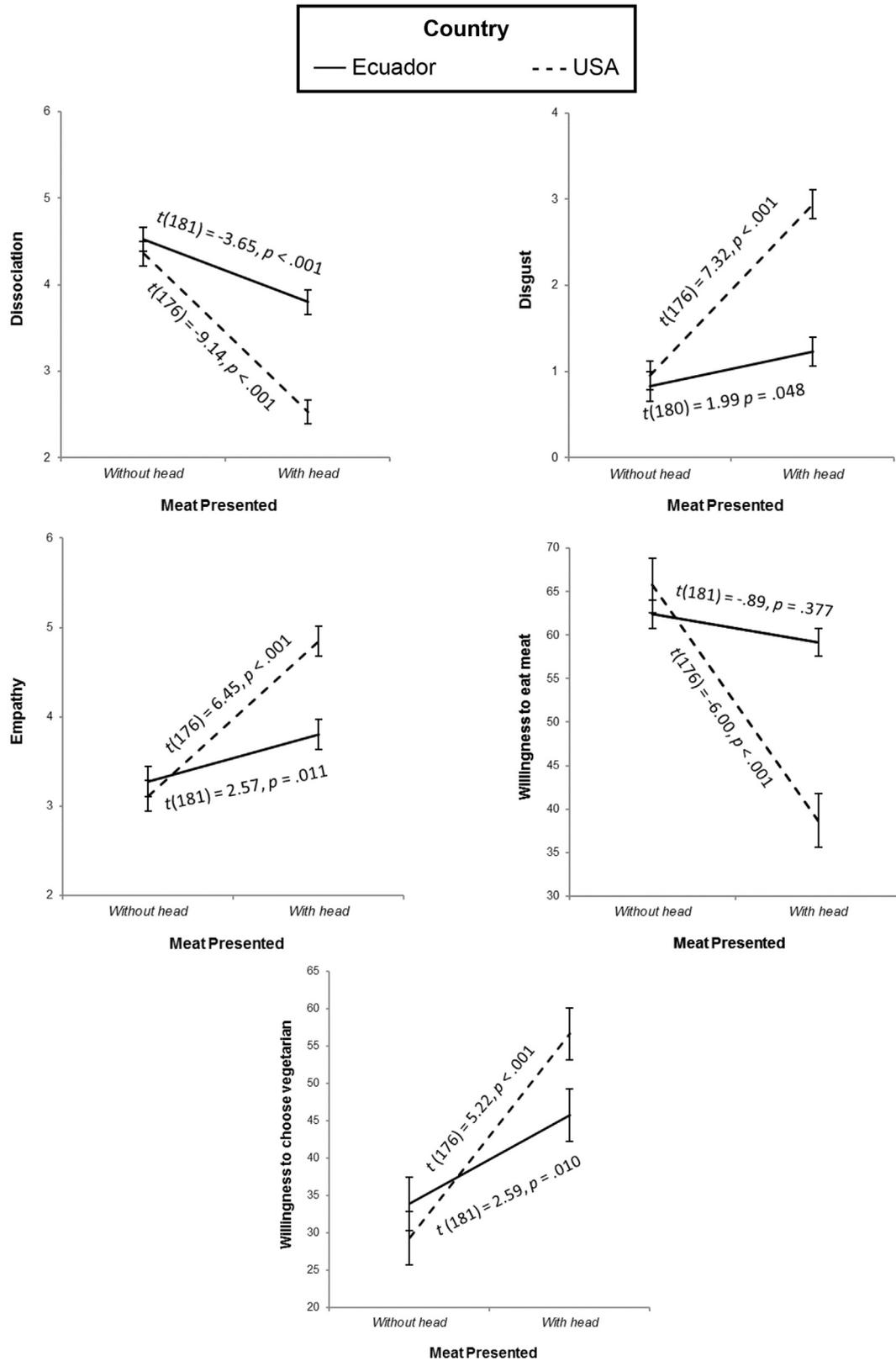


Fig. 1. Experimental effects on disgust, empathy, willingness to eat meat, and willingness to choose a vegetarian alternative in the Ecuadorian and US samples are displayed. Error bars represent ± 1 standard error.

Table 2

Moderated regression analyses are displayed: exposure to unprocessed meat moderated the experimental effects on all but one of the dependent variables.

	Dissociation						Disgust						Empathy					
	β	B	SE	95% CI		p	β	B	SE	95% CI		p	β	B	SE	95% CI		p
				LB	UB					LB	UB					LB	UB	
Condition	-0.42	-1.30	0.15	-1.59	-1.01	<0.001	0.35	1.25	0.18	0.91	1.60	<0.001	0.33	1.16	0.17	0.83	1.50	<0.001
Exposure	0.02	0.02	0.04	-0.06	0.09	0.655	-0.15	-0.15	0.05	-0.24	-0.06	0.002	-0.12	-0.11	0.05	-0.20	-0.02	0.016
Con * Exp	0.19	0.31	0.08	0.16	0.46	<0.001	-0.16	-0.30	-0.09	-0.49	-0.12	0.001	-0.15	-0.27	0.09	-0.45	-0.09	0.003
F	31.65***						23.53***						20.21***					

	Willingness to Eat Meat						Willingness to Choose Vegetarian					
	β	B	SE	95% CI		p	β	B	SE	95% CI		p
				LB	UB					LB	UB	
Condition	-0.26	-16.38	3.12	-22.51	-10.26	<0.001	0.29	20.03	3.55	13.05	27.02	<0.001
Exposure	0.18	3.00	0.82	1.38	4.61	<0.001	-0.03	-0.58	0.94	-2.42	1.26	0.537
Con * Exp	0.15	5.01	1.65	1.77	8.25	0.003	-0.06	-2.07	1.88	-5.76	1.62	0.271
F	16.80***						11.10***					

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

suggesting that the model had a slightly better fit in the US. Findings replicated the results from Kunst and Hohle (2016) in both samples. As displayed in Fig. 3a, showing the head of the pork roast reduced dissociation in both countries, leading to heightened disgust and empathy and, consequently, less willingness to eat the meat and more willingness to choose vegetarian (Fig. 3 presents unstandardized coefficients; please see Fig. S1 in the supplementary online materials for standardized coefficients). Bootstrapping with 5000 random re-samples was used to test the significance of the resulting indirect effects and to compare their strength between the countries. Results showed that presenting the head led to a lower willingness to eat meat because it reduced dissociation and subsequently increased disgust in Ecuador, $B = -1.62$, 95% CI [-3.58, -0.62], but especially in the US, $B = -8.50$, 95% CI [-14.52, -3.83]. A differences test showed that the indirect effects differed significantly in strength, $\Delta B = 6.89$, 95% CI [2.04, 12.97]. Similarly, in terms of the second indirect pathway, presenting the head led to lowered willingness to eat meat by decreasing dissociation and subsequently increasing empathy in Ecuador, $B = -1.92$, 95% CI [-4.11, -0.75], but again especially in the US, $B = -17.21$, 95% CI [-25.33, -11.22]. The strength of the indirect effects differed significantly between the countries, $\Delta B = 15.30$, 95% CI [8.96, 23.39].

Also with vegetarian choice as dependent variable, indirect effects were more pronounced for the US sample. Here, presenting the head of the pork roast led to a higher willingness to choose vegetarian because it reduced dissociation and subsequently increased disgust in Ecuador, $B = 2.30$, 95% CI [0.82, 5.15], but especially in the US, $B = 13.18$, 95% CI [7.59, 20.37]. The strength of these indirect effects on vegetarian choice differed significantly, $\Delta B = -10.88$, 95% CI [-18.39, -5.04]. Finally, presenting the head of the pork roast led to a higher willingness to choose vegetarian because it reduced dissociation and thereby increased empathy in Ecuador, $B = 1.24$, 95% CI [0.24, 3.45], but again especially in the US, $B = 14.13$, 95% CI [8.25, 22.27]. The indirect paths differed significantly in strength, $\Delta B = -12.90$, 95% CI [-21.21, -6.84].

Partly constrained model. Having established support for the model in both samples, Wald tests were conducted to see whether the model could be simplified by constraining certain paths to equality across the countries. This procedure would also allow for an identification of the particular parts of the model that are different versus equal across the countries. Wald tests showed that constraining paths involving the dissociation variable lead to a significant deterioration in model fit. Specifically, constraining the paths from the experimental manipulation to dissociation, Wald

test(1) = 15.04, $p < 0.001$, from dissociation to disgust, Wald test(1) = 44.38, $p < 0.001$, and from dissociation to empathy, Wald test(1) = 38.58, $p < 0.001$, led to worse model fit. Hence, these paths differed significantly between the countries. However, Wald tests suggested that constraining the remaining paths did not deteriorate model fit. Specifically, the test was non-significant when constraining the path from disgust on meat eating, Wald test(1) = 1.32, $p = 0.251$, from empathy on meat eating, Wald test(1) = 3.45, $p = 0.063$, from disgust on vegetarian choice, Wald test(1) = 1.14, $p = 0.289$, and from empathy on vegetarian choice, Wald test(1) = 3.34, $p = 0.068$. Also constraining the covariates between empathy and disgust, Wald test(1) = 0.01, $p = 0.937$, and meat eating and vegetarian choice, Wald test(1) = 1.08, $p = 0.297$, did not deteriorate model fit. This suggested that the paths were equal across the countries. Setting the respective constraints resulted in a well-fitting model, $\chi^2(N = 361, df = 18) = 25.18$, $p = 0.120$, $RMSEA = 0.047$, 90% CI [0.000, 0.087], $CFI = 0.993$, $sRMR = 0.042$, which fitted equally good as the unconstrained model according to a chi-square difference test, $\Delta\chi^2 = 6.44$, $\Delta df = 12$, $p = 0.892$. The estimated, partly constrained model can be seen in Fig. 3b.

5.4. Multi-group path model comparing participants with high and low exposure to unprocessed meat

Unconstrained model. Next, to obtain convergent evidence, the same model was estimated this time comparing 103 participants with high ($M = 4.39$, $SD = 1.27$) and 120 participants with low ($M = 0.00$, $SD = 0.00$) exposure to unprocessed meat. This division of participants was based on splitting the sample into three relatively equally sized tiles in SPSS 24 using the *Ntiles* function. The model (see Fig. 4a for unstandardized coefficients and Fig. S2 in the supplementary online materials for standardized coefficients) fitted the data well, $\chi^2(N = 223, df = 12) = 16.91$, $p = 0.153$, $RMSEA = 0.061$, 90% CI [0.000, 0.122], $CFI = 0.992$, $sRMR = 0.042$. However, similar to the previous model, the group of participants with low exposure to unprocessed meat contributed to the chi-square value to lower extent ($\chi^2 = 6.57$), than those with high exposure to unprocessed meat did ($\chi^2 = 10.34$). This suggested that the model had a slightly better fit for the sample of participants with low exposure to unprocessed meat.

Results were highly similar to those in the cross-cultural models estimated before. Presenting the head indirectly led to a lower willingness to eat meat because it reduced dissociation and, subsequently, increased empathy among participants with high exposure, $B = -1.85$, 95% CI [-4.86, -0.24], but especially among

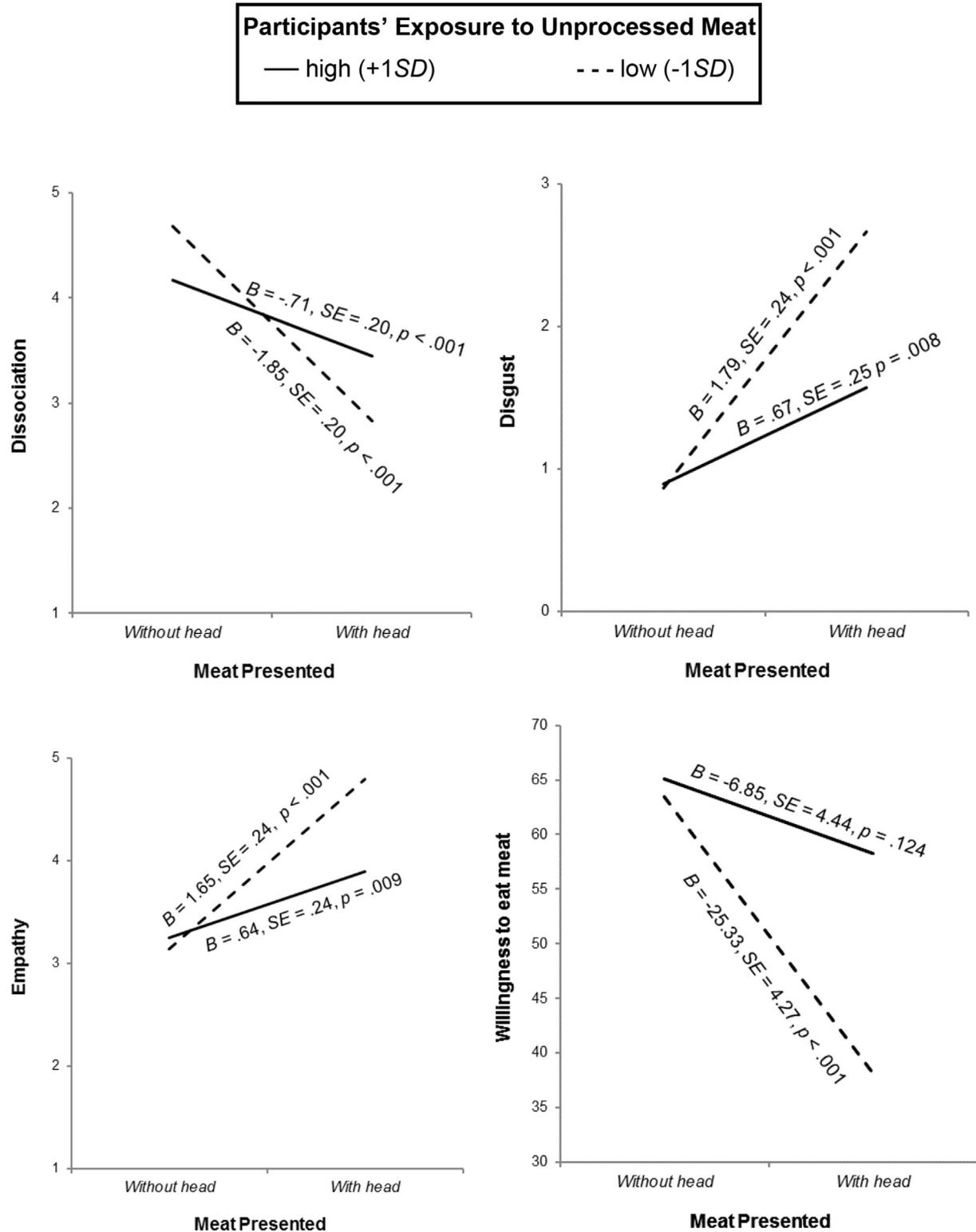
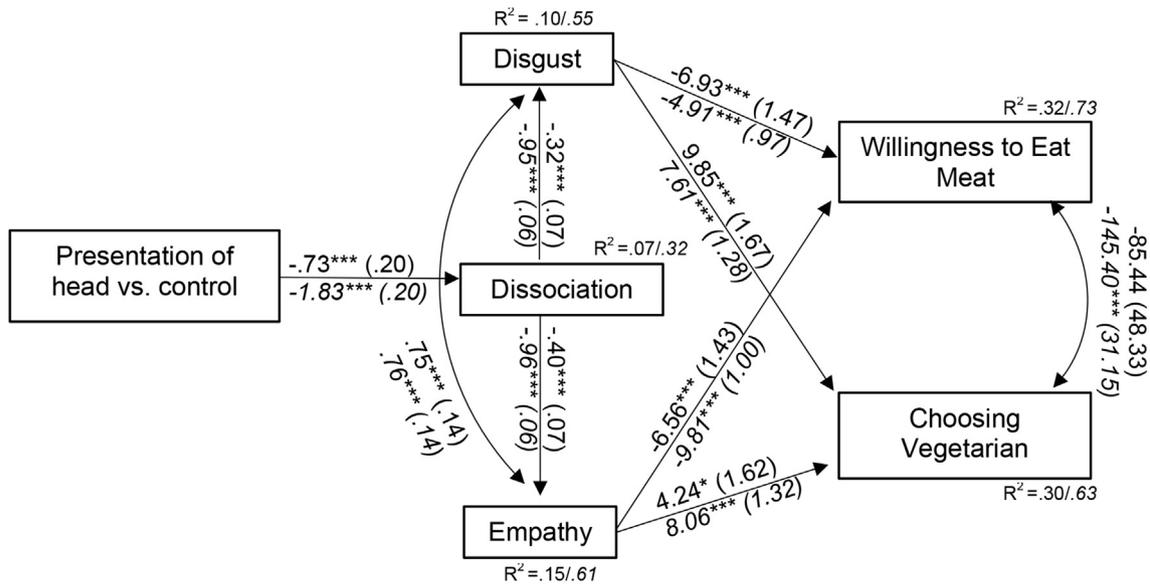


Fig. 2. The experimental effects as moderated by exposure to unprocessed meat are displayed. Simple slopes for willingness to choose vegetarian are not displayed because the interaction was non-significant.

those with low exposure to unprocessed meat, $B = -17.62$, 95% CI $[-27.64, -9.74]$. The strength of the indirect effects differed significantly between the groups, $\Delta B = 15.77$, 95% CI $[7.52, 26.06]$. In terms of the equivalent indirect path going via heightened levels of disgust, showing the head of the pork roast led to a lower

willingness to eat meat because it reduced dissociation and, subsequently, increased disgust for participants with high exposure to unprocessed meat, $B = -1.12$, 95% CI $[-3.72, -0.06]$, but especially for those with low exposure to unprocessed meat, $B = -6.32$, 95% CI $[-13.16, -1.36]$. However, a differences test suggested that both

a) Unconstrained multi-group model between countries



b) Partly constrained multi-group model between countries

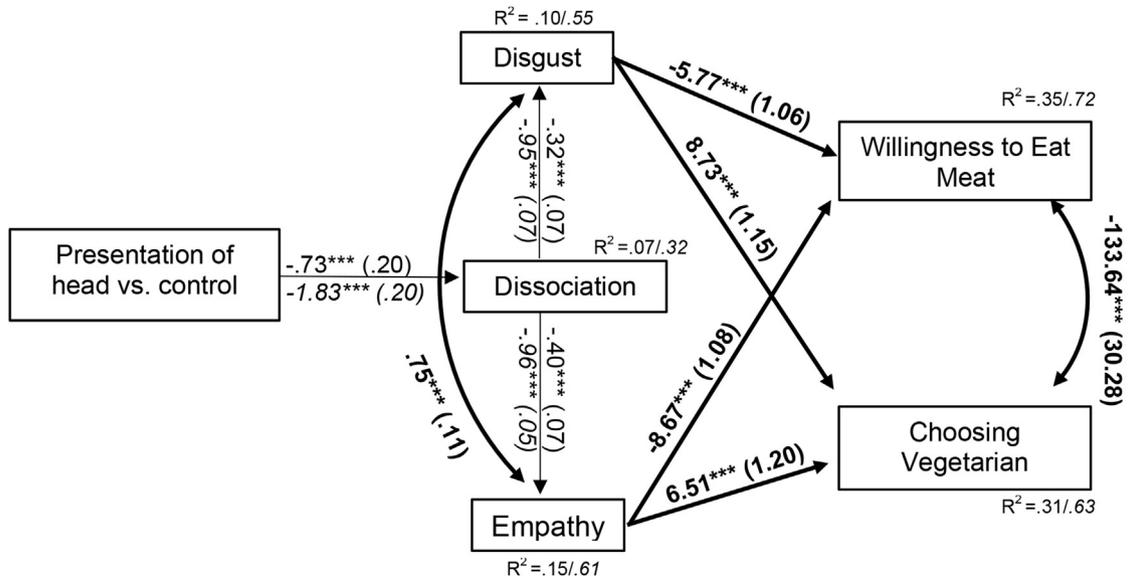


Fig. 3. The unconstrained (a) and partly constrained (b) estimated multi-group (country) mediation models are displayed. Upper non-italicized values represent estimates for the Ecuadorian sample, whereas lower italicized values represent estimates for the US sample. All estimates are unstandardized and standard errors are presented in parentheses. Standardized values can be found in Fig. S1 in the supplementary online materials. Paths and estimates displayed in bold are set to equality between the samples. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

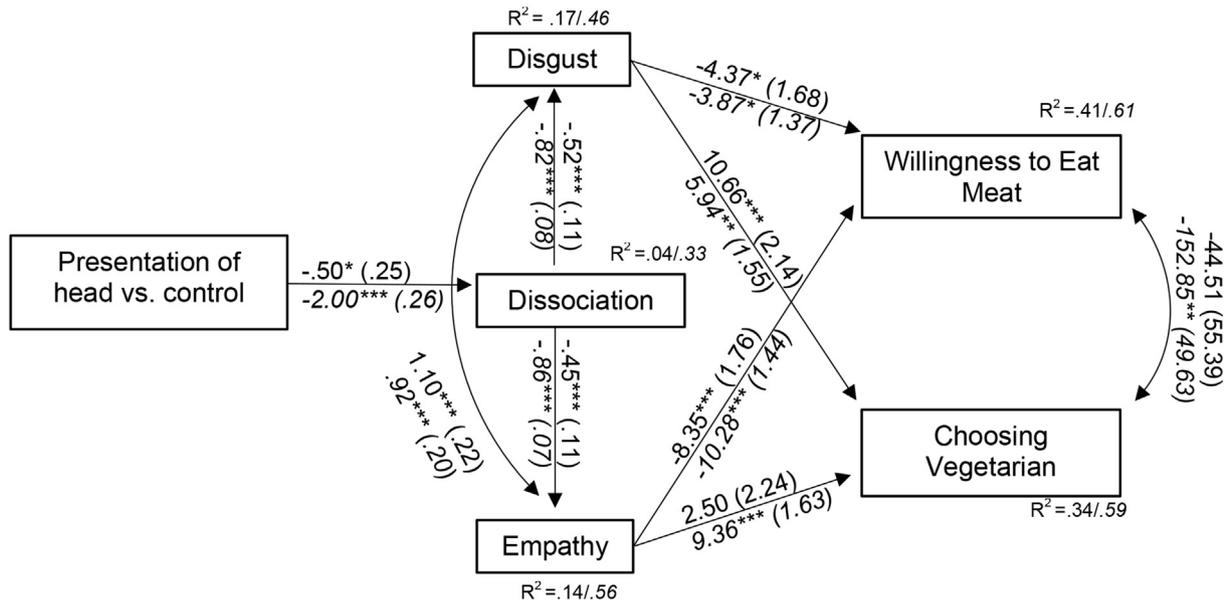
effect only marginally significantly differed in strength $\Delta B = 5.20$, 95% CI $[-0.07, 12.15]$.

Differences between the samples were also observed when vegetarian choice was the dependent variable. Here, showing the head indirectly lead to a higher likelihood to choose vegetarian because it decreased dissociation thereby increasing disgust among those with high exposure, $B = 2.75$, 95% CI $[0.22, 7.80]$, but especially among those with low exposure to unprocessed meat, $B = 9.72$, 95% CI $[3.69, 17.00]$. The strength of the indirect effects differed significantly between the groups, $\Delta B = -6.97$, 95% CI

$[-15.34, -0.34]$. In terms of the equivalent indirect effect going through increased empathy (instead of disgust), presenting the animal head had no effect on vegetarian choice among those with high exposure to unprocessed meat, $B = 0.55$, 95% CI $[-0.28, 3.03]$, but led to higher vegetarian choice among those with low exposure, $B = 16.04$, 95% CI $[8.68, 25.70]$. The strength of the indirect effects differed significantly between the groups, $\Delta B = 15.49$, 95% CI $[-25.22, -7.78]$.

Partly constrained model. As with the previously estimated country model, Wald tests were used to estimate whether the

a) Unconstrained multi-group model between participants with high and low exposure to unprocessed meat



b) Partly constrained multi-group model between participants with high and low exposure to unprocessed meat

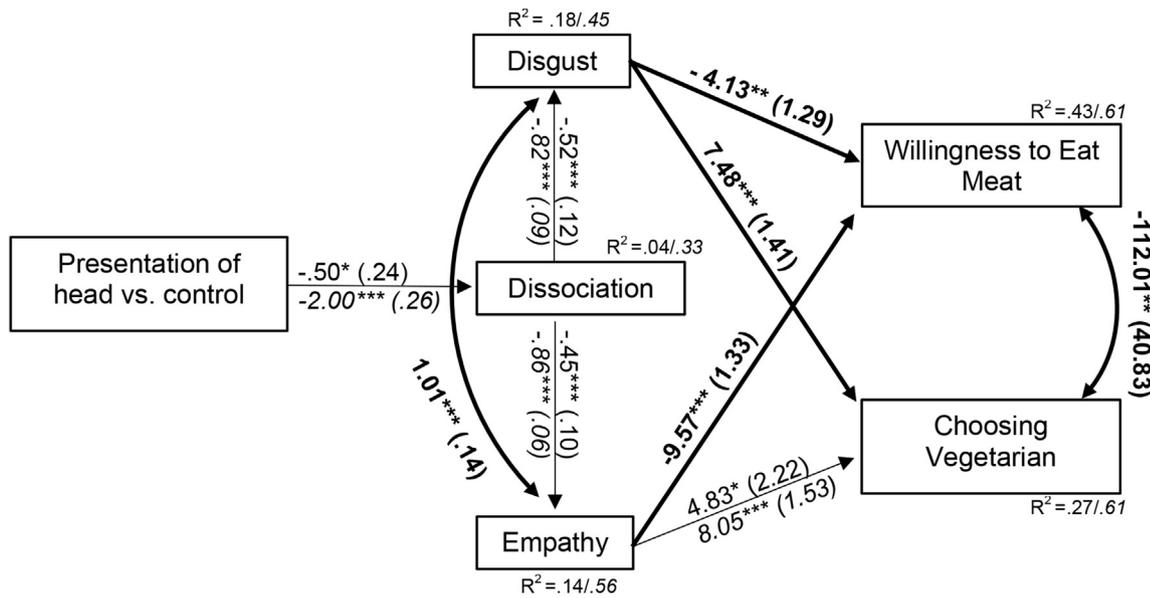


Fig. 4. The unconstrained (a) and partly constrained (b) estimated multi-group mediation models comparing individuals with high and low exposure to unprocessed meat are displayed. Upper non-italicized values represent estimates for participants with high exposure to unprocessed meat, whereas lower italicized values represent estimates for participants with low exposure. All estimates are unstandardized and standard errors are presented in parentheses. Standardized values can be found in Fig. S2 in the supplementary online materials. Paths and estimates displayed in bold are set to equality between the samples. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

present model could be simplified by constraining paths to equality across both groups. Results were highly similar to those of the country model. Constraining the effect of showing the head on dissociation, Wald test(1) = 17.65, $p < 0.001$, from dissociation on disgust, Wald test(1) = 4.68, $p = 0.030$, and from dissociation on empathy, Wald test(1) = 10.09, $p = 0.002$, significantly deteriorated

the model's fit. The only difference to the results from the country model was that constraining the path from empathy on vegetarian choice also deteriorated model fit, Wald test(1) = 6.13, $p = 0.013$. In contrast, Wald tests indicated that the path from disgust to willingness to eat meat, Wald test(1) = 0.05, $p = 0.817$, from empathy to willingness to eat meat, Wald test(1) = 0.72, $p = 0.396$, from disgust

to vegetarian choice, Wald test(1) = 3.20, $p = 0.074$, and the covariates between empathy and disgust, Wald test(1) = 0.38, $p = 0.540$, and vegetarian choice and willingness to eat meat, Wald test(1) = 2.12, $p = 0.145$, could be constrained without causing a drop in model fit. This suggested that these paths were equal among participants with high and low exposure to unprocessed meat.

Constraining the respective paths resulted in a well-fitting model, $\chi^2(N = 223, df = 17) = 23.38, p = 0.137, RMSEA = 0.058, 90\% CI [0.000, 0.111], CFI = 0.990, sRMR = 0.051$, which fitted equally good as the unconstrained model according to a chi-square difference test, $\Delta\chi^2 = 6.47, \Delta df = 13, p = 0.927$. The estimated, partly constrained model can be seen in Fig. 4b.

6. Discussion

Recent research suggested that dissociating meat from its animal origins might be a powerful way for consumers to deal with the cognitive dissonance stemming from liking meat but disliking causing pain to animals (Kunst & Hohle, 2016; Rothgerber, 2013, 2014). The present cross-cultural study nuances this observation: While dissociation seems to affect willingness to eat meat across cultures to some extent, it does so especially in societies where consumers are less exposed to unprocessed meat on a daily basis, leaving them more sensitive to cues linking meat to animal origins.

In both a country where average consumers are relatively frequently exposed to unprocessed meat (i.e., Ecuador) and a country where consumers have little such exposure (i.e., the US), presenting the head of a pork roast led to less dissociation and consequently more disgust and empathy for the killed animal. However, these effects were much more pronounced in the US than in Ecuador. Moreover, while seeing the animal head led to a higher willingness to choose a vegetarian alternative dish in both countries, it only directly reduced willingness to eat meat in the US. While these differences could have been due to many types of cultural variations between the countries, analyses using participants' exposure to unprocessed meat as moderator instead of the country variable produced the same, almost identical, pattern of results. This suggested that the cross-cultural differences indeed reflected differences in exposure to unprocessed meat.

Estimation of the whole model across countries gave important insights into the universality versus culture-specificity of the effects of dissociation on meat consumption. To start with, the effect of presenting the pork roast on dissociation was stronger in the US than in Ecuador. Hence, arguably due to repeated exposure, consumers in Ecuador were desensitized to cues reminding them of meat's animal origins so that seeing such a cue interrupted processes of dissociation to less of a degree. Importantly, also the subsequent effects of dissociation on empathy and disgust were stronger in the US than in Ecuador. This suggests that the dissociation process is not only less affected by external cues, but also that interrupting this process has less of an impact on feelings of disgust and empathy in countries where consumers are used to seeing animal carcasses. In contrast, the effects of disgust and empathy on willingness to eat meat and to choose vegetarian were equal in both countries. This observation is in line with the argument that disgust as well as empathy have universally evolved and, hence, regulate behavior equally across cultures (De Waal, 2008, 2009; Rozin & Fallon, 1980, 1987). However, because the dissociation pathway was more pronounced in the US than in Ecuador, presenting the animal head still indirectly influenced willingness to eat meat to larger extent in the US. Indeed, the model explained about double the amount of variance in the dependent variables in the US as compared to Ecuador. This suggests that the dissociation model may have higher explanatory power in countries where people are

not accustomed to cues connecting meat with their animal origins, something that also may explain cross-cultural differences observed in previous research (Ruby & Heine, 2012; Tian et al., 2016). At the same time, this observation begs the question of which other processes may explain meat consumption in countries such as Ecuador.

First, it is possible that hedonistic, evolutionary and nutritional arguments to justify meat consumption (Piazza et al., 2015) may be stronger in developing countries such as Ecuador where meat is a rarer commodity than in developed countries such as the US. However, this argument is somewhat undermined by the fact that both groups of participants in our study reported the same weekly meat consumption. Yet, as the economic advancement in Ecuador only recently has made meat more available to larger societal groups (Bermudez & Tucker, 2003), the average Ecuadorian consumer may still consider it a relatively rare commodity. Second, it is possible that the Ecuadorian participants to larger extent downplayed animals' moral status, seeing them as less intelligent and to have a lower capacity of sensation (Bastian et al., 2012; Piazza & Loughnan, 2016). Indeed, it would be interesting to test whether participants with high exposure to unprocessed meat are the ones who make use of such denial of mind the most to deal with the meat paradox (Leroy & Praet, 2017). This could be tested for instance comparing average customers with people directly working with meat processing such as butchers. Third, because Ecuadorians relatively frequently are exposed to unprocessed meat (and likely to some extent whether they want it or not), they may engage in "strategic ignorance", that is, deliberately choosing not to deal with the fact that meat comes from animals (Onwezen & van der Weele, 2016). Finally, Ecuadorians and inhabitants of many other Latin American countries may value masculinity to relatively large degrees (Diekman, Eagly, Mladinic, & Ferreira, 2005), which in turn may predict meat consumption as suggested by previous research (Rothgerber, 2013). Hence, masculinity values may have explained some of the variance in Ecuadorians' willingness to eat meat that was unaccounted for by our models.

Our study had strengths and weaknesses that should be discussed. First, comparing two countries is a strength as it allowed us to identify processes that were universal versus culture-specific. However, we did not use representative samples so that one has to be careful in fully generalizing our findings to Ecuador and the US. Also, while the Ecuadorian sample was recruited through convenience sampling, the US Americans were recruited through an online panel. Yet, while this may have limited the comparability of the samples, both groups of participants were equal on the dimensions most important to our study (i.e., meat consumption), supporting their comparability.

Related to this, we did not assess whether participants in both countries were equally familiar with the specific dish presented (i.e., a pork roast). As long as the head was not present, participants in both countries reported equal emotional reactions and an equally high willingness to eat the meat. While this may suggest a comparable familiarity with the dish in both countries, it only provides circumstantial evidence for this notion. Future research may thus profit from including direct measures of participants' familiarity with the dish to ensure such comparability. Indeed, it would be interesting to replicate our findings with a dish that both participants with high and low exposure to unprocessed meat are equally *unfamiliar* with. Because such a design would elegantly control for the familiarity factor, it would provide particularly strong convergent support for our findings.

Lastly, as in previous research (e.g., Kunst & Hohle, 2016; Tian et al., 2016; Zickfeld et al., 2018), we only measured self-reported willingness to eat meat. Given that such measures only to some extent reflect and predict real behavior, future research is still

needed to establish the ecological validity of the dissociation model.

To sum up, the present research demonstrated that dissociation influences meat consumption in two different countries. Importantly, extending previous research it showed that dissociation may predict willingness to eat meat especially in societies where people seldom are exposed to unprocessed meat.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.appet.2017.09.016>.

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