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### Rationalizing meat consumption

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1 Running Head: THE 4NS

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3 Rationalizing Meat Consumption: The 4Ns

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**Abstract**

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Recent theorizing suggests the 4Ns—that is, the belief that eating meat is

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*natural, normal, necessary, and nice*—are common rationalizations people use to

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defend their choice of eating meat. However, such theorizing has yet to be subjected

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to empirical testing. Six studies were conducted on the 4Ns. Studies 1a-1b

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demonstrated that the 4N classification captures the vast majority (83%-91%) of

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justifications people naturally offer in defense of eating meat. In Study 2, individuals

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who endorsed the 4Ns tended also to objectify (dementalize) animals and included

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fewer animals in their circle of moral concern, and this was true independent of social

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dominance orientation. Subsequent studies (Studies 3-5) showed that individuals who

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endorsed the 4Ns tend not to be motivated by ethical concerns when making food

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choices, are less involved in animal-welfare advocacy, less driven to restrict animal

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products from their diet, less proud of their animal-product decisions, tend to endorse

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Speciesist attitudes, tend to consume meat and animal products more frequently, and

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are highly committed to eating meat. Furthermore, omnivores who strongly endorsed

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the 4Ns tended to experience less guilt about their animal-product decisions,

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highlighting the guilt-alleviating function of the 4Ns.

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**Keywords:** meat, vegetarianism, rationalization, justification, animal welfare,

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attitudes

## 49 **Rationalizing Meat Consumption: The 4Ns**

### 50 **Introduction**

51 Many omnivores are confronted by a “meat paradox” (Herzog, 2010; Joy,  
52 2010; Loughnan, Bastian, & Haslam, 2014; Loughnan, Haslam, & Bastian, 2010).  
53 They are morally conflicted by the thought of their behavior harming animals, while  
54 also enjoying meat as a desirable staple in their diet. Loughnan et al. (2014) argue,  
55 consistent with cognitive dissonance theory (Cooper, 2007; Festinger, 1957; Harmon-  
56 Jones & Mills, 1999), that resolution of this conflict can take one of two routes: one  
57 can reject meat consumption, bringing one’s behaviors into alignment with one’s  
58 moral ideals, or one can bring one’s beliefs and attitudes in line with one’s behavior  
59 through various psychological maneuvers (see below). The fact that omnivores  
60 continue to make up the vast majority of the world’s population (see Ruby, 2012)  
61 suggests that the latter route is most commonly adopted.

62 Research attests that there are numerous strategies available to omnivores to  
63 bring their beliefs and behavior in line, including denying that animals used as food  
64 suffer (Bastian, Loughnan, Haslam, & Radke, 2012; Bratanova, Loughnan, & Bastian,  
65 2011), or that such animals are worthy of moral concern (Loughnan et al., 2010). One  
66 common, yet under-studied mechanism omnivores employ when resolving the meat  
67 paradox is *rationalization*. Rationalization involves providing reasonable  
68 justifications for one’s behavior when it comes under scrutiny or criticism, or when  
69 one’s behavior is perceived as discrepant with an integral aspect of one’s character  
70 (Kunda, 1990; Mercier, 2011; Tsang, 2002). Rationalizing potentially morally  
71 troublesome behaviors has both social and personal benefits. Humans live in tight-  
72 knit social groups in which it is important to manage and defend one’s actions to  
73 others (Ingram, Piazza, & Bering, 2009). Providing defensible reasons and arguments

74 for one's actions when one's actions are called into question is therefore an essential  
75 part of human sociality (Haidt, 2001; Mercier & Sperber, 2011). Rationalization is  
76 also essential to maintaining a positive image of oneself as a good, moral person  
77 (Bandura, 1999; Jordan & Monin, 2008; Mazar, Amir, & Ariely, 2008). Research  
78 suggests that people often rationalize their behavior when they are motivated to  
79 continue in a practice or belief that they might otherwise feel guilty about on account  
80 of dissenting perspectives (Kundra, 1990; Haidt, 2001; Uhlmann, Pizarro,  
81 Tannenbaum, & Ditto, 2009). While the ultimate goal of rationalization is to persuade  
82 others of the legitimacy of one's perspective, rationalization functions best if the actor  
83 is convinced by his or her own justifications (Tsang, 2002). One consequence of this  
84 motivated reasoning process is that people will often seek out arguments that support  
85 their own viewpoint, while overlooking or dismissing arguments that challenge it  
86 (Ditto & Lopez, 1992; Kuhn, 1991; Nickerson, 1998). This leads people to  
87 overestimate the amount of evidence that favors their position, known as "myside  
88 bias" or belief overkill (see Baron, 1995; Perkins, 1985; Stanovich, West & Toplak,  
89 2013).<sup>1</sup>

90 Meat eating is a practice that in recent years has become subject to criticism.  
91 Recent polls indicate that about 3-5% of adults in the U.S., and roughly 8% in Canada  
92 and 3-8% in the United Kingdom, self-identify as practicing vegetarians, though a  
93 number of polled vegetarians admit to sometimes eating meat, particularly fish or

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<sup>1</sup> In one unpublished study (Piazza, 2013) a group of Americans were asked to rate the extent to which animals were suffering as a result of current factory-farming practices in the U.S. Individuals who believed animals do not suffer much tended to also believe that raising livestock for meat does not have destructive consequences for the environment, that being a vegetarian does not help reduce world hunger, that eating meat has major health benefits and few risks, that practicing vegetarianism does not promote human-directed compassion, and that meat-based meals are more affordable than vegetarian-based meals. In short, people's beliefs about vegetarianism came packaged in such a way that the bulk of evidence was stacked highly in favor of their preferred view, consistent with a belief-overkill or myside bias.

94 poultry (Gallup, 2012; GfK Social Research, 2009; National Institute of Nutrition,  
95 1997, 2001; Vegetarian Resource Group, 2012). Vegetarians often endorse a  
96 multitude of reasons for rejecting meat or restricting meat from their diet, including  
97 health, environment, and taste (see e.g., Berndsen & van der Pligt, 2004; Rozin,  
98 Markwith, & Stoess, 1997), yet an increasingly common motivation involves moral  
99 concerns about the cruel treatment of animals raised and slaughtered for food (Amato  
100 & Partridge, 1989; Beardsworth & Keil, 1991; Fessler, Arguello, Mekdara, & Macias,  
101 2003; Fox & Ward, 2008; Herzog, 2010; Jabs, Devine, & Sobal, 1998; Lindeman &  
102 Väänänen, 2000; Ruby, 2012; Santos & Booth, 1996). Although meat eating is still  
103 the norm in most countries, many people—including meat eaters themselves—believe  
104 that vegetarianism is a morally admirable practice for which vegetarians deserve  
105 credit (Minson & Monin, 2012; Ruby & Heine, 2011). For example, Ruby and Heine  
106 (2011) found that, all else equal, individuals who reject meat are rated as more  
107 virtuous than individuals who eat meat. This was true both among vegetarian and  
108 omnivore participants, and when controlling for perceptions of the healthiness of the  
109 vegetarian target's diet.

110         One consequence of this moral accreditation is that meat eaters sometimes  
111 respond defensively to the presence of vegetarians. This may be because vegetarian  
112 appeals and campaigns sometimes come across as self-righteous, and thus off-putting.  
113 Additionally, it may be that the moral commitments of vegetarians pose an implicit  
114 threat to meat eaters' own moral identities. If some individuals refrain from eating  
115 animals out of concern for animal welfare, this raises the question of whether others  
116 should do likewise, in effect, "If *we* can do it, why don't *you*?" (see Minson & Monin,  
117 2012). Thus, omnivores today sometimes find themselves in social situations where  
118 they must defend their commitments to eating meat.

### 119 **The 3Ns of Justification**

120           According to Joy (2010), there are principally three categories of justifications  
121 that meat eaters have at their disposal to preserve their commitment to eating meat  
122 and diffuse any guilt they might otherwise experience as a consequence of consuming  
123 animal products. These justifications include that eating meat is *natural*, *normal*, and  
124 *necessary*, otherwise known as the “Three Ns of Justification” (see Joy, 2010, pp. 96-  
125 97). Joy argues that through a recurrent process of socialization people come to  
126 believe that eating meat is *natural*—that eating meat is written in our biology, meat is  
127 what we naturally crave, and it is what our species evolved to eat; that eating meat is  
128 *normal*—that it is what most people in civilized society do and what most people  
129 expect from us; and that eating meat is *necessary*—that we need meat for survival or  
130 that we need to consume at least some meat to be strong, fully healthy individuals.  
131 Joy proposes that the 3Ns are widespread beliefs that are reinforced through various  
132 social channels, including family, media, religion, and various private and public  
133 organizations. For example, one popular belief related to the *necessity* of eating meat  
134 is the idea that one cannot maintain a diet that contains enough protein without  
135 consuming at least some meat. Although scientists, including the American Dietetic  
136 Association (ADA), America’s leading organization of nutritionists, have released  
137 numerous publications showing that this is not the case (see e.g., ADA, 2009; Rand,  
138 Pellett, & Young, 2003; Young & Pellett, 1994), the belief is persistent.

139           The application of the 3Ns is not limited to meat eating. The 3Ns may be a  
140 ubiquitous set of rationalizations that have an even broader application. Many  
141 historical practices, from slavery to sexism, have invoked the 3Ns as justification. For  
142 example, in defense of male-only voting practices in the U.S. opponents of women’s  
143 suffrage often appealed to the *necessity* of denying women the vote to prevent

144 “irreparable damage” to the nation, to the *natural* superiority of male intelligence, and  
145 to the historical *normalness* of male-only voting as “designed by our forefathers”  
146 (Joy, 2010, p. 97; see footnote for a contemporary example).<sup>2</sup> Today, most people  
147 find such arguments in support of male-only voting ludicrous at best. However, it is  
148 often only after a system collapses that people come to scrutinize or question the  
149 justifications supporting it. By contrast, when an ideology is widely endorsed, as meat  
150 eating is in most parts of the world today, the justifications supporting the ideology  
151 generally go unchallenged. Unless directly challenged by an alternative viewpoint,  
152 people tend not to question the legitimacy of their rationalizations (see Haidt, 2001).

### 153 **A fourth “N” and present research**

154         Although there have been some qualitative studies of the 3Ns, mainly by Joy  
155 (2010), there is currently almost no systematic, quantitative research in support of the  
156 3Ns as prevalent meat-eating justifications. Nor has there been any work investigating  
157 the relationship between 3N endorsement and people’s eating practices, meat and  
158 animal-product consumption, or attitudes towards animal welfare. Thus, the present  
159 research was intended to fill this empirical gap.

160         Before we outline our research plan and hypotheses, there is one final matter  
161 to address. There may be a fourth N specific to meat eating, not captured under the  
162 3N justification scheme. Several lines of evidence suggest that the enjoyment people  
163 derive from eating meat is a major barrier to reducing meat consumption and/or  
164 adopting a vegetarian diet (e.g., Kenyon & Barker, 1998; Lea & Worsely, 2001, 2003;  
165 Ruby, 2012). For example, Lea and Worsely (2001) found “meat appreciation and

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<sup>2</sup> 3N justifications are currently being applied within various ongoing, ideological debates. As one example, opponents of same-sex marriage often appeal to the *necessity* of limiting marriage to heterosexual couples to prevent “further weakening of the institution...giving people in polygamous, incestuous, bestial, and other nontraditional relationships the right to marry”, to the *naturalness* of marriage as “a union of man and woman, uniquely involving the procreation and rearing of children within a family”, and to the *normalness* of heterosexual marriage as an institution “as old as the book of Genesis” (Gay Marriage ProCon.org, 2014).



166 enjoyment” to be one of the biggest obstacles for Australian women contemplating a  
167 vegetarian diet. Likewise, Rothgerber (2013) found that pro-meat attitudes, which  
168 tend to be higher among men, are a strong predictor of continued meat consumption.  
169 Furthermore, as we discuss below (see Studies 1a-1b), when meat-eaters are asked to  
170 defend their right to eat meat, they often appeal to the tastiness of meat, or the  
171 hedonic pleasure that they derive from it, as a justification for its continued  
172 consumption.

173 For these reasons, we submit *nicensess* as a fourth N (justification) used in  
174 defense of eating meat, closing out the 4Ns at *natural*, *normal*, *necessary*, and *nice*.  
175 We speculate that *nice* has largely been ignored by theorists as a potential justification  
176 category because it constitutes a very weak moral defense. This becomes apparent  
177 when it’s applied to less controversial ideologies, such as sexism. Imagine someone  
178 making the argument that men should continue to be granted favor in society simply  
179 because men derive pleasure from their elevated position. Few people would find  
180 such an argument defensible, as it prioritizes the relatively trivial pleasure of some  
181 (men) over the much deeper suffering of others (women). Yet this argument is  
182 analogous to the one employed in defense of eating meat on account of the pleasure  
183 humans derive from it.<sup>3</sup>

184 In the present research, we tested whether the 4Ns are in fact the principal  
185 justifications omnivores offer in defense of their commitment to eating meat. In  
186 Studies 1a and 1b, we tested this very simply by having omnivores provide three  
187 reasons why they think it is acceptable to eat meat, and we coded their responses via  
188 independent raters. In Studies 2-5, our main aim was to develop an instrument for

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<sup>3</sup> Of course, one can argue that sexism and animal welfare are not completely analogous insofar as sexism negatively affects *people* and meat eating negatively affects *animals*. But unless a person does not care at all about the suffering of animals used as food, the argument remains analogous by degree.

189 reliably assessing 4N endorsement along a continuum, which could be used to assess  
190 the strength of an individual's commitment to defending the legitimacy of their meat  
191 consumption. Finally, in these latter studies, we sought to test a number of predictions  
192 about the role of 4N endorsement in relation to people's dietary practices, meat  
193 consumption, and the moral attitudes they hold towards animals.

#### 194 **Study 1a and 1b – Spontaneous Justifications for Eating Meat**

195 The aim of these studies was to test whether the 4Ns would emerge as the  
196 lion's share of spontaneous justifications omnivores offer in defense of eating meat.  
197 The method was simple: we asked two different groups of individuals (university  
198 students in Study 1a; Mechanical Turk workers in Study 1b) to provide three reasons  
199 why it is "OK" to eat meat, and independent raters coded their responses.

#### 200 **Study 1a**

201 **Participants, materials, and procedures.** We recruited 188 students from the  
202 University of Pennsylvania to participate in exchange for course credit. The study was  
203 embedded in a larger package of studies with non-overlapping themes. In response to  
204 a filter question, "Do you ever eat meat, for example, beef, pork/ham, chicken, turkey,  
205 fish or other kinds of seafood?" twelve participants (6%) reported that they never eat  
206 meat. The remaining 176 meat-eating participants (114 women, 62 men;  $M_{age} = 19.66$ ,  
207  $SD = 2.07$ ) continued with the meat-eating justification question, while the twelve  
208 non-meat-eaters skipped this question. Participants were instructed: "Please give  
209 three reasons why you think it is OK to eat meat," and were provided three separate  
210 textboxes to type in their three reasons. Among the sample of 176 meat eaters, 91%  
211 reported being "omnivores", 6% "semi-vegetarians", and 3% "pescetarians" (fish or  
212 seafood was the only meat they ate); 81% were American, 19% had other

213 nationalities. The sample was ethnically diverse, religiously diverse, and, on average,  
 214 politically moderate.<sup>4</sup>

215 **Coding of justifications.** Two participants offered only two justifications,  
 216 while all others offered three, producing a grand total of 526 responses. Three of the  
 217 authors [JP, MBR, SL] each read the entirety of responses given and together they  
 218 devised a coding scheme to fully capture the range of responses offered (see Table 1  
 219 for coding scheme and examples for each category). Next, two of the authors [JP,  
 220 MBR] separately coded a different half of the responses using the coding scheme, and  
 221 a third person, an English-speaking undergraduate student, blind to the objectives of  
 222 the study, independently coded all of the responses. Interrater agreement was high  
 223 between both sets of coders. There were 236 agreements out of 264 between the  
 224 independent coder and JP (89.4% agreement rate). There were 250 agreements out of  
 225 262 between the independent coder and MR (95.4% agreement). Disagreements  
 226 between the raters were resolved via joint discussion sessions. Twelve responses were  
 227 determined to be unscorable, leaving a final total of 514 scored responses.

228 **[Insert Table 1 about here]**

## 229 **Results**

230 Figure 1 presents the frequency of each response category. The 4Ns accounted  
 231 for 83% of the total justifications offered. Necessary was the largest category,  
 232 followed by Nice, Natural, and Normal, respectively. There were a fairly large

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<sup>4</sup> Study 1a ethnicity: 51% White/Caucasian, 24% East Asian, 9% Hispanic, 7% Black/African American, 9% other or multiple ethnicities. Religion: 23% Jewish, 21% Catholic, 10% Protestant, 4% Other Christian denomination, 3% Evangelical Christian, 3% Muslim, 3% Buddhist, 2% Hindu, 3% Personal spirituality, 9% had no religion/faith, 9% Agnostic, 10% Atheist. Measured on 1-7 scales, the sample was on average politically moderate ( $M = 3.27$ ,  $SD = 1.31$ , 1 = "Very liberal", 7 = "Very conservative"), somewhat religious ( $M = 2.78$ ,  $SD = 1.60$ , 1 = "Not at all religious", 7 = "Very religious"), and moderately spiritual ( $M = 3.53$ ,  $SD = 1.75$ , 1 = "Not at all spiritual", 7 = "Very spiritual").

233 percent of miscellaneous justifications in this sample, but the percent of  
234 miscellaneous justifications never exceeded the percent obtained for each of the 4Ns.

235 **[Insert Figure 1 about here]**

236 In sum, the 4Ns made up the bulk of justifications spontaneously offered by  
237 omnivores in defense of eating meat. In Study 1b, we sought to replicate this finding  
238 using a different, non-student sample.

### 239 **Study 1b**

240 We recruited 107 adults (49 women, 57 men;  $M_{\text{age}} = 34.90$ ,  $SD = 12.15$ ) using  
241 Amazon's Mechanical Turk ([www.mturk.com](http://www.mturk.com)). All participants were located in the  
242 U.S. and paid for their participation. Although we did not assess participants' diet in  
243 this study, rates of non-omnivores (strict vegetarians and vegans) among MTurk  
244 workers tend to reflect levels on par with the overall population (1-5%; see Studies 3-  
245 5). The phrasing of the meat justification probe was the same as in Study 1a (i.e.,  
246 "Please give three reasons why you think it is OK to eat meat"). A total of 321  
247 responses were collected. Two independent raters (undergraduate students; one blind  
248 to the hypotheses) coded the responses and agreed in their classification 95.7% of the  
249 time. Disagreements were resolved between the two raters through discussion.

250 As can be seen in Figure 2, the category frequencies were quite consistent  
251 with the results from Study 1a. The 4Ns accounted for 91% of the total justifications  
252 offered. As in Study 1a, Necessary was the most frequent justification category.  
253 Necessary was followed by Natural, Nice, and Normal, respectively. Thus, the results  
254 largely replicated Study 1a, yet with an even larger representation of the 4Ns offered  
255 as justifications for eating meat.

256 **[Insert Figure 2 about here]**

257           Studies 1a and 1b demonstrated the prevalent use of the 4Ns as justifications  
258 for eating meat. In the following studies, we turn to the objectives of developing a  
259 reliable instrument (the 4N scale) for assessing 4N endorsement as a continuous  
260 measure, and testing the relationship between 4N endorsement and various dietary  
261 and animal-welfare practices and motivations.

## 262                           **Study 2 – The 4Ns and Moral Concern for Animals**

263           Study 2 had four objectives. First, we developed a scale for assessing 4N  
264 endorsement as a continuous variable. Second, we sought to show that individuals  
265 with dietary restrictions regarding meat would endorse the 4Ns to a lesser extent than  
266 individuals without these restrictions. Third, we tested whether our newly developed  
267 4N scale would predict various morally relevant attitudes towards animals, including  
268 the diversity of animals one cares about and the degree to which individuals attribute  
269 mental capacities to animals. Increasing evidence suggests that meat eaters *objectify*  
270 or de-mentalize animals (i.e., deny that animals have mental properties, such as the  
271 capacity to suffer or experience pleasure), particularly when they are confronted by an  
272 ostensible contradiction between eating meat and caring about animals (Bastian et al.,  
273 2012; Bratanova et al., 2011; Loughnan et al., 2010). For example, in one study  
274 (Loughnan et al., 2010), participants were randomly assigned to consume either beef  
275 jerky or nuts, and, subsequently, to rate a cow’s capacity to suffer. Participants who  
276 ate beef rated cows as less capable of suffering than participants who ate nuts,  
277 possibly as a means of reconciling their beliefs (“cows don’t matter”) with their  
278 actions (“I eat cows”). Here we sought to test the hypothesis that individuals who tend  
279 to de-mentalize animals also tend to rationalize their meat eating.

280           As a final objective, we sought to show that endorsement of the 4Ns is greater  
281 among individuals who tend to endorse anti-egalitarian values and support

282 hierarchical group-based systems of inequality (Pratto, Sidanius, Stallworth, & Malle,  
283 1994). Some previous research by Allen, Wilson, Ng, and Dunne (2000) suggests that  
284 individuals on the higher end of the vegetarian-omnivore continuum (i.e., those who  
285 consume higher quantities of meat) tend to be more supportive of inequality in group  
286 relationships than individuals on the lower end. In particular, they found modest  
287 correlations between omnivore identification and both right-wing authoritarianism  
288 (Altemeyer, 1981) and social dominance orientation (SDO; Pratto et al., 1994).  
289 Individuals high in SDO are motivated to see their own groups dominate other  
290 groups. Arguably, motivations to defend meat consumption may share a common  
291 origin with motivations for group-based inequality (i.e., between humans and  
292 animals). Thus, we expected 4N endorsement to correlate positively with SDO.  
293 However, we also expected 4N endorsement to have explanatory power that extends  
294 beyond any relationship it has with SDO, as we expect omnivores low in SDO to also  
295 engage in meat-consumption rationalization. Consistent with such a hypothesis, we  
296 predicted that 4N endorsement would *negatively* predict mentalizing (attributing  
297 mental states to animals) and moral regard for animals, independent of SDO.

## 298 **Method**

299 **Participants and dietary classification.** Participants were 171 students from  
300 the University of Melbourne, Australia (106 women, 63 men, 2 other or missing;  $M_{age}$   
301 = 22.91,  $SD = 5.11$ ). Participants were recruited from a university campus food hall.  
302 Participation was voluntary. Diet was assessed on a continuum rather than as a  
303 dichotomous choice (for similar approaches, see Allen et al., 2000; Hamilton, 2006;  
304 Rozin et al., 2012). Participants reported one of seven diets ranging from strong  
305 identification with meat eating (meat-eater, or omnivore) to restricted omnivore  
306 (limited meat intake, e.g., only fish or chicken, no red meat) to strong identification

307 with meat abstinence (lacto-ovo vegetarian, or vegan). Based on their self-reported  
308 diet, participants were divided into three groups (73 omnivores; 40 restricted  
309 omnivores; 58 vegetarians and vegans).

310 **Measures.**

311 **4N Scale.** Sixteen items, four items per N, were generated by three of the  
312 authors [JP, SL, HMW], taking inspiration partly from Joy's (2010) discussion of the  
313 3Ns of Justification. The four resulting subscales with their corresponding items and  
314 Cronbach's  $\alpha$ s were as follows:

- 315 • **Natural** ("It is only natural to eat meat", "Our human ancestors ate meat all  
316 the time", "It is unnatural to eat an all plant-based diet", "Human beings are  
317 natural meat-eaters – we naturally crave meat";  $\alpha = .78$ )
- 318 • **Necessary** ("It is necessary to eat meat in order to be healthy", "A healthy diet  
319 requires at least some meat", "You cannot get all the protein, vitamins and  
320 minerals you need on an all plant-based diet", "Human beings need to eat  
321 meat";  $\alpha = .87$ )
- 322 • **Normal** ("It is normal to eat meat", "It is abnormal for humans not to eat  
323 meat", "Most people eat meat, and most people can't be wrong", "It is  
324 common for people to eat meat in our society, so not eating meat is socially  
325 offensive";  $\alpha = .65$ )
- 326 • **Nice** ("Meat is delicious", "Meat adds so much flavor to a meal it does not  
327 make sense to leave it out", "The best tasting food is normally a meat-based  
328 dish (e.g., steak, chicken breast, grilled fish)", "Meals without meat would just  
329 be bland and boring";  $\alpha = .84$ ).

330

331 The overall scale had a strong internal reliability ( $\alpha = .93$ ). Participants rated their  
332 level of agreement or disagreement with each item on a 1-7 scale (1 = *completely*  
333 *disagree*; 4 = *neither agree nor disagree*; 7 = *completely agree*).

334 ***Moral concern for animals and mind attribution.*** To examine whether these  
335 dietary groups can be distinguished on the basis of how they think about animals, we  
336 measured moral concern and mind attribution. To measure moral concern, we adapted  
337 the “moral circle” measure from Laham (2009) (see also Bratanova, Loughnan, &  
338 Gatersleben, 2012; Loughnan et al., 2010). Participants were presented with a list of  
339 26 animals prefaced with the instruction: “When we think about entities in the world,  
340 we might feel a moral obligation to show concern for the welfare and interests of  
341 some of those entities. Below is a list of entities. Circle those that you feel morally  
342 obligated to show concern for.” We used the number of animals circled divided by the  
343 total number of possible animals as their *moral concern* score, with higher scores  
344 indicating larger moral circles. To assess mind attribution, or more precisely the  
345 extent to which people *deny* mental states to food animals, participants were asked to  
346 imagine a cow (beef is the most commonly consumed meat in Australia; Australian  
347 Bureau of Statistics, 2013) and to rate the extent to which they believe the cow  
348 possessed 20 mental capabilities on a Likert scale (1 = *definitely does not possess*; 7 =  
349 *definitely does possess*). The scale comprises two dimensions previously identified to  
350 capture the way people think about minds (see Gray, Gray, & Wegner, 2007): agency  
351 (8 items; e.g., *planning, self-control*) and experience (12 items; e.g., *joy, hunger*). All  
352 20 items were averaged as our measure of *mind attribution*. The overall reliability of  
353 the scale was good ( $\alpha = .89$ ).

354 ***Social dominance orientation.*** Previous work has identified endorsement of  
355 social inequality as an important characteristic in distinguishing between vegetarians



356 and omnivores (Allen et al., 2000). We therefore measured the extent to which  
357 participants possessed system-justifying tendencies such as endorsement of  
358 hierarchical group dominance (e.g., “Superior groups should dominate inferior  
359 groups”; 1 = *strongly agree*; 7 = *strongly disagree*), using the 16-item Social  
360 Dominance Orientation questionnaire ( $\alpha = .91$ ; Pratto et al., 1994).

361 **Procedure.** Participants were recruited by one of the authors [ML] from a  
362 university food hall between 10am and 3pm over a two-month period. All people  
363 entering the area were approached and asked to participate. On agreement, they were  
364 provided with a questionnaire<sup>5</sup>, which they completed independently. The order of  
365 scales used in the questionnaire was counterbalanced using a Latin-square design, and  
366 all items were presented in a standard random order.

### 367 **Results**

368 Correlations between the 4N scale and other measures can be seen in Table 2.  
369 Skewness was an issue particularly for the moral concern and mind attribution  
370 measures, due to significant differences in responding as a function of diet. Thus, to  
371 reduce Skewness we log transformed scores for these measures prior to calculating  
372 Pearson’s correlations. The data contained small amounts of missing data where  
373 participants did not complete all measures, and this is reflected in the variable degrees  
374 of freedom across the analyses.

375 **[Insert Table 2 about here]**

376 **4N scale.** There was a main effect of diet on overall 4N endorsement,  
377  $F(2,168) = 130.22, p < .001, \eta^2_p = .608$ —a very large overall effect. It was predicted  
378 that individuals would endorse the 4Ns in relation to their level of meat restriction in

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<sup>5</sup> Aquino and Reeds’ (2002) 10-item moral identity scale was also included in the questionnaire, and had no clear relationship to the 4N scale. Please contact the authors for more information.

379 their diet. Consistent with this prediction, omnivores endorsed the 4Ns at a  
380 significantly higher rate ( $M = 4.06$ ,  $SD = 0.96$ ) than both restricted omnivores ( $M =$   
381  $2.58$ ,  $SD = 0.77$ ) and vegetarians/vegans ( $M = 1.82$ ,  $SD = 0.56$ ), and restricted  
382 omnivores endorsed the 4Ns significantly more than vegetarians/vegans,  $p < .001$  for  
383 all comparisons (Tukey's HSD). Consistent with a belief-overkill effect or myside  
384 bias, these diet-based differences held across all four subscales,  $F_s > 59.40$ ,  $p_s < .001$ ,  
385  $\eta^2_p = .354-.594$ ;  $p_s < .03$  for all groupwise comparisons (see Figure 3).

386 A few further observations are worth noting. First, of all the Ns, Natural had  
387 the highest endorsement ratings among individuals with meat-restricted diets. Second,  
388 Normal had the lowest level of endorsement among omnivores. Finally, Nice  
389 produced the largest drop in endorsement ratings when comparing omnivores with  
390 restricted omnivores and vegetarians/vegans.

391 **[Insert Figure 3 about here]**

392 **Moral concern.** Diet had an overall effect on moral concern for animals,  
393  $F(1,156) = 33.52$ ,  $p < .001$ ,  $\eta^2_p = .302$ . As expected, omnivores included fewer  
394 animals in their circle of moral concern ( $M = .52$ ,  $SD = .32$ ), as compared to both  
395 restricted omnivores ( $M = .72$ ,  $SD = .35$ ) and vegetarians/vegans ( $M = .96$ ,  $SD = .16$ ),  
396 Tukey's HSD tests,  $p_s < .002$ . Likewise, restricted omnivores included fewer animals  
397 in their moral circle than did vegetarians/vegans,  $p < .001$ . Thus, increased adherence  
398 to a meat-based diet was associated with less moral concern for animals.

399 **Mind attribution.** Diet had an overall effect on mind attribution to animals,  
400  $F(2,168) = 21.83$ ,  $p < .001$ ,  $\eta^2_p = .206$ . On average, vegetarians/vegans attributed  
401 animals more mind ( $M = 5.51$ ,  $SD = 0.75$ ) than did omnivores ( $M = 4.56$ ,  $SD = 0.85$ )  
402 and restricted omnivores ( $M = 4.97$ ,  $SD = 0.82$ ), Tukey's HSD,  $p_s < .005$ . Likewise,  
403 restricted omnivores attributed more mind to animals than did omnivores,  $p = .029$ . In

404 short, increased adherence to a meat-based diet was associated with attributing less  
405 mind to animals.

406 **SDO.** There was an overall effect of diet on system justification  
407 endorsement as measured via SDO,  $F(2,168) = 27.09, p < .001, \eta^2_p = .244$ . As  
408 expected, omnivores were more likely to endorse exploitative ideologies ( $M = 2.87,$   
409  $SD = 0.98$ ) than were restricted omnivores ( $M = 2.01, SD = 0.70$ ) and  
410 vegetarians/vegans ( $M = 1.87, SD = 0.70$ ), Tukey's HSD,  $ps < .001$ , who in turn did  
411 not differ in SDO,  $p = .70$ .

412 **Regression analysis.** To examine whether 4N endorsement predicted moral  
413 concern for animals and mind attribution to animals independent of SDO, we entered  
414 the 4N scale and SDO simultaneously into a regression predicting moral concern, and,  
415 separately, predicting mind attribution. For both measures, the 4N scale predicted a  
416 significant portion of variance independent of SDO: 4N endorsement independently  
417 predicted having a *less inclusive* moral circle,  $\beta = -.34, t(156) = -4.37, p < .001$ , and  
418 attributing *less* mind to animals,  $\beta = -.26, t(168) = -3.38, p = .001$ , as did SDO,  $\beta = -$   
419  $.31, t(156) = -3.99, p < .001$ , and  $\beta = -.30, t(168) = -3.86, p < .001$  (respectively).

420 In sum, omnivores endorsed the 4Ns to a greater extent than did individuals  
421 who had more meat-restricted diets. This was true across all four Ns. Furthermore, 4N  
422 endorsement predicted moral concern for fewer animals and less mentalizing,  
423 independent of SDO, though 4N endorsement correlated with SDO. Thus, 4N meat  
424 justification appears to be related to inequality justification, but it has predictive value  
425 beyond this relationship.

### 426 **Study 3 – The 4Ns and Other Meat-eating Psychological Defenses**

427 The main aim of Study 3 was to explore the relationship between the 4N  
428 scale with another recently developed measure of psychological defenses meat

429 eaters engage in—Rothgerber’s (2013) Meat-Eating Justification (MEJ) scale. The  
430 MEJ assesses a number of different psychological strategies, including both direct  
431 and indirect strategies. Within Rothgerber’s theorizing, direct strategies include  
432 *denying* that animals suffer when being raised and killed for meat, a process related  
433 to objectification, discussed in Study 2 (e.g., “Animals do not feel pain the same  
434 way humans do”); general *pro-meat* appeals (e.g., “I enjoy eating meat too much to  
435 ever give it up”); and explicit endorsements of various justifications for eating meat,  
436 including *religious justifications* (e.g., “God intended for us to eat animals”), *health*  
437 *justifications* (e.g., “Meat is essential for strong muscles”), *hierarchical*  
438 *justifications* (e.g., “Humans are at the top of the food chain and meant to eat  
439 animals”), and *fate or destiny justifications* (e.g., “Our early ancestors ate meat, and  
440 we are supposed to also”). From our perspective, many of these justification  
441 categories are encompassed by several of the 4N categories, specifically, Natural  
442 (hierarchy, fate, religion<sup>6</sup>) and Necessary (health), and the *pro-meat* subscale is  
443 quite similar to Nice. Thus, it would be surprising if the 4N scale did not correlate  
444 highly with the MEJ-Direct strategies. At the same time, the MEJ also assesses two  
445 indirect strategies available to meat eaters, which includes *avoiding* thoughts of  
446 animal suffering (e.g., “I try not to think about what goes on in slaughterhouses”),  
447 and *dissociating* meat from its origins (e.g., “I do not like to think about where the  
448 meat I eat comes from”). Given that the 4N scale is a measure of meat-eating  
449 rationalizations, and thus has less in common with these indirect strategies, we  
450 refrained from speculating about the 4N scale’s relationship with the MEJ-Indirect

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<sup>6</sup> The MEJ religion category is operationalized in terms of meat consumption fulfilling God’s natural order or God’s will for humans to have dominion over animals, which is encompassed by the Natural category in the 4N scheme.

451 subscale, though we anticipated that its relationship with this subscale would be  
452 much weaker than its relationship with the MEJ-Direct subscale.

453 As a secondary aim we sought to investigate the relationship between 4N  
454 endorsement and various food choice motivations, including ethical food choice  
455 motivations such as animal welfare or environmental concerns. We predicted that  
456 people who endorse the 4Ns should be *less* motivated by ethical concerns when  
457 making food choices. Finally, as an exploratory goal, we assessed the role of  
458 gender in 4N endorsement.

#### 459 **Method**

460 **Participants and diet.** We recruited a new sample of 195 adults via  
461 Mechanical Turk. All participants were located in the U.S. and were compensated  
462 for their participation. Three participants did not complete the survey, leaving a total  
463 of 192 (100 women, 83 men, 5 other or missing;  $M_{\text{age}} = 35.74$ ,  $SD = 13.02$ ). The  
464 majority of the sample identified as “omnivores/non-vegetarians” (86%), 9% as  
465 “partial vegetarians,” and 5% as “other” (e.g., pescetarian). Nine additional  
466 participants were recruited that identified as vegetarian or vegan, but due to  
467 experimenter error they did not receive the full battery of materials (specifically,  
468 they did not receive the MEJ scale), and thus were not included in the analyses  
469 reported here (exceptions are footnoted).

470 **Materials and procedures.** In the following set order, participants  
471 answered several subscales of the Food Choice Questionnaire (FCQ: Health,  
472 Familiarity, Sensory appeal, Natural content, and Weight control; only the three-  
473 highest loading items from each subscale were administered, 15 items total; see  
474 Steptoe, Pollard, & Wardle, 1995), the Animal Welfare and Environmental  
475 Protection subscales of the Ethical Food Choice Questionnaire (5 items total;

476 Lindman & Väänänen, 2000), the Meat-Eating Justification (MEJ) Scale (27 items  
477 total; Rothgerber, 2013), and a slightly revised version of the 16-item 4N Scale (one  
478 Normal item was reworded; for subscale reliabilities see footnote).<sup>7</sup> In this study,  
479 the 4N scale had a strong internal reliability (Cronbach's  $\alpha = .94$ ).

480 The FCQ presents participants with a number of statements that finish the  
481 sentence, "It is important that the food I eat on a typical day..." (e.g., "...*keeps me*  
482 *healthy*"). The Animal Welfare and Environmental Protection subscales follow the  
483 same format, as they were designed as an extension of the FCQ (see Lindman &  
484 Väänänen, 2000; e.g., "...*has been produced in a way that animals have not*  
485 *experienced pain*"; "...*has been prepared in an environmentally friendly way*").  
486 The scale ranged from 1 = *Not at all important* to 4 = *Very important*.

487 The MEJ (Rothgerber, 2013) contains nine first-order subscales (pro-meat,  
488 deny, dichotomize, fate, religion, health, hierarchy, dissociation, avoid) that can be  
489 further divided into two second-order subscales (Direct vs. Indirect strategies). Each  
490 first-order subscale contains three items. The *dichotomize* subscale, which was not  
491 discussed above, is a first-order MEJ subscale designed to assess the process of  
492 dichotomizing (or splitting) animals into different categories, such as "pets" vs.  
493 "food animals." As reported by Rothgerber (2013), the dichotomize subscale  
494 generally produces the lowest internal reliabilities ( $\alpha$ s ranged from .53 to .55), and  
495 the dichotomize items tend to load more highly with the direct items than the

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<sup>7</sup> For this study, we amended one of the Normal items to avoid a double-barreled phrasing. The item "It is common for people to eat meat in our society, so not eating meat is socially offensive" was amended to simply "In my country, not eating meat breaks social norms." Amending this item led to a slight improvement in the internal reliability of the Normal subscale (Cronbach's  $\alpha = .71$ ). Reliabilities for the other subscales ranged from .81-.95. An exploratory factor analysis of the 4N items, using parallel analysis as our extraction method, revealed a single-factor solution (eigenvalue = 8.77) explaining 54.8% of the total variance. Arguably, a second factor (eigenvalue = 1.59) comprised of just one of the Normal items also emerged. Thus, in the latter studies (see esp. Study 5) we continued to make further improvements to the Normal subscale.

496 indirect items. Thus, we treated dichotomize as a direct factor. In previous studies,  
497 Rothgerber (2013) found that men tend to endorse the MEJ-Direct strategies more  
498 so than women, while women tend to adopt the indirect strategies more so than men  
499 (the exception being *dichotomize*, which did not differ by gender). It was also found  
500 that many of the direct strategies correlated positively with meat consumption (i.e.,  
501 they functioned successfully as meat-eating defenses), while the indirect strategies  
502 often correlated negatively with meat consumption (i.e., they were counter-  
503 productive as meat-eating defenses). Rothgerber did not report factor analyses of the  
504 MEJ items. Nonetheless, in our sample, the 27 MEJ items factor loaded onto three  
505 separate factors (eigenvalues = 8.87, 4.26, 2.00), accounting for 56.1% of the  
506 cumulative variance. The first factor was comprised of all of the direct items  
507 (including dichotomize items), and the second factor was comprised of all the  
508 indirect items. The third factor was comprised of the three religious justification  
509 items, which cross-loaded with the first factor. Since all of the religious items  
510 loaded more strongly with the first factor than the third factor, we dropped the third  
511 factor and aggregated the religious items with the other direct items—which is  
512 consistent with Rothgerber’s theorizing.

513 We assessed MEJ in terms of participants’ level of agreement or  
514 disagreement with the items on a -4 (*Strongly disagree*) to 4 (*Strongly agree*) scale  
515 (with 0 = *Neither agree nor disagree*). The same 9-point bipolar scale was used for  
516 the 4N scale. Basic demographic information (gender, age, socio-economic status  
517 [SES] relative to other Americans) was also collected.

## 518 **Results**

519 **Preliminary analysis.** Repeated-measures t-tests between the subscales  
520 revealed that Nice ( $M = 1.23$ ,  $SD = 1.89$ ) was endorsed to a greater extent than were

521 the other Ns (all  $ps < .001$ ), followed by Natural ( $M = 0.85$ ,  $SD = 1.68$ ). Participants  
522 endorsed that eating meat is Necessary ( $M = 0.34$ ,  $SD = 2.23$ ) and Normal ( $M =$   
523  $0.13$ ,  $SD = 1.68$ ) at equal levels ( $p = .091$ ), yet lower than endorsement levels for  
524 Nice and Natural ( $ps < .001$ ).

525 Overall, men endorsed the 4Ns more strongly ( $M = 6.02$ ,  $SD = 1.45$ ) than  
526 did women ( $M = 5.36$ ,  $SD = 1.70$ ),  $F(1, 182) = 8.01$ ,  $p = .005$ ,  $\eta^2_p = .042$  (we  
527 excluded “other gender” participants from the analysis of gender). Respectively,  
528 men endorsed Normal ( $M = 5.52$ ,  $SD = 1.60$  vs.  $M = 4.80$ ,  $SD = 1.70$ ) and Nice ( $M$   
529  $= 6.79$ ,  $SD = 1.66$  vs.  $M = 5.84$ ,  $SD = 1.91$ ) more than women,  $F_s > 8.77$ ,  $ps < .004$ ,  
530  $\eta^2_p = .046$ -. $066$ , but did not differ from women in their endorsement of Natural or  
531 Necessary,  $F_s < 3.24$ ,  $ps > .07$ ,  $\eta^2_p = .015$ -. $017$ . Consistent with Rothgerber’s  
532 (2013) findings, overall men scored higher on the MEJ than women ( $M = 5.38$ ,  $SD$   
533  $= 1.26$ ),  $F(1, 182) = 6.88$ ,  $p = .009$ ,  $\eta^2_p = .036$ , but this was due to men engaging in  
534 more direct strategies ( $M = 5.91$ ,  $SD = 1.20$ ) than women ( $M = 5.09$ ,  $SD = 1.52$ ),  
535  $F(1, 182) = 15.99$ ,  $p < .001$ ,  $\eta^2_p = .081$ . By contrast, women engaged in more  
536 indirect strategies ( $M = 6.40$ ,  $SD = 1.66$ ) than men ( $M = 5.61$ ,  $SD = 1.96$ ),  $F(1, 182)$   
537  $= 8.94$ ,  $p = .003$ ,  $\eta^2_p = .047$ . Neither the 4N scale nor the MEJ scale correlated  
538 significantly with participants’ age or SES ( $rs < .08$ ,  $ps > .29$ ).

539 The 4N scale correlated moderately to highly with all seven of the MEJ-  
540 Direct subscales, but it did not correlate with either of the MEJ-Indirect subscales  
541 (see Table 3). The 4N Scale correlated at  $r = .84$  with the overall MEJ-Direct scale,  
542 and  $r = -.04$  with the MEJ-Indirect scale. This makes sense theoretically, as the  
543 indirect strategies of dissociating or avoiding thoughts of animal suffering are  
544 passive responses, whereas the direct strategies involve many explicit  
545 rationalizations, much like the 4Ns. It is not surprising then that the MEJ-Pro-meat,



546 MEJ-Hierarchy, MEJ-Fate and MEJ-Health subscales have the highest correlations  
547 with the 4N scale, given their similarities with the 4N-Nice, 4N-Natural and 4N-  
548 Necessary subscales.

549 **[Insert Table 3 about here]**

550 **Food choice motivations.** Table 4 depicts the correlations between the 4N  
551 scale and the various food-choice motivations, and the same for the MEJ scale.

552 With regards to non-ethical motivations, people who selected food on the basis of  
553 its familiarity were more inclined to endorse the 4Ns. With regards to ethical  
554 motivations, as predicted, individuals who were concerned about the environment,  
555 and to a lesser extent animal welfare, were *less* inclined to endorse the 4Ns.<sup>8</sup> The  
556 MEJ behaved very similarly to the 4N scale, with the addition that the MEJ  
557 correlated negatively with natural content motivations as well (see Table 4).

558 **[Insert Table 4 about here]**

559 In sum, men endorsed the 4Ns to a greater extent than did women. The 4N  
560 scale correlated with other types of meat-eating justifications and defenses, as  
561 measured by the MEJ-Direct subscale, but endorsement of the 4Ns was unrelated to  
562 dissociation and avoidance meat-eating strategies. Additionally, individuals who  
563 endorsed the 4Ns were motivated to make food choices on the basis of the familiarity  
564 of the food, while individuals who rejected the 4Ns were motivated to select foods  
565 that promote animal and ecological welfare. Similar results were obtained for the  
566 MEJ-Direct subscale. Although the two scales have some overlapping components,  
567 we believe the 4N scale has several distinct methodological strengths, which we  
568 discuss at length in the General Discussion.

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<sup>8</sup> When the nine vegetarians/vegans were included in the analysis the correlation between animal welfare and the 4Ns was significant,  $r(199) = -.18, p = .011$ , as was the correlation between environmental protection and the 4Ns,  $r(199) = -.21, p = .003$ .



594 this may be only true when focusing on omnivores, since the pride vegetarians and  
595 vegans experience with regards to their dietary practices may act as a counterweight  
596 to any guilt they might otherwise experience.

### 597 **Method**

598 **Participants and diet.** A total of 215 participants (119 women, 96 men;  
599  $M_{age} = 31.89$ ,  $SD = 10.7$ ) participated in a twenty minute survey in exchange for  
600 suitable payment. Participants were recruited online via Mechanical Turk.  
601 Recruitment materials described the study as “a series of questions about your  
602 consumption/use of animal products, particularly concerns you may have about  
603 restricting or not restricting various animal products.” A pre-screening questionnaire  
604 filtered out potential participants who consumed all kinds of meat and other animal  
605 products and who had no concerns about doing so. The aim was to recruit only  
606 individuals who had some misgivings or ambivalence about consuming animal  
607 products. The participant pool included only those who rejected at least one type of  
608 animal-based food product, or omnivores who were considering restricting their  
609 consumption of animal products though currently not refraining from animal-  
610 product consumption.

611 There were two waves of recruitment. Both waves were conducted through  
612 Mechanical Turk. In the initial wave, 182 participants completed the survey. A  
613 second wave was deemed necessary to increase the number of vegetarians and  
614 vegans collected. In the second wave, conducted a week after the first, a pre-  
615 screening questionnaire filtered out participants who identified as omnivores or  
616 semi-vegetarians. An additional 33 vegetarian and vegan participants completed the  
617 survey in the second wave. The final sample consisted of 57 participants who self-  
618 identified as omnivores, 90 as semi- or partial vegetarians, 44 as vegetarians, 16 as  
619 strict vegetarians/dietary vegans, and 8 as lifestyle vegans.

620           **Materials and procedures.**

621           **Current diet.** For the purpose of the survey, participants were instructed that  
622 “animal products” refers to anything that comes from an animal, including meat,  
623 dairy, eggs, honey, leather, fibers (wool, silk, etc.), and animal-derived ingredients  
624 that are used in a variety of products, such as toiletries. Participants indicated their  
625 current dietary practices with respect to animal products by selecting one diet from  
626 a list of five: “Omnivorous,” “Semi- or Partial Vegetarian,” “Vegetarian,” “Strict  
627 Vegetarian or Dietary Vegan,” or “Lifestyle Vegan” (definitions for each category  
628 were provided, see Appendix A). Participants also indicated which animal products  
629 they currently rejected (i.e., “do not consume or use”) from a list of thirteen.<sup>9</sup>

630           **4N scale.** The 16-item 4N scale from Study 2 was used to assess 4N  
631 endorsement. Each statement was presented in a randomized order and assessed in  
632 terms of level of agreement on a seven-point scale (1 = *Strongly disagree*; 7 =  
633 *Strongly agree*). Overall, the sixteen items of the 4N scale had a high internal  
634 reliability ( $\alpha = .94$ ).<sup>10</sup> The overall mean for the scale (see Table 6) was lower than  
635 in previous studies, most likely due to the greater sampling of vegetarians and  
636 vegans, and the omission of omnivores who have absolutely no concern about  
637 consuming animal products.

638           **Restriction of animal products.** We assessed the degree to which  
639 participants were moving towards increasing or decreasing the level of animal-

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<sup>9</sup> Overall, 64% reported currently rejecting red meat (beef, veal, etc.), 61% rejected pork, 44% rejected seafood, 41% rejected fish, 35% rejected poultry, 20% rejected dairy products, 18% rejected eggs, 69% rejected the use of fur, 48% rejected non-food products tested on animals, 41% rejected leather goods, 31% rejected non-food products containing animal ingredients, and 20% rejected other animal-based fibers (wool, silk, etc.); overall, 97% of the sample currently rejected at least one animal product.

<sup>10</sup> The internal reliabilities (Cronbach’s  $\alpha$ ) for each of the 4N subscales ranged from good to excellent (Natural  $\alpha = .80$ ; Nice  $\alpha = .89$ ; Necessary  $\alpha = .92$ ), with the exception of Normal, which had a below satisfactory internal reliability ( $\alpha = .63$ ). In the final study, we aimed to improve upon several of the Normal subscale items.

640 product restrictions they were engaging in within the past five years, with a single  
641 question: “How would you describe the general direction of your changes with  
642 respect to your consumption/use of animal products over the last 5 years?” Answers  
643 were made along a 1-7 scale (1 = *Strongly moving towards less restrictions*; 4 =  
644 *Fluctuating between restricting and not restricting*; 7 = *Strongly moving towards*  
645 *more restrictions*), with higher scores representing movement towards greater  
646 restriction. Only participants who indicated that they had changed their diets in the  
647 past five years answered this question. Participants who indicated they had not  
648 changed their diet in the past five years were assigned a score of 4 (thus, a score of  
649 4 represented either no change or fluctuation between restricting and not restricting  
650 animal products).

651 ***Pride, guilt, discomfort, and moral self-regard.*** We included four measures  
652 of people’s emotional and self-appraisal correlates related to their consumption and  
653 use of animal products. These reflected self-conscious moral emotions (guilt, pride)  
654 and moral self-appraisals participants might experience with regards to these dietary  
655 and lifestyle choices. Participants indicated how proud, guilty, and uncomfortable  
656 they felt with regard to their current animal-product decisions, on a 1-7 scale (e.g., 1  
657 = *Not at all proud*; 7 = *Extremely proud*). Additionally, they rated on a nine-point  
658 scale how accurately a series of six moral-character traits described them in relation  
659 to their animal-product decisions: *inconsistent, principled, reliable, committed,*  
660 *dedicated, and hypocritical*. The overall reliability of the scale was high ( $\alpha = .90$ ),  
661 thus, the six traits were aggregated to form a *moral self-regard* index (*inconsistent*  
662 and *hypocritical* were reverse scored). See Table 6 for descriptive statistics and  
663 correlations pertaining to these four measures.

664           ***Animal-welfare advocacy.*** We included three measures of animal-welfare  
665 advocacy, measured on six-point scales. These items encompassed tendencies to  
666 experience negative affect when witnessing animal-welfare violations or attempts to  
667 influence others' animal-product consumption. Participants were asked how often  
668 they tried to convince others to limit or reject some or all animal products (1 =  
669 *Never*; 6 = *All of the time*); how upset they are when eating with others who are  
670 consuming animal products that they reject (1 = *Not at all upset*; 6 = *Extremely*  
671 *upset*); and how angry they are when they see someone wearing a fur coat (1 = *Not*  
672 *at all angry*; 6 = *Extremely angry*). The three items were fairly well inter-correlated  
673 (*r*s ranged from .39 to .53;  $\alpha = .62$ ), thus, we aggregated them into a single *animal-*  
674 *welfare advocacy* index.

675           ***Speciesism.*** Speciesist attitudes (prioritizing human interests over animal  
676 interests) were measured with five items (see Appendix B). Agreement with the  
677 items was measured on a 1-7 scale (1 = *Strongly disagree*; 7 = *Strongly agree*), with  
678 higher values representing greater endorsement of Speciesism. The five items were  
679 internally reliable (Cronbach's  $\alpha = .84$ ), thus, they were aggregated to form an  
680 index of Speciesism endorsement. Descriptive statistics for the index may be found  
681 in Table 5.

682           ***Additional measures.*** The present study was part of a student's independent  
683 research project on dietary choices and included some additional measures that were  
684 of less relevance to the present purposes. This included, for instance, a number of  
685 questions about which kinds of animal products participants were planning to  
686 restrict or resume using in the future, their motivations for doing so, measures of  
687 family and social support of their dietary choices, involvement in vegetarian/vegan  
688 or animal welfare groups, their willingness to consume insect-based food as an

689 alternative to traditional meat products, qualitative self-evaluations of any  
690 inconsistencies in their dietary behavior, and an assessment of meaning in life (the  
691 4N scale was unrelated to this measure). For brevity's sake, we do not report on  
692 these measures. Please contact the authors for more information.

693 **[Insert Table 5 about here]**

## 694 **Results**

695 **Diet and 4Ns.** Figure 4 depicts the mean 4N scale scores (and standard  
696 errors) by diet. Diet had a large, overall effect on 4N endorsement,  $F(1,211) =$   
697  $38.76, p < .001, \eta^2_p = .36$ . As we predicted, omnivores had the highest 4N scores,  
698 followed by semi-vegetarians (see Figure 4). Vegetarians and dietary and lifestyle  
699 vegans had the lowest 4N scores. All post hoc comparisons (Tukey HSD tests) were  
700 significant at  $p < .001$ , except the comparison of vegetarians and dietary/lifestyle  
701 vegans, which did not at all differ,  $p = .906$ .

702 **[Insert Figure 4 about here]**

703 **Correlates of the 4Ns.** Table 5 presents correlations between the overall 4N  
704 scale, Speciesism endorsement, the emotion and self-appraisal measures pertaining  
705 to participants' consumption/use of animal products, animal-welfare advocacy, and  
706 animal product restriction. As expected, the 4N scale was negatively correlated with  
707 animal-welfare advocacy and animal product restriction. In other words, individuals  
708 who endorsed the 4Ns were less involved in animal-welfare advocacy and were less  
709 likely to be moving towards more restrictions with regards to animal product  
710 consumption. Also as predicted, the 4N scale was positively correlated with  
711 Speciesism. That is, individuals who endorsed the 4Ns tended to hold Speciesist  
712 beliefs. Critically, the relationship was moderate in strength, which suggests that 4N  
713 endorsement is a distinct construct from Speciesism. Additionally, the 4N scale was

714 negatively correlated with pride in one's animal-product decisions, and negatively  
715 correlated with moral self-regard derived from such decisions. That is, people who  
716 endorsed the 4Ns experienced less pride and less moral self-regard with respect to  
717 their animal-product decisions. With all dietary groups included in the analysis, 4N  
718 endorsement was uncorrelated with guilt and discomfort over one's animal-product  
719 decisions. However, when restricting the sample to just omnivores, 4N endorsement  
720 was *negatively* correlated with guilt experienced in relation to one's diet,  $r(55) = -$   
721  $.40, p = .002$ , though the negative relationship was not significant for discomfort,  
722  $r(55) = -.16, p = .246$ . Thus, omnivores who strongly endorsed the 4Ns experienced  
723 less guilt about their dietary practices than did omnivores who endorsed them to a  
724 lesser degree.

725         It is worth noting that the 4N scale correlated more strongly than did the  
726 Speciesism scale with all of the outcome measures, with the exception of animal-  
727 welfare advocacy. Speciesism had a weak negative correlation with guilt and animal  
728 product restriction, and a moderate negative correlation with animal-welfare  
729 advocacy, suggesting that the more a person endorses Speciesism, the less guilty  
730 they feel about their consumption of animal products, the less inclined they are to  
731 increase their restriction of animal products, and the less likely they are to engage in  
732 animal-welfare advocacy.

733         In sum, 4N endorsement predicted a number of outcomes related to animal-  
734 product consumption, animal-welfare advocacy, Speciesist attitudes, and the self-  
735 directed emotional corollaries of engaging in choices pertaining to animal-product  
736 restriction. Critically, there was a negative relationship between 4N endorsement  
737 and guilt over one's animal-product choices among omnivores, suggesting that 4N  
738 justifications assist with effective guilt regulation.



**739 Study 5 –Test-Retest Validity of the 4N Scale and Actual Meat Consumption**

740 So far we have shown 4N endorsement to be consistently higher among  
741 individuals who self-identify as omnivores than among individuals who identify as  
742 partial vegetarians, full vegetarians, and vegans. In Study 5, we sought to show that  
743 endorsement of the 4Ns correlates with the frequency with which people consume  
744 meat and other animal products in their diet. Consistent with the idea that 4N  
745 justifications are rationalizations fueled by a desire to continue eating meat, we also  
746 sought to show that 4N endorsement would highly correlate with a person's explicit  
747 commitment to eating meat. Finally, to polish off the items comprising the 4N scale,  
748 we made minor adjustments to several of the Normal items (in Studies 2-4 the  
749 Normal subscale consistently had the lowest Cronbach's  $\alpha$ s), and we administered  
750 the final version of the 4N scale to the same sample at two different time points to  
751 establish the instrument's test-retest reliability.

**752 Method**

753 **Participants and diet.** At Time 1 we recruited a new sample of 236 adults (74  
754 women, 162 men;  $M_{\text{age}} = 29.67$ ,  $SD = 8.05$ ) via Mechanical Turk. All participants  
755 were located in the U.S. and paid for participating in a short, two-part study. At Time  
756 1, participants were informed that they would be taking part in a two-part study.  
757 Eleven days later participants were contacted by email and invited to complete Part II.  
758 Participants were given a span of three days to complete Part II. They were given a  
759 security password to enter the survey. In order to anonymously link their responses  
760 from Parts I and II, participants were instructed to generate a unique, memorable code  
761 to enter at Time 1 and Time 2 (emails were also collected at both time points to help  
762 link responses).

763           One-hundred and thirty-six participants (47 women, 89 men) completed both  
764 parts of the study (a 58% return rate). The vast majority of participants at Time 1 and  
765 Time 2 classified themselves as omnivores (“I eat meat and other animal products,  
766 like dairy and/or eggs”) (Time 1: 88%; Time 2: 90%). The next largest dietary  
767 category was semi-vegetarian (“I eat meat, but only on rare occasions or only certain  
768 types of meat”) (Time 1: 6%; Time 2: 3%). A few participants were full vegetarians  
769 or vegans (Time 1: 6%; Time 2: 7%).

770           **Materials and procedures.** The surveys comprising Parts I and II were  
771 identical. First, participants answered a slightly revised version of the 16-item 4N  
772 scale. Two of the most problematic Normal items were amended in an attempt to  
773 improve the subscale’s internal reliability. In order to make it more generally  
774 applicable, the item “In my country, not eating meat breaks social norms” was  
775 amended to “Not eating meat is socially unacceptable.” To avoid a double-barreled  
776 phrasing, the item “Most people eat meat, and most people can’t be wrong” was  
777 amended to “Most people I know eat meat” (see Table 8 for a final list of items).  
778 Agreement with the 4Ns was assessed on a 1-7 scale as in Study 4. The 4N scale was  
779 followed by a dietary questionnaire assessing the average number of days per week  
780 (1-7) they ate various animal products (beef, pork, lamb, chicken, fish, seafood, eggs,  
781 dairy) and non-animal products (bread, rice, vegetables, fruit). We included non-  
782 animal food products as a test of discriminant validity; the 4N scale should only  
783 correlate with animal-product consumption. Next they responded to a 7-item Meat  
784 Commitment Scale (MCS) developed by the authors (see Appendix C for items).  
785 Lastly, they answered a basic demographics questionnaire. They were debriefed and  
786 paid at both time points.

787           **Results**

788 **4N intercorrelations and internal reliability.** All 4N subscales correlated  
789 strongly with the full scale ( $r_s = .86-.93$ ,  $p_s < .001$ ), and with each other ( $r_s = .69-.81$ ,  
790  $p_s < .001$ ). The correlations between the 4N subscales ranged from .69 to .81, all  
791 significant at  $p < .001$ . The Cronbach's  $\alpha$  of the full scale was .95 at Time 1 and .94 at  
792 Time 2.

793 **Factor Analysis.** A principal components factor analysis of the 4N scale  
794 suggested a single-factor solution (eigenvalue = 8.93, explaining 55.8% of the total  
795 variance). All 16 items loaded together above .30 (see Table 6 for factor loadings,  
796 means and standard deviations). The item "Not eating meat is socially unacceptable"  
797 had the lowest loading, probably due to the quite low endorsement of this item.<sup>11</sup> The  
798 two lowest loading items, both from the Normal subscale, cross-loaded with a  
799 potential second factor (eigenvalue = 1.65; 10% of the total variance).<sup>12</sup> In the  
800 General Discussion, we speculate as to why these two items behaved somewhat  
801 differently from the others.

802 **[Insert Table 6 about here]**

803 **Test-retest reliability of 4N scale.** The overall test-retest reliability of the full  
804 4N scale was strong,  $r(134) = .93$ ,  $p < .001$ . Table 9 depicts the test-retest correlations  
805 for each of the subscales. The  $r_s$  ranged from .71 (Normal) to .92 (Nice), with all  $r_s$   
806 significant at  $p < .001$ . Thus, the 4N scale had strong test-retest reliability over a  
807 period of about two weeks. The Normal subscale had the weakest test-retest  
808 reliability, though it reached adequate levels of reliability.

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<sup>11</sup> One potential suggestion for improving this item in the future would be to phrase it in terms of the acceptability of eating meat, rather than the unacceptability of not eating meat.

<sup>12</sup> We conducted a confirmatory factor analysis omitting the two lowest loading Normal items, treating the remaining fourteen items as members of a single latent "meat-justification" factor. This model provided a less than adequate fit to the data, with  $\chi^2(77) = 547.66$ ,  $p < .0001$ , RMSEA = .161, CFI = .831. However, the fit of the baseline model, compared to the saturated model, was much worse, with  $\chi^2(91) = 2873.90$ ,  $p < .0001$ . An alternative model with four distinct latent variables (the 4N categories) with four items each could not be run as convergence was not achieved (due most likely to too few items).

809 [Insert Table 7 about here]

810 **4N endorsement.** Repeated-measures t-tests were carried out on the 4N  
811 subscale means. Nice ( $M = 5.02$ ,  $SD = 1.54$ ) was endorsed at the highest level, and at  
812 a level significantly higher than the other three Ns,  $ps < .001$ . Next, Natural ( $M =$   
813  $4.80$ ,  $SD = 1.41$ ) and Normal ( $M = 4.72$ ,  $SD = 0.94$ ) were endorsed at equal levels,  $p$   
814  $= .165$ , and at levels significantly greater than Necessary ( $M = 4.16$ ,  $SD = 1.76$ ),  $ps <$   
815  $.001$ , which had the lowest level of endorsement. Overall, men endorsed the 4Ns to a  
816 significantly greater extent than did women ( $M_{men} = 4.79$ ,  $SD = 1.23$  vs.  $M_{women} =$   
817  $4.43$ ,  $SD = 1.33$ ),  $F(1, 234) = 4.15$ ,  $p = .043$ ,  $\eta^2_p = .017$ . Men had higher means for all  
818 4Ns though only for Natural and Normal were the means significantly higher than for  
819 women.

820 **Commitment to eating meat.** The MCS had a strong test-retest reliability of  
821  $r(134) = .93$ ,  $p < .001$ , and a strong internal reliability, Cronbach's  $\alpha = .96$  (Time 1),  
822  $\alpha = .96$  (Time 2). Men were significantly more committed to eating meat ( $M = 4.87$ ,  
823  $SD = 1.70$ ) than were women ( $M = 4.39$ ,  $SD = 1.80$ ),  $F(1, 234) = 4.07$ ,  $p = .045$ ,  $\eta^2_p =$   
824  $.017$ , which is consistent with much past research (e.g., Fagerli & Wandel, 1999;  
825 Rappoport, Peters, Downey, & McCann, 1993; Rothgerber, 2013; Ruby & Heine,  
826 2012). As can be seen in Table 8, the full 4N scale highly correlated with a  
827 commitment to eating meat.<sup>13</sup> As an exploratory analysis, we entered each of the 4N  
828 subscales simultaneously into a regression predicting MCS ratings at Time 1.<sup>14</sup> Multi-  
829 collinearity was a concern, but it was not so problematic to make the test unreliable  
830 (Tolerance range: .22-.38; VIF range: 2.63-4.51). All four subscales were positively  
831 predictive of a commitment to eating meat ( $\beta$ s: Natural = .07; Necessary = .10;

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<sup>13</sup> 4N endorsement at Time 1 also highly correlated with meat commitment at Time 2,  $r(134) = .83$ ,  $p < .001$ .

<sup>14</sup> We did not conduct a comparable analysis with Time 2 scores due to loss of power.

832 Normal = .08; Nice = .14); however, only the Necessary and Nice subscales were  
833 significant, independent predictors,  $ps < .05$  (all other  $ps > .13$ ).

834 **[Insert Table 8 about here]**

835 **Meat consumption.** As can be seen in Table 8, the 4N scale selectively  
836 correlated with measures of the frequency with which participants consumed animal  
837 products, but it did not correlate with consumption frequencies for non-animal food  
838 products. The correlations were strongest for meat products (e.g., beef, chicken,  
839 pork), but were significant for eggs and dairy products as well. Of the 4Ns,  
840 endorsement of Necessary was the most reliable correlate of animal-product  
841 consumption. It significantly correlated with the consumption of all eight categories  
842 of animal products.

843 **General Discussion**

844 Morally motivated vegetarians, although a minority, may serve as a source  
845 of implicit moral reproach for many omnivores, eliciting behaviors designed to  
846 defend against moral condemnation (Minson & Monin, 2012). One method for  
847 rendering moral vegetarians nonthreatening, examined here, is to rationalize or  
848 provide reasonable justification for one's consumption of animal products. The  
849 present research built upon the theorizing of Joy (2010) pertaining to the 3Ns of  
850 Justification—that eating meat is natural, normal, and necessary. To this list, we  
851 added a fourth N—that eating meat is nice (i.e., enjoyable, satisfying, etc.).  
852 Consistent with this theorizing, Studies 1a-1b identified the 4Ns (Natural, Normal,  
853 Necessary and Nice) as the principal justifications used to argue for the  
854 acceptability of eating meat. Furthermore, Studies 2-5 documented the relationship  
855 between 4N endorsement and a number of important variables related to meat  
856 consumption and animal-welfare concerns.

857 Overall, omnivores tended to endorse the 4Ns more so than partial  
858 vegetarians, full vegetarians, and vegans (Studies 2 and 4). Moreover, individuals  
859 who tended to endorse the 4Ns included fewer animals in their circle of moral  
860 concern (Study 2), attributed fewer mental capacities to cows (Study 2), were more  
861 tolerant and supportive of social inequality (Study 2), were less motivated by ethical  
862 concerns when making food choices (Study 3), were less active in advocating on  
863 behalf of animals (Study 4), held Speciesist attitudes more strongly (Study 4), were  
864 less proud of their consumer choices pertaining to animals (Study 4), were less  
865 likely to be moving towards greater restriction of animal products in their diet  
866 (Study 4), tended to consume meat and other animal products more frequently in  
867 their weekly diet (Study 5), and tended to be highly committed to eating meat in the  
868 future (Study 5). Furthermore, omnivores who strongly endorsed the 4Ns tended to  
869 experience less guilt with regards to their animal-product choices than did  
870 omnivores who endorsed the 4Ns to a lesser extent (Study 4), suggesting that the  
871 4Ns are effective for reducing guilt. Consistent with theorizing by Joy (2010), it  
872 would seem that the 4Ns are a powerful, pervasive tool employed by individuals to  
873 diffuse the guilt one might otherwise experience when consuming animal products.

#### 874 **Implications for omnivore-vegetarian discourse**

875 In Study 2, we observed that omnivores tended to endorse all four of the Ns,  
876 while vegetarians and partial-vegetarians tended not to endorse them, or to endorse  
877 them to a much lesser degree. In other words, rather than participants independently  
878 agreeing with one another about the validity of a few of the Ns, participants tended  
879 to endorse or reject every available justification that was consistent with their  
880 position, reflecting a myside bias or belief-overkill effect (see also Baron, 1995;  
881 Stanovich et al., 2012). Nonetheless, the Ns that produced the greatest levels of

882 disagreement across dietary groups were Necessary and Nice. This suggests that  
883 beliefs about the necessity of eating meat, and the pleasure derived from eating  
884 meat, may be the least persuasive of the 4Ns in convincing a vegetarian audience. It  
885 also suggests, as we observed in Study 5, that Necessary and Nice may be the most  
886 useful N for predicting divergent dietary attitudes. By contrast, endorsement of the  
887 naturalness of eating meat (e.g., that human beings have evolved body structures  
888 adapted to eating meat) was the most uniform across dietary groups, in that it  
889 produced the highest ratings of endorsement among vegetarians (though still below  
890 the mid-point). In other words, the belief that it is natural to eat meat may be most  
891 widely accepted of the 4Ns as having a factual basis. We might speculate that  
892 beliefs about the naturalness of eating meat may be the most persistent and difficult  
893 to overturn. Looking to the future, independent manipulations of the 4Ns would  
894 help clarify these issues.

895 Future research might also test which of the 4N justifications present the  
896 greatest challenge to meat-reduction campaigns aimed at promoting healthy and  
897 environmentally sustainable eating habits. Based on our observations, we would  
898 speculate that the perceived necessity of meat consumption may be the most  
899 formidable of the 4Ns given that it is frequently offered in defense of eating meat  
900 (Studies 1a-1b) and strongly endorsed by omnivores as a justification (Studies 2-5),  
901 though we acknowledge as others have (e.g., Lea & Worsely, 2001) that the  
902 niceness, or hedonic pleasure, derived from meat is another formidable obstacle.

### 903 **The 4N scale and the MEJ scale**

904 The scale we developed for assessing endorsement of the 4Ns on a  
905 continuum consistently showed strong internal reliability and, in Study 5, strong  
906 test-retest reliability. The four subscales, for the most part, loaded onto a single

907 factor, with the possible exception of the Normal subscale, which had two items that  
908 loaded to the overall scale at lower levels. These two items (“Most people I know  
909 eat meat”, “Not eating meat is socially unacceptable”) are distinct from the other  
910 scale items in that they may be understood simply as statements of fact or  
911 observations rather than opinions or attitudes. As a consequence, individuals with  
912 different dietary orientations living within the same societal context could  
913 potentially share high-levels of overlap in their endorsement (or non-endorsement)  
914 of these items, and this may explain their distinct factor loadings. Indeed, the  
915 relatively extreme means for these two items (see Table 6) is consistent with this  
916 supposition. Given the recurrently lower loadings of these two Normal items, we  
917 recommend continued efforts to improve their loadings, for example, by rephrasing  
918 the items (e.g., “Eating meat is an acceptable practice in my society”).

919         Importantly, the overall 4N scale correlated strongly with motivations to  
920 continue eating meat and with actual meat consumption, confirming its predictive  
921 validity. In Study 3, we observed moderate to strong positive correlations between  
922 the 4N scale and the Direct-strategies subscale of Rothgerber’s (2013) MEJ scale.  
923 Furthermore, both the 4N scale and the MEJ-Direct scale correlated *negatively* with  
924 ethically motivated food choices (i.e., people who endorsed the 4Ns or who engaged  
925 in direct meat-eating justification strategies made food choices that were *less*  
926 motivated by ethical concerns for animals or the environment).

927         Although there is some redundancy between the two scales, we submit that  
928 there are several favorable strengths to the 4N scale in relation to the MEJ. First, as  
929 we have shown in Studies 1a-1b, the 4Ns comprise the bulk of real-world  
930 justifications omnivores volunteer in defense of eating meat. As such, the 4N  
931 scheme represents a parsimonious way of classifying the principal justifications



932 supporting meat consumption. For example, Natural in the 4N classification  
933 encompasses several of the MEJ subscales, including hierarchy, fate, and religion.  
934 Second, the 4N scheme includes one major justification category largely missing  
935 from the MEJ—that eating meat is *normal*. Finally, the factor structure of the 4N  
936 scale is more internally coherent than the factor structure of the MEJ. Conceptually,  
937 the MEJ scale is purportedly measuring nine lower-order, or two higher-order,  
938 constructs (see Rothgerber, 2013), while the 4N scale is arguably measuring one  
939 construct (meat-eating rationalizations) with four subcomponents. Consistent with  
940 this conceptualized structure, we consistently obtained single-factor structures for  
941 the 4N scale. By contrast, the MEJ produced two, possibly three, independent  
942 factors (see Study 3).

943 In short, the 4N scheme is conceptually and empirically parsimonious as a  
944 measure of meat-eating justifications. By contrast, the MEJ is conceptually and  
945 empirically complex, as it is intended to capture other, indirect strategies for  
946 continuing in the practice of eating meat beyond rationalization, including  
947 avoidance, dissociation, and dichotomizing. Thus, we recommend using the 4N  
948 scale when the focus of a research team is on rationalizing meat-eating in particular,  
949 while the MEJ may be more suitable for researchers whose aims are broader.

#### 950 **Limitations and future directions**

951 The present research has a number of limitations. In particular, the studies  
952 recruited participants either from the US or Australia where omnivores are the  
953 dominant dietary group. Although we sampled individuals reporting a diverse  
954 variety of dietary practices, from no meat restriction to complete restriction of all  
955 meat and other animal products, it would be interesting to compare endorsement of  
956 the 4Ns at the level of nations rather than simply at the level of individuals. Given

957 the high rates of vegetarianism in India (European Vegetarian Union, 2008), a  
958 country-level comparison between Indian and Western samples would be helpful in  
959 illuminating the structural role of 4N rationalization in maintaining omnivorous  
960 diets at the societal level. For instance, there are likely to be society-level  
961 differences regarding the perceived necessity and normalness of eating meat, which  
962 may predict variability in meat consumption across societies. Additionally, the 4N  
963 scale may be limited by its treatment of “meat” in a general manner, as opposed to  
964 assessing beliefs about specific meat products. This might be a limitation when  
965 comparing results from the 4N scale across cultures, as people from different  
966 cultures may use different prototypes or exemplars of “meat” when answering the  
967 scale. For example, some cultures may have fish and seafood more centrally located  
968 in their concept of meat than other cultures. Preliminary research conducted by our  
969 team suggests that at least some Americans (32%) spontaneously think of seafood  
970 products when asked to list different types of meat. Given the heterogeneity in  
971 thinking about meat, future research using the 4N scale would benefit from  
972 comparing 4N endorsement across different meat categories.

973         The present studies are also limited by their predominantly correlational  
974 methodologies. In the future it would be useful to examine meat-eating  
975 rationalization processes *in situ*, that is, in relation to behavioral manipulations of  
976 meat consumption or consumer motivation, as has been done within some animal  
977 objectification studies (e.g., Bastian et al., 2012; Loughnan et al., 2010). Based on  
978 evidence gathered here, we would expect behavioral manipulations of meat  
979 consumption or consumer motivations to increase levels of 4N endorsement relative  
980 to the consumption of non-animal products, and, conversely, manipulations of the  
981 4Ns to decrease the discomfort an omnivore may experience with regards to their

982 meat consumption. We might also predict that manipulating perceptions of the  
983 validity of various Ns (e.g., the necessity of eating meat) would impact willingness  
984 to consume meat. Such findings would demonstrate that the 4N rationalizations are  
985 not simply post hoc arguments (see Haidt, 2001) but can play a causal role in  
986 people's decision-making. Finally, further research is also needed to explore the  
987 role of 4N rationalizations in other contemporary controversies beyond diet and  
988 animal-welfare concerns.

### 989 **Conclusion**

990       The relationships people have with animals are complicated. While most  
991 people enjoy the company of animals and billions of dollars are spent each year on  
992 pet care and maintenance, most people continue to eat animals as food (Herzog,  
993 2010; Joy, 2010). People employ a number of strategies to overcome this apparent  
994 contradiction in attitude and behavior (Loughnan et al., 2014). As we have seen  
995 here, one important and prevalent strategy is to rationalize that meat consumption is  
996 natural, normal, necessary, and nice. Rationalizing enables omnivores to continue in  
997 a dietary practice that has increasingly come under public scrutiny. It is difficult to  
998 predict whether endorsement of the 4Ns will decrease over time. However, like  
999 many controversial issues (see Liu & Ditto, 2013), as attitudes towards meat  
1000 consumption shift, so too may the beliefs that support them.

1001

1002

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1003

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1004

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1006

1007

**Appendix A**

1008

**Descriptions of Diet Categories Used in Study 4**

<b>Diet</b>	<b>Description</b>
Omnivorous	Consume animal products, except those excluded for taste preference, medical (e.g., allergy, intolerance), and/or religious reasons.
Semi- or Partial Vegetarian	Consume some, but not all, of the following: red meat (beef, veal, etc.), pork, poultry, fish, and/or seafood. Consume eggs and dairy products.
Vegetarian	Never consume red meat (beef, veal, etc.), pork, poultry, fish, or seafood, but may consume eggs and/or dairy products.
Strict Vegetarian or Dietary Vegan	Never consume any animal products, including red meat (beef, veal, etc.), pork, poultry, fish, seafood, eggs, dairy products, or other animal products (e.g., gelatin, casein, etc.).
Lifestyle Vegan	Never consume any animal products, and avoid some or all non-food animal products (e.g., leather, silk, cosmetics containing animal ingredients, etc.) and/or products tested on animals.

1009

1010

**Appendix B**

1011

**Speciesism Scale Used in Study 4**

1012

1. We should always elevate human interests over the interests of animals.

1013

2. When human interests conflict with animal interests, human interests should

1014

always be given priority.

1015

3. We should strive to alleviate human suffering before alleviating the suffering

1016

of animals.

1017

4. The suffering of animals is just as important as the suffering of humans.

1018

(reverse scored)

1019

5. Having extended basic rights to minorities and women, it is now time to

1020

extend them also to animals. (reverse scored)

1021

1022

**Appendix C**

1023

**Meat Commitment Scale Used in Study 5**

1024

1. I don't want to eat meals without meat.

1025

2. When choosing food, I virtually always select the meat option.

1026

3. I can't imagine giving up meat.

1027

4. I am committed to eating meat.

1028

5. The best part of most meals is the meat portion.

1029

6. I would never give up eating meat.

1030

7. I cannot imagine substituting meat from a meal.

1031

1032

1033

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**Tables**

1206 Table 1

1207 *Coding scheme used to score participants spontaneous meat-eating justifications in*1208 *Studies 1a-1b.*

<b>Category</b>	<b>Definition</b>	<b>Examples</b>
<i>Natural</i>	Appeals to biology, biological hierarchy, natural selection, human evolution, or the naturalness of eating meat.	“It is natural for humans to eat meat”; “Humans are carnivores”; “Evolutionarily hominids have always eaten meat”; “Organisms consuming each other is something that is prevalent in nature”; “Humans were meant to have dominion over animals”
<i>Necessary</i>	Appeals to the necessity of meat for survival, strength, development, health, animal population control, or economic stability.	“Humans need meat to survive”; “Our bodies need the protein”; “Meat provides good nutrients”; “Protein is a necessary part of our diet”; “Because if we didn't, there would be an overabundance of certain animals”
<i>Normal</i>	Appeals to dominant societal norms, normative behavior, historical human behavior, or socially constructed food pyramids.	“Society says it’s okay”; “I was raised eating meat”; “Meat is culturally accepted”; “A lot of other people eat meat”
<i>Nice</i>	Appeals to the tastiness of meat, or that it is fulfilling or satisfying.	“It tastes good”; “It’s delicious”; “Tastes great (I mean bacon...come on)”
<i>Humane</i>	Appeals to the “humane” nature of	“As long as you know it comes from a

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<i>Slaughter</i>	slaughtering practices.	company that does not mistreat animals”; “Humane options exist for meat products”
<i>Religion</i>	Appeals to religion, scripture, God, or divine sovereignty, without also appealing to human nature, biology, or social norms.	“It’s allowed by my religious creed”; “According to God there is no unclean animals to eat”; “God provided them for us to eat”
<i>Sustainable</i>	Appeals to the sustainable nature of meat as a renewable resource.	“Fish create less waste than other animals”
<i>Miscellaneous</i>	Miscellaneous arguments (e.g., appeals to dietary freedom, availability of meat, inferiority of animals, etc.).	“It’s readily available”; “The animals are already killed”; “Animals are not nearly as intelligent as humans”; “This is America and I am free to do what I want”
<i>Unscorable</i>	Does not answer the question or rejects the premise that eating meat is not OK.	“I am not a vegetarian”; “It’s not morally wrong”

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1212 Table 2

1213 *Correlations between the 4N scale and other measures in Study 2*

	2	3	4
1. 4N scale	-.47***	-.37***	.52***
2. Moral concern	-	.44***	-.45***
3. Mind attribution	-	-	-.44***
4. SDO	-	-	-

1214 *Note.* \*\*\*  $p < .001$ . SDO = Social Dominance Orientation.  $N_s = 159-171$ .

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Table 3

*Pearson correlations between 4N scale and MEJ subscales (Study 3).*

	MEJ Direct						MEJ Indirect		
	Pro- meat	Deny	Dichot.	Fate	Religion	Health	Hierarchy	Dissoc.	Avoid
4N Scale	.71***	.58***	.34***	.78***	.49***	.84***	.70***	.06	-.14

*Note.* \*\*\*  $p < .001$ .  $N_s = 192$  non-vegetarians/vegans. MEJ = Meat-Eating Justification (Rothgerber, 2013).

Table 4

*Pearson correlations between 4N scale and food choice motivations (Study 3).*

	Non-ethical Motivations					Ethical Motivations	
	Health	Familiarity	Sensory appeal	Natural content	Weight control	Animal Welfare	Environmental Protection
4N scale	-.10	.24***	.11	-.09	.09	-.10	-.16*
MEJ scale	-.13	.24***	.14	-.19**	.06	-.12	-.23**

*Note.* \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ . Non-ethical motivations from FQC (Steptoe et al., 1995); ethical motivations from Lindeman and Väänänen (2000).  $N_s = 192$  non-vegetarians/vegans.

Table 5

*Correlations between 4N scale and measures from Study 4.*

	Mean (SD)	2	3	4	5	6	7	8
1. 4N scale	3.30 (1.28)	.42***	-.22**	.08	.03	-.24**	-.25***	-.41***
2. Speciesism	3.55 (1.31)	-	-.10	-.17*	-.10	-.09	-.36***	-.19**
3. Pride in animal-product decisions	4.69 (1.68)	-	-	-.45***	-.15*	.63***	.23**	.28***
4. Guilt about animal-product decisions	2.75 (1.58)	-	-	-	.31***	-.61***	.09	-.22**
5. Discomfort over animal-product decisions	2.70 (1.64)	-	-	-	-	-.28***	.10	-.05
6. Moral self-regard derived from animal-product decisions	6.31 (1.77)	-	-	-	-	-	.19**	.28***
7. Animal-welfare advocacy	2.09 (0.80)	-	-	-	-	-	-	.21**
8. Restriction of animal products	5.09 (1.41)	-	-	-	-	-	-	-

*Note.* All measurements assessed on 1-7 scales, with the exception of animal-welfare advocacy (1-6) and moral self-regard (1-9).

Table 6

*Final Version of the 4N Scale: Unrotated factor loadings, means, and standard deviations from Study 5.*

Scale Items	Loadings	<i>M</i> (SD)
<i>Natural</i>		
It is only natural to eat meat.	.858	5.04 (1.67)
It is unnatural to eat an all plant-based diet.	.787	3.86 (1.82)
Our human ancestors ate meat all the time.	.677	5.29 (1.64)
Human beings naturally crave meat.	.788	5.00 (1.91)
<i>Necessary</i>		
It is necessary to eat meat in order to be healthy.	.815	4.00 (1.91)
You cannot get all the protein, vitamins, and mineral you need on an all plant-based diet.	.716	4.05 (2.02)
Human beings need to eat meat.	.834	4.15 (1.91)
A healthy diet requires at least some meat.	.847	4.47 (1.93)
<i>Normal</i>		

Not eating meat is socially unacceptable.	.334	2.69 (1.62)
It is abnormal for humans not to eat meat.	.773	3.92 (1.73)
Most people I know eat meat.	.400	6.34 (0.88)
It is normal to eat meat.	.709	5.93 (1.33)
<i>Nice</i>		
Meat is delicious.	.670	6.04 (1.38)
Meat adds so much flavor to a meal it does not make sense to leave it out.	.847	4.74 (1.83)
The best tasting food is normally a meat based dish (e.g., steak, chicken breast, grilled fish).	.821	5.08 (1.80)
Meals without meat would just be bland and boring.	.832	4.24 (1.98)

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*Note.* Level of agreement or disagreement rated on a 1-7 scale (1 = Strongly disagree; 7 = Strongly agree).

Table 7

*Test-retest reliabilities (correlations) for each of the 4N subscales and the full scale.*

	Time 1				
	Natural	Necessary	Normal	Nice	Full 4N Scale
Time 2	.86***	.89***	.71***	.92***	.93***

*Note.* \*\*\*  $p < .001$ .  $N = 136$ .

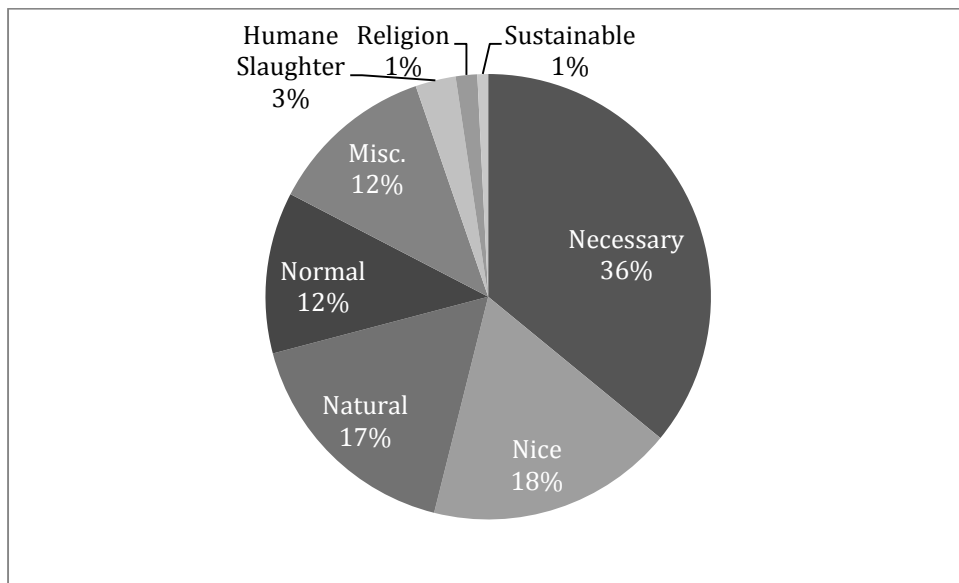
Table 8

*Correlations between 4Ns and dietary measures from Study 5.*

4Ns	MCS	Animal Products							Non-Animal Products				
		Beef	Pork	Lamb	Chicken	Fish	Seafood	Eggs	Dairy	Bread	Rice	Veg	Fruit
Natural	.77***	.37***	.14*	.06	.36***	.12	.08	.12	.14*	.05	-.01	-.07	.01
Necessary	.69***	.38***	.18**	.16*	.38***	.25***	.15*	.14*	.16*	.03	.10	-.09	.05
Normal	.69***	.41***	.21**	.12	.31***	.15*	.08	.12	.11	-.02	.00	-.04	.03
Nice	.88***	.41***	.23***	.04	.38***	.12	.07	.17**	.23***	.05	.01	-.03	.00
Full Scale	.85***	.44***	.21**	.10	.41***	.18**	.11	.16*	.18**	.04	.04	-.07	.03

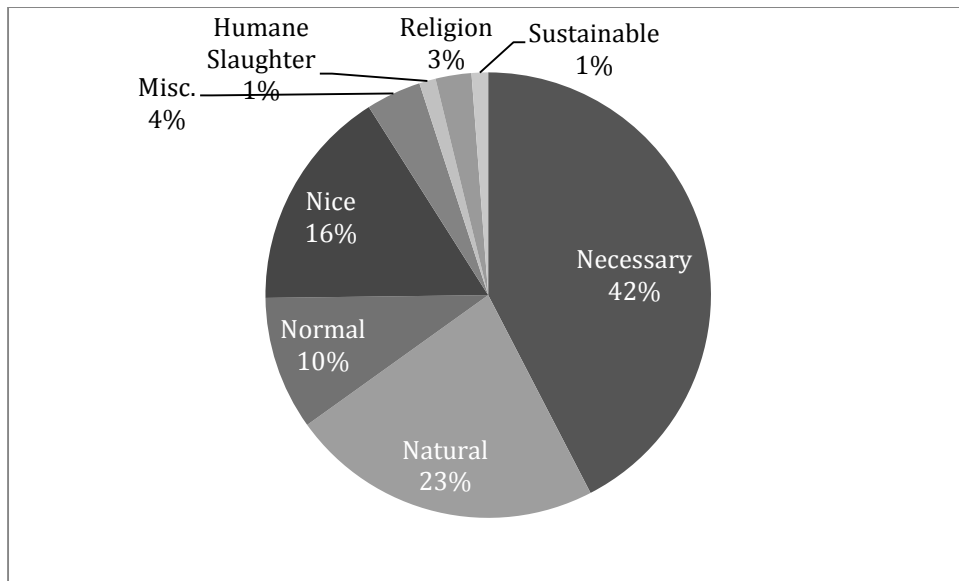
*Note.* MCS = Meat Commitment Scale. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

$N = 236$ .

**Figures and Captions**

*Figure 1.* Frequency of various meat-eating justifications from Study 1a.  $N = 176$  Penn undergraduate students.





*Figure 2.* Frequency of various meat-eating justifications from Study 1b.  $N = 107$

MTurk workers.

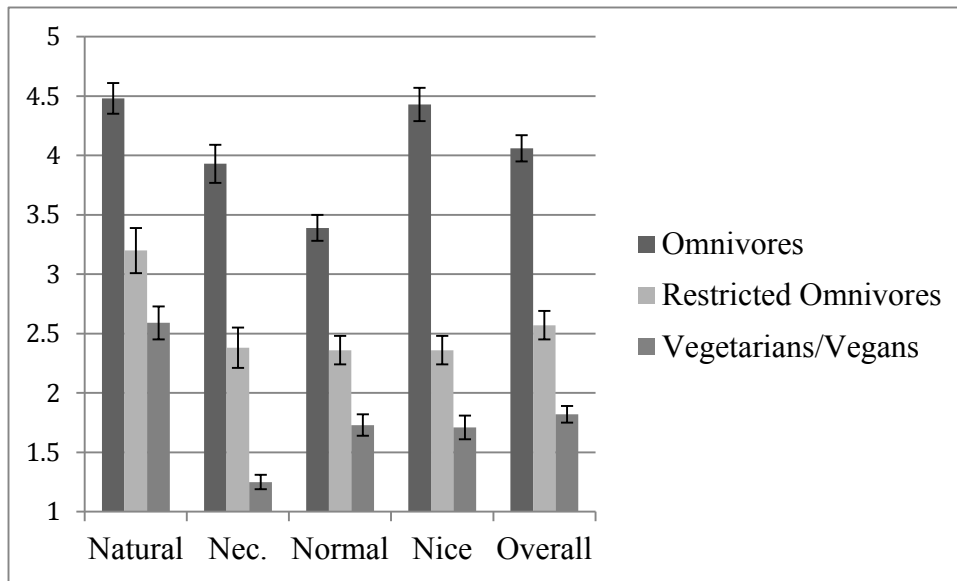


Figure 3. 4N endorsement means and standard errors by diet (Study 2). Bars  $\pm$  1 SE.

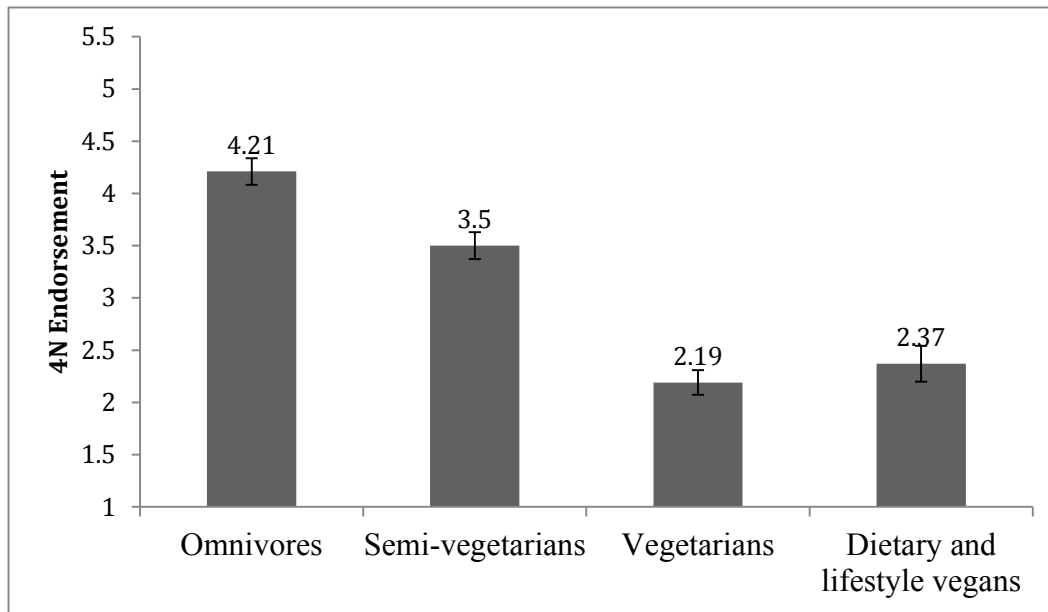


Figure 4. Mean 4N scores by diet (Study 3). Error bars  $\pm 1$  S.E.