THE UNIVERSITY of EDINBURGH

Edinburgh Research Explorer

Rationalizing meat consumption

The 4Ns

OPEN ACCESS

1   Running Head: THE 4NS

2

3   Rationalizing Meat Consumption: The 4Ns

4

5   Jared Piazza*

6   Lancaster University

7   Matthew B. Ruby

8   University of Pennsylvania

9   Steve Loughnan

10   University of Edinburgh

11   Mischel Luong

12   University of Melbourne

13   Juliana Kulik

14   University of Pennsylvania

15   Hanne M. Watkins

16   University of Melbourne

17   and

18   Mirra Seigerman

19   University of Melbourne

20

21   **Word count:** 12,021

22   ***First author contact:** Jared Piazza
23   Fylde College, Department of Psychology, Lancaster University
24   Lancaster, Bailrigg, United Kingdom
25   LA1 4YF
26   Email: jaredpiazza13@gmail.com (primary), j.piazza@lancaster.ac.uk (secondary)
27   Phone: +44(0)7549349033
28
29

30   **Abstract**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

46 highlighting the guilt-alleviating function of the 4Ns.

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

48 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).[1]

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

---

[1] 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).[2] 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

---

[2] 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 *niceness* 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.[3]

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

---

[3] 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.[4]

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

[4] 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_{age} = 34.90, SD = 12.15) using

241   Amazon's Mechanical Turk (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 αs 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"; α = .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"; α = .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"; α = .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"; α = .84).

330

331   The overall scale had a strong internal reliability (α = .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 (α = .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 (α = .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[5], 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

---

[5] 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, $Fs > 59.40$, $ps < .001$,

385    $\eta^2_p = .354$-$.594$; $ps < .03$ 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, $ps < .002$. 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, $ps < .005$. 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[6]) 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

---

[6] 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.

subscale, though we anticipated that its relationship with this subscale would be

much weaker than its relationship with the MEJ-Direct subscale.

As a secondary aim we sought to investigate the relationship between 4N

endorsement and various food choice motivations, including ethical food choice

motivations such as animal welfare or environmental concerns. We predicted that

people who endorse the 4Ns should be *less* motivated by ethical concerns when

making food choices. Finally, as an exploratory goal, we assessed the role of

gender in 4N endorsement.

Method

Participants and diet. We recruited a new sample of 195 adults via

Mechanical Turk. All participants were located in the U.S. and were compensated

for their participation. Three participants did not complete the survey, leaving a total

of 192 (100 women, 83 men, 5 other or missing; M_{age} = 35.74, SD = 13.02). The

majority of the sample identified as "omnivores/non-vegetarians" (86%), 9% as

"partial vegetarians," and 5% as "other" (e.g., pescetarian). Nine additional

participants were recruited that identified as vegetarian or vegan, but due to

experimenter error they did not receive the full battery of materials (specifically,

they did not receive the MEJ scale), and thus were not included in the analyses

reported here (exceptions are footnoted).

Materials and procedures. In the following set order, participants

answered several subscales of the Food Choice Questionnaire (FCQ: Health,

Familiarity, Sensory appeal, Natural content, and Weight control; only the three-

highest loading items from each subscale were administered, 15 items total; see

Steptoe, Pollard, & Wardle, 1995), the Animal Welfare and Environmental

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).[7] In this study,

479   the 4N scale had a strong internal reliability (Cronbach's α = .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 (αs ranged from .53 to .55), and

495   the dichotomize items tend to load more highly with the direct items than the

---

[7] 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 α = .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, $Fs > 8.77$, $ps < .004$,

530   $\eta^2_p = .046\text{-}.066$, but did not differ from women in their endorsement of Natural or

531   Necessary, $Fs < 3.24$, $ps > .07$, $\eta^2_p = .015\text{-}.017$. 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.[8] 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.

---

[8] 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, $r(199) = -.21$, $p = .003$.

569   **Study 4 – The 4Ns, Animals-Product Choices, Moral Emotions and Self-**

570   **Appraisals**

571   Studies 2-3 provided some initial evidence that individuals who reject the 4Ns

572   tend to have more meat-restricted diets (Study 2), are more concerned with the

573   welfare of animals (Study 2), and are motivated by ethical concerns when making

574   food choices (Study 3). The aim of Study 4 was to demonstrate in a more

575   comprehensive manner the role of 4N endorsement in people's dietary and lifestyle

576   practices involving animal products, as well as the self-directed emotions (e.g., guilt,

577   pride) and appraisals generated from these practices. We also sought to correlate 4N

578   endorsement with a person's level of involvement in animal-welfare advocacy and

579   their endorsement of Speciesist attitudes (i.e., prioritizing human interests above

580   animal interests; see e.g., Singer, 2009). To this end, we recruited a more

581   heterogeneous sample that included full vegetarians and vegans, in addition to

582   omnivores and semi-vegetarians who were concerned to some degree about their

583   consumption of animal products.

584   We predicted that 4N endorsement would be *negatively* related to (a) taking

585   active steps towards restricting one's use and consumption of animal products, (b)

586   animal-welfare advocacy, and (c) experiencing pride and appraisals of moral self-

587   regard in relation to one's animal-product consumption. By contrast, we predicted that

588   4N endorsement would be *positively* related to (d) the endorsement of Speciesist

589   attitudes towards animals. With regards to guilt experienced due to one's

590   consumption of animal products, we were uncertain how 4N endorsement would

591   relate to this variable. If Joy (2010) is correct that meat-eating justifications serve to

592   "alleviate the moral discomfort we might otherwise feel when eating meat" (p. 97),

593   then we might expect a *negative* relationship between guilt and 4N endorsement. But

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.[9]

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 (α = .94).[10] 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-

---

[9] 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.

[10] The internal reliabilities (Cronbach's α) for each of the 4N subscales ranged from good to excellent (Natural α = .80; Nice α = .89; Necessary α = .92), with the exception of Normal, which had a below satisfactory internal reliability (α = .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 (α = .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; α = .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 α = .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 αs), 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_{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 (rs = .86-.93, ps < .001), and with each other (rs = .69-.81,

790   ps < .001). The correlations between the 4N subscales ranged from .69 to .81, all

791   significant at p < .001. The Cronbach's α 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.[11] 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).[12] 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 rs ranged from .71 (Normal) to .92 (Nice), with all rs

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.

---

[11] 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.

[12] 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), $F(1, 234) = 4.15$, $p = .043$, η^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 α = .96 (Time 1),

822   α = .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), $F(1, 234) = 4.07$, $p = .045$, η^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.[13] As an exploratory analysis, we entered each of the 4N

828   subscales simultaneously into a regression predicting MCS ratings at Time 1.[14] 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 (βs: Natural = .07; Necessary = .10;

---

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

[14] 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   **Acknowledgments**

1005

1006

1007   **Appendix A**

1008   **Descriptions of Diet Categories Used in Study 4**

Diet	Description
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

1034   **References**

1035   Allen, M. W., Wilson, M., Ng, S. H., & Dunne, M. (2000). Values and beliefs of

1036   vegetarians and omnivores. *The Journal of Social Psychology, 140,* 405-422.

1037   Altemeyer, B. (1981). *Right-wing authoritarianism.* Winnipeg: University of

1038   Manitoba Press.

1039   Amato, P. R., & Partridge, S. A. (1989). *The new vegetarians. Promoting health and*

1040   *protecting life.* New York, NY: Plenum Press.

1041   American Dietetic Association. (2009). Position of the American Dietetic

1042   Association: Vegetarian diets. *Journal of the American Dietetic Association,*

1043   *109,* 1266-1282.

1044   Australian Bureau of Statistics (2013). *Livestock Products, Australia, 2013* (

1045   NO.7215.0). Retried from

1046   http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/7215.0main+features2Mark

1047   202013

1048   Aquino, K., & Reed, A. II. (2002). The self-importance of moral identity. *Journal of*

1049   *personality and social psychology*, *83*(6), 1423-1440.

1050   Bandura, A. (1999). Moral disengagement in the perpetration of inhumanities.

1051   *Personality and social psychology review*, *3*(3), 193–209.

1052   Baron, J. (1995). Myside bias in thinking about abortion. *Thinking & Reasoning, 1,*

1053   221-235.

1054   Bastian, B., Costello, K., Loughnan, S., & Hodson, G. (2012). When Closing the

1055   Human–Animal Divide Expands Moral Concern The Importance of Framing.

1056   *Social Psychological and Personality Science*, *3*(4), 421–429.

1057   Bastian, B., Loughnan, S., Haslam, N., & Radke, H. R. M. (2012). Don't mind meat?

1058   The denial of mind to animals used for human consumption. *Personality and*

1059   *Social Psychology Bulletin, 38,* 247-256.

1060   Beardsworth, A. D., & Keil, E. T. (1991). Vegetarianism, veganism and meat

1061   avoidance. Recent trends and findings. *British Food Journal, 93,* 19-24.

1062   Berndsen, M., & van der Pligt, J. (2004). Ambivalence towards meat. *Appetite, 42,*

1063   71-78.

1064   Bratanova, B., Loughnan, S., & Bastian, B. (2011). The effect of categorization as

1065   food on the perceived moral standing of animals. *Appetite*, *57*(1), 193–196.

1066   Bratanova, B., Loughnan, S., & Gatersleben, B. (2012). The moral circle as a

1067   common motivational cause of cross-situational pro-environmentalism.

1068   *European Journal of Social Psychology, 42,* 539-545.

1069   Cooper, J. (2007). *Cognitive dissonance: Fifty years of a classic theory.* Los Angeles,

1070   CA: Sage Publications.

1071   Ditto, P., & Lopez, D. (1992). Motivated skepticism: Use of differential decision

1072   criteria for preferred and nonpreferred conclusions. *Journal of Personality and*

1073   *Social Psychology, 63(4),* 568-584.

1074   European Vegetarian Union. (2008). *How many veggies...?* Retrieved from:

1075   http//www.euroveg.eu/lang/en/info/howmany.php.

1076   Fagerli, R. A., & Wandel, M. (1999). Gender differences in opinions and practices

1077   with regard to a ''healthy diet''. *Appetite, 32*, 171–190.

1078   Fessler, D. M. T., Arguello, A. P., Mekdara, J. M., & Macias, R. (2003). Disgust

1079   sensitivity and meat consumption: A test of an emotivist account of moral

1080   vegetarianism. *Appetite, 41,* 31-41.

1081   Festinger, L. (1957). *A theory of cognitive dissonance.* Stanford, CA: Stanford

1082   University Press.

1083   Fox, N. & Ward, K. (2008). Health, ethics and environment: A qualitative study of

1084   vegetarian motivations. *Appetite, 50,* 422-429.

1085   Gallup. (2012). In U.S., 5% consider themselves vegetarians. Retrieved from: <http://

1086   www.gallup.com/poll/156215/consider-themselves-vegetarians.aspx>.

1087   Gay Marriage ProCon.org. (2014). *Should gay marriage be legal?* Retrieved from

1088   Gay Marriage ProCon.org.

1089   GfK Social Research (2009). *Public attitudes to food survey 2009.* Food Standards

1090   Agency. Retrieved from

1091   <http://tna.europarchive.org/20111116080332/http://www.food.gov.uk/multi

1092   media/pdfs/publicattitudestofood.pdf>.

1093   Gray, H., Gray, K., & Wegner, D. (2007). Dimensions of mind perception. *Science,*

1094   *619,* 315.

1095   Haidt, J. (2001). The emotional dog and its rational tail: A social intuitionist approach

1096   to moral judgment. *Psychological Review, 108,* 814-834.

1097   Hamilton, M. (2006). Eating death: vegetarians, meat and violence. *Food, Culture*

1098   *and Society: An International Journal of MultidisciplinaryResearch*, *9*(2),

1099   155–177.

1100   Harmon-Jones, E., & Mills, J. (1999). *Cognitive dissonance: Progress on a pivotal*

1101   *theory in social psychology.* Washington, DC: American Psychological

1102   Association.

1103   Herzog, H. (2010). *Some we love, some we hate, some we eat: Why it's so hard to*

1104   *think straight about animals.* New York: Harper Perennial.

1105

1106 Ingram, G. P. D., Piazza, J. R., & Bering, J. M. (2009). The adaptive problem of

1107   absent third-party punishment. In H. Høgh-Olesen, J. Tønnesvang, & P.

1108   Bertelsen (Eds.), *Human Characteristics: Evolutionary perspectives on human*

1109   *mind and kind* (pp. 205-229). Newcastle, UK: Cambridge Scholars

1110   Publishing.

1111 Jabs, J., Devine, C. M., & Sobal, J. (1998). Model of the process of adopting

1112   vegetarian diet: Health vegetarians and ethical vegetarians. *Journal of*

1113   *Nutrition Education, 30,* 196-202.

1114 Jordan, A. H., & Monin, B. (2008). From sucker to saint. Moralization in response to

1115   self-threat. *Psychological Science, 19,* 809-815.

1116 Joy, M. (2010). *Why we love dogs, eat pigs, and wear cows: An introduction to*

1117   *carnism*. Red Wheel/Weiser.

1118 Kenyon, P. M., & Barker, M. E. (1998). Attitudes towards meat-eating in vegetarian

1119   and non-vegetarian teenage girls in England—an ethnographic approach.

1120   *Appetite, 30,* 185-198.

1121 Kuhn, D. (1991). *The skills of arguments.* Cambridge, MA: Cambridge University

1122   Press.

1123 Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin, 108,*

1124   480-498.

1125 Laham, S. M. (2009). Expanding the moral circle: Inclusion and exclusion mindsets

1126   and the circle of moral regard. *Journal of Experimental Social Psychology*,

1127   *45*(1), 250–253.

1128 Lea, E., & Worsley, A. (2003). Benefits and barriers to the consumption of a

1129   vegetarian diet in Australia. *Public Health Nutrition, 6,* 505-511.

1130   Lea, E., & Worsley, A. (2001). Influences on meat consumption in Australia.

1131   *Appetite, 36,* 127-136.

1132   Lindeman, M., & Väänänen, M. (2000). Measurement of ethical food choice motives.

1133   *Appetite, 34,* 55-59.

1134   Liu, B S., & Ditto, P. H. (2013). What dilemma? Moral evaluation shapes factual

1135   beliefs. *Social Psychological & Personality Science, 4,* 316-323.

1136   Loughnan, S., Bastian, B., & Haslam, N. (2014). The psychology of eating animals.

1137   *Current Directions in Psychological Science, 23(2),* 104-108.

1138   Loughnan, S., Haslam, N., & Bastian, B. (2010). The role of meat consumption in the

1139   denial of moral status and mind to meat animals. *Appetite*, *55*(1), 156–159.

1140   Mazar, N., Amir, O., & Ariely, D. (2008). The dishonesty of honest people: A theory

1141   of self-concept maintenance. *Journal of Marketing Research, 45,* 633-644.

1142   Mercier, H. (2011). What good is moral reasoning? *Mind & Society, 10(2),* 131-148.

1143   Mercier, H., & Sperber, D. (2011) Why do humans reason? Arguments for an

1144   argumentative theory. *Behavioral and Brain Sciences, 34,* 57-74.

1145   Minson, J. A., & Monin, B. (2012). Do-gooder derogation: Disparaging morally

1146   motivated minorities to defuse anticipated reproach. *Social Psychological*

1147   *and Personality Science, 3(2),* 200-207.

1148   National Institute of Nutrition. (1997). Tracking nutrition trends. Retrieved from

1149   <http://www.ccfn.ca/pdfs/canadian%20nutrition%201997.pdf>.

1150   National Institute of Nutrition. (2001). Tracking nutrition trends. Retrieved from

1151   <http://www.ccfn.ca/pdfs/rap-vol17-1.pdf>.

1152   Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomena in many

1153   guises. *Review of General Psychology, 2,* 175-220.

1154

1155   Perkins, D. N. (1985). Postprimary education has little impact on informal

1156   reasoning. *Journal of Educational Psychology, 77,* 562-571.

1157   Rappoport, L., Peters, G. R., Downey, R., & McCann, T. (1993). Gender and age

1158   differences in food cognition. *Appetite, 20*, 33–52.

1159   Rand, W. M., Pellett, P. L., & Young, V. R. (2003). Meta-analysis of nitrogen

1160   balance studies for estimating protein requirements in healthy adults.

1161   *American Journal of Clinical Nutrition, 77,* 109-127.

1162   Rothgerber, H. (2013). Real men don't eat (vegetable) quiche: Masculinity and

1163   the justification of meat consumption. *Psychology of Men & Masculinity*,

1164   *14,* 363-375.

1165   Rozin, P., Hormes, J. M., Faith, M. S., & Wansink, B. (2012). Is meat male? A

1166   multimethod framework to establish metaphoric or symbolic relationships.

1167   *Journal of Consumer Research, 39,* 629-643.

1168   Rozin, P., Markwith, M., & Stoess, C. (1997). Moralization and becoming a

1169   vegetarian: The transformation of preferences into values and the recruitment

1170   of disgust. *Psychological Science, 8*(2), 67–73.

1171   Ruby, M. B. (2012). Vegetarianism: A blossoming field of study. *Appetite, 58,* 141-

1172   150.

1173   Ruby, M. B., & Heine, S. J. (2011). Meat, morals, and masculinity. *Appetite, 56*(2),

1174   447–450.

1175   Ruby, M. B., & Heine, S. J. (2012). Too close to home. Factors predicting meat

1176   avoidance. *Appetite, 59*, 47–52.

1177   Santos, M. L. S. & Booth, D. A. (1996). Influences on meat avoidance among British

1178   students. *Appetite, 27,* 197-205.

1179

1180   Singer, P. (2009). *Animal liberation, 4ᵗʰ ed.* New York, NY: HarperCollins

1181   Publishers.

1182   Stanovich, K. E., West, R. F., & Toplak, M. E. (2012). Myside bias, rational thinking,

1183   and intelligence. *Current Directions in Psychological Science, 22(4),* 259-264.

1184   Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of the motives

1185   underlying the selection of food: The food choice questionnaire. *Appetite, 25,*

1186   267-284.

1187   Tsang, J. A. (2002). Moral rationalization and the integration of situational factors

1188   and psychological processes in immoral behavior. *Review of General*

1189   *Psychology, 6,* 25-50.

1190   Uhlmann, E. L., Pizarro, D. A., Tannenbaum, D., & Ditto, P. (2009). The motivated

1191   use of moral principles. *Judgment & Decision Making, 4,* 476-491.

1192   Vegetarian Resource Group (2012). How often do Americans eat vegetarian meals?

1193   And how many adults in the U.S. are vegetarian? Retrieved from:

1194   <http://www.vrg.org/blog/2012/05/18/how-often-do-americans-eat-

1195   vegetarian-meals-and-how-many-adults-in-the-u-s-are-vegetarian/>.

1196   Young, V. R., & Pellett, P. L. (1994). Plant proteins in relation to human protein

1197   and amino acid nutrition. *American Journal of Clinical Nutrition, 59,*

1198   1203S-1212S.

1199

1200

1201

1202

1203

1204

1205 **Tables**

1206 Table 1

1207 *Coding scheme used to score participants spontaneous meat-eating justifications in*

1208 *Studies 1a-1b.*

Category	Definition	Examples
Natural	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"
Necessary	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"
Normal	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"
Nice	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)"
Humane	Appeals to the "humane" nature of	"As long as you know it comes from a

Slaughter	slaughtering practices.	company that does not mistreat animals"; "Humane options exist for meat products"
Religion	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"
Sustainable	Appeals to the sustainable nature of meat as a renewable resource.	"Fish create less waste than other animals"
Miscellaneous	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"
Unscorable	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"

1209

1210

1211

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. Ns = 159-171.

1215

1216

1217

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	*M* (SD)
Natural		
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)
Necessary		
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)
Normal		

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)

Nice

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)

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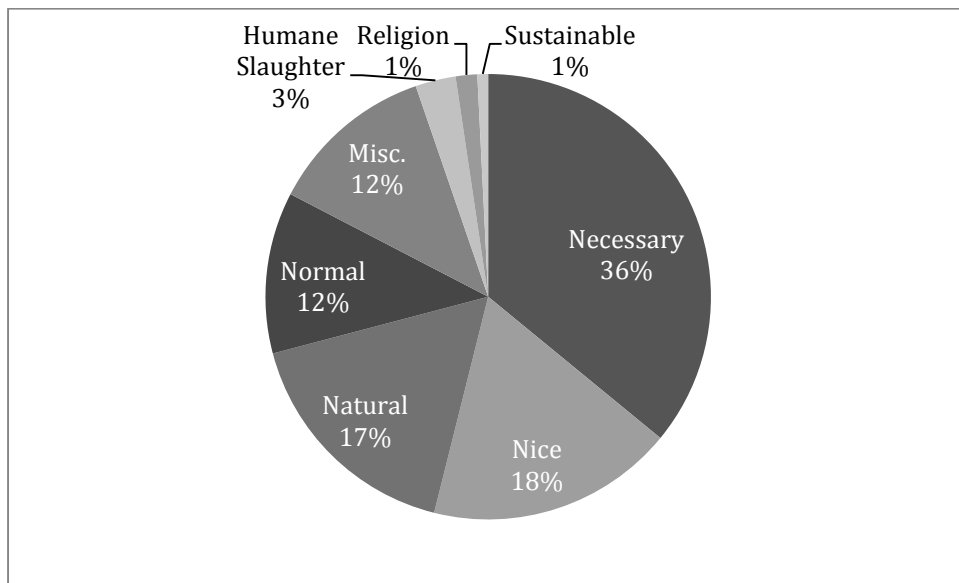
Figure 1. Frequency of various meat-eating justifications from Study 1a. *N* = 176
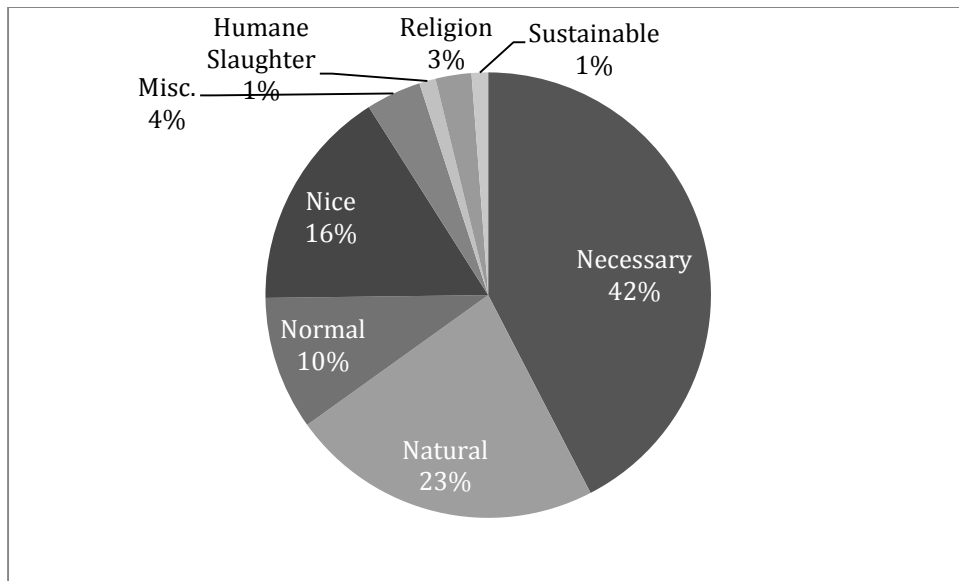
Penn undergraduate students.

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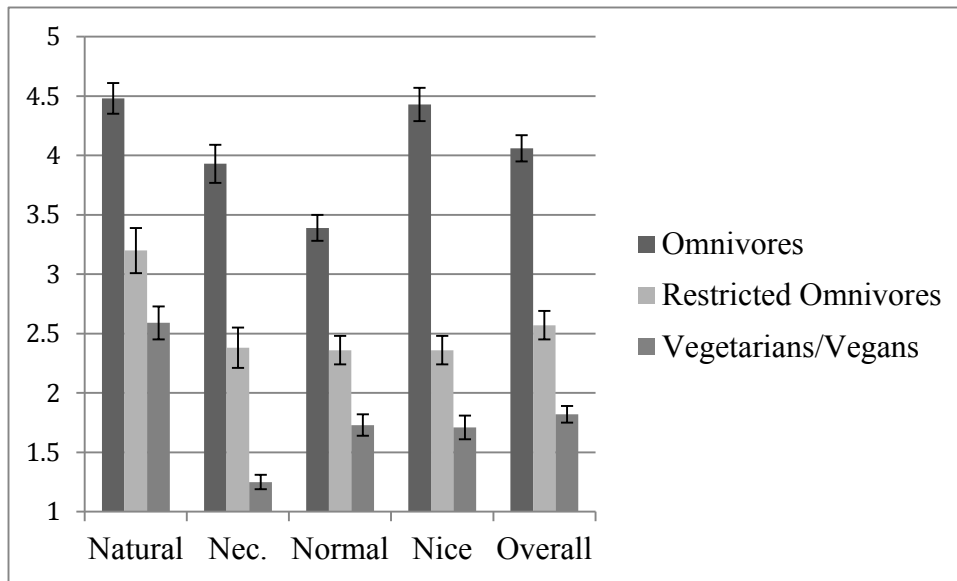
MTurk workers.

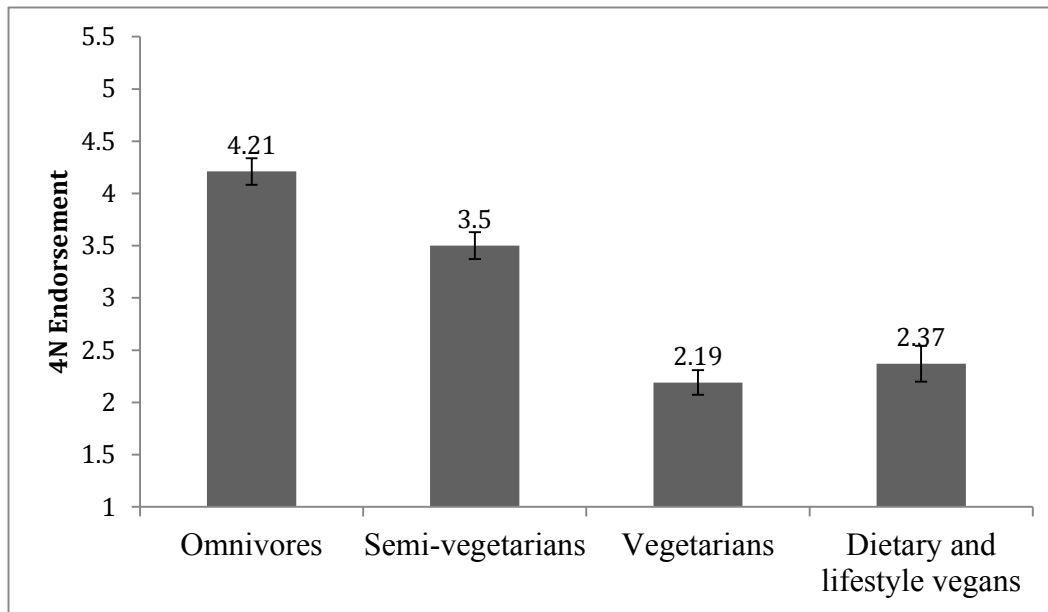*Figure 3.* 4N endorsement means and standard errors by diet (Study 2). Bars ± 1 SE.

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