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DOI: <https://doi.org/10.1016/j.appet.2021.105210>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-205888>

Journal Article

Published Version

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Originally published at:

Hopwood, Christopher J; Piazza, Jared; Chen, Sophia; Bleidorn, Wiebke (2021). Development and validation of the motivations to Eat Meat Inventory. *Appetite*, 163:105210.

DOI: <https://doi.org/10.1016/j.appet.2021.105210>

Development and validation of the motivations to Eat Meat Inventory

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ARTICLE INFO

Keywords:

Meat
Plant-based
Motivation
Personality
Values
Vegetarian
4 Ns

ABSTRACT

Previous research suggests that there are four primary motives to eat meat: that it is natural, normal, necessary, or nice. However, these motives have not yet been distinguished empirically; the lack of a measurement tool that can distinguish these motives has contributed to a literature that focuses primarily on meat-eating motivation or justification in general, as opposed to differences between these motives. We developed a 19-item measure, the *Motivations to Eat Meat Inventory* (MEMI), that fit a four-factor model in three samples (total N = 2175), including one with a large number of vegetarians. Using this instrument, we generated psychological profiles associated with each motive, and showed that the structure and correlates of meat-eating motives is highly similar for omnivores and vegetarians. This research provides a valuable tool for studying variation in psychological motives for eating meat among both meat-eaters and vegetarians and provides an initial framework for understanding the underpinnings of these different motivations.

1. Introduction

The question “why are you vegetarian” seems to get asked more often than “why do you eat meat”.¹ Why is that? One reason may be that most people eat meat, so it is natural to ask about the rarer dietary habit. Another factor may be that people who eat meat do so with considerable ambivalence (Bastian & Loughnan, 2017), and for that reason there may be a general understanding that meat-eaters prefer not being asked to justify their reasons (Harmon-Jones, 2004). That being said, there is evidence that a personally convincing rationale brings some emotional relief, presumably via dissonance reduction (Buttler & Walther, 2019; Rothgerber, 2014).

People typically give one or more of a relatively small number of reasons to eat animals and animal biproducts (Joy, 2010; The Smiths, 1985). Piazza et al. (2015) found that around 90% of open-ended responses to the question “why is it okay to eat meat” could be placed into one of four categories: that it is a *natural* human behavior, *necessary* for health, *normal* in our society, or *nice* tasting. Based on this result, Piazza et al. developed the *4N Meat Justification Scale* (4N Scale), a 16-item measure of these four justifications, or “rationalizations” to eat meat. They found that the 4N Scale total score reliably distinguished meat-eaters from vegetarians, and was correlated with a variety of

eating justification and morality measures. Many subsequent studies have used the 4N Scale to study meat-eating justification (e.g., Graça, Calheiros, & Oliveira, 2015; Macdiarmid, Douglas, & Campbell, 2016).

Though important and useful, there are several limitations to this work. First, Piazza et al. were specifically focused on people’s moral justifications for eating meat (i.e., the arguments people use to defend their meat consumption to others). This is a somewhat narrower, more social, and more morally tinged conception of reasons to eat meat than the broader and more neutral concept of “motivations for eating meat”. That being said, the 4 Ns could be conceptualized as either cognitive-dissonance reducing justifications or relatively common motivations, depending on context. Furthermore, the four scales intended to measure these justifications were not empirically distinct in the original validation study; rather, all of the scales were highly intercorrelated and an item-level principal components analysis suggested the presence of a single factor. Studies that have used the 4N Scale have generally focused on the overall score, rather than the four sub-scale scores.

Empirically distinct sub-scales would allow researchers to examine the various reasons people have for eating meat and enable research on important topics such as social cognitive and identity-related factors underlying food choices (e.g., Rosenfeld & Burrow, 2017a), the potential for advocacy or interventions targeting specific motivations (e.g.,

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¹ We refer throughout the paper to “meat-eating” and “vegetarian” for simplicity. However, we intend “meat-eating” to be inclusive of meat and other animal biproducts, and for “vegetarian” to be inclusive of vegans and other categories of people who purposely reduce their consumption of animal products.

Hopwood, Bleidorn, Schwaba, & Chen, 2020), and the malleability of meat-eating behavior as a function of the underlying beliefs that support it (e.g., Rozin, Markwith, & Stoess, 1997). The overall goal of this study was to develop and validate a measure of motivations to eat meat with empirically distinct scales, and to use that measure to develop psychological profiles of people who are most sympathetic to each of the different meat-eating motivations. Integral to this aim, in our scale development, we used a broader operationalization of motivation that is not narrowly tied to the notion of justification or a moral defense, as well as scale development techniques designed to distinguish the 4 Ns empirically.

1.1. Are there four distinct motivations to eat meat?

Our first specific aim was to test the hypothesis that four distinct motivations could be identified with item content suggestive of the natural, normal, necessary, and nice constructs described by Piazza et al. (2015). It is possible that the 4N Scale items formed a single factor because there is, essentially, one overarching meat-eating motivational factor. If so, it would make little sense to conceptualize or investigate the motives separately. Another possibility is that the 4 Ns have a high degree of empirical coherence when assessed as moral justifications due to the psychological tendency for people to engage in “belief overkill” or myside bias (Baron, 1995; Piazza et al., 2015), that is, to endorse not one or a few, but all of the 4 Ns, when defending the acceptability of eating meat. This kind of issue is well-known to affect discriminant validity in psychological scale development (Campbell et al., 1960).

However, there are strong theoretical reasons to distinguish the 4 Ns, as motivations for eating meat, which have been discussed as distinct entities in the literature. Thus, it is also possible that separate factors exist but are not clearly distinguished by the 4N Scale, particularly when operationalized within a moral-justification framework. Identifying empirically distinct scales would provide a solid conceptual foundation and useful tool for research on individual differences in motives to eat meat. In contrast, failure to identify those four factors may suggest the need to rethink the structure of meat-eating motivations.

We used three strategies to increase our chances to identify discriminant scales. First, we wrote more items than we intended to keep, so that we could eliminate poorly functioning items. Second, we wrote items whose content was as specific as possible to the construct they were intended to measure. Third, we added instructions requesting that respondents spread their responses across the entire range of the response scale, in order to isolate the reasons that were most important for them and avoid simply rating every item with high or low scores, regardless of content (see Appendix). We then used covariance modeling techniques to refine the scale and ensure its generalizability across different samples, as described in detail below.

1.2. What are the psychological profiles of different meat-eating motivations?

Our second aim was to examine the nomological net of these different motivations by examining scale levels in relation to one another, gender differences, and criterion correlations with variables related to eating attitudes and behavior, personality and personality problems, and values and self-concept. We did not have strong expectations about which motives would be most common, relative to one another. We did expect that men would tend to have higher scores across all meat-eating motivations, given previous research suggesting that women are more likely to be vegetarian and to identify more strongly with some aspects of vegetarian diet (Rosenfeld, 2020).

In the current study, we focused on three major domains of psychological functioning in selecting criterion measures. The first domain was eating attitudes and behaviors. We should expect any measure of meat-eating motivation to adhere relatively closely to other instruments designed to measure eating behavior, particularly as it pertains to eating

animal products. Thus, we were interested in how our scales would relate to other measures of meat-eating justification (Piazza et al., 2015), motivations to be vegetarian (Hopwood et al., 2020), and dietarian identity (Rosenfeld & Burrow, 2017a), as well as behaviors such as hunting/fishing and eating red meat.

The second domain included personality traits. Comprehensive models of individual differences in personality provide a general framework for understanding variation in certain specific domains, including eating behavior (Soto, 2019). We focused on the widely used big five model of personality traits, which proposes that a broad array of individual differences can be accounted for by variation in neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Previous research has found that vegetarian diet is related to agreeableness and openness to experience (Forestell & Nezlek, 2018; Pfeiler & Egloff, 2018a, b), however research on the associations between these traits and specific meat-eating motives is more limited. Big five domains and more specific facets that depict personality at a more granular level can be extended to include maladaptive traits, problems, and psychopathology. We included both normal range and maladaptive range personality characteristics because some of the motivations to eat meat have been associated with maladaptive behavior, interpersonal difficulties, and psychopathology symptoms (Amiot & Bastian, 2017; Arluke, Levin, Luke, & Ascione, 1999; Dadds, Whiting, & Hawes, 2006; Kavanaugh, Signal, & Taylor, 2013; McPhedran, 2009). In particular, we focused on antisocial or antagonistic personality traits (Miller, Lynam, & Leukafeld, 2003) such as callousness, lack of empathy, and indifference to others' suffering, based on previous research connecting traits from this domain to anti-animal attitudes that may support meat-eating behavior (Hopwood, Rosenfeld, Chen, & Bleidorn, 2021).

Third, we examined the links with values and self-concept. The choice to eat meat is often thought to reflect not only individual differences in personality, or broad patterns of behavior, but specific values, such as conservatism (Allen & Hung Ng, 2003; De Backer & Hudders, 2015), speciesism (Caviola et al., 2019), social dominance orientation (Dhont, Hodson, Costello, & MacInnis, 2014), or masculinity (Loughnan & Davies, 2019). Indeed, in our previous research we found that values generally had stronger correlations with the 4N Scale than personality traits (Hopwood et al., 2021). We were also interested in self-concept clarity (Campbell et al., 1996), because we reasoned that people with a sturdier sense of themselves may have more certainty about their dietary choices.

1.3. Do meat-eating motivations function differently in meat-eaters and vegetarians?

Our third goal was to compare meat-eating motivations among both omnivore and vegetarian respondents. Although they do not eat meat, it is reasonable to expect that vegetarians are more sympathetic to some motives than others. For instance, a vegetarian might acknowledge that it is socially normal to eat meat, even if they abstain themselves, whereas they may be more likely to object to the view that eating meat is necessary. Moreover, many vegetarians have been and/or will be meat-eaters at some point in their lives (Rosenfeld & Tomiyama, 2019), and presumably these motives were operative in their meat-eating. The question of whether motivations to eat meat function similarly in people who eat meat as they do in people who do not is therefore of significant interest in its own right.

Given our interest in personal motivations, our focus was on individuals' personal reasons, as opposed to the degree to which they acknowledge others' reasons. If the same measurement model fits the data in both meat-eating and vegetarian samples, it would suggest that vegetarians understand and acknowledge the reasons people give for eating meat, even if those reasons are not sufficiently compelling to them to actually eat meat or other animal biproducts. Finding that these dimensions have similar correlations with other eating attitudes and behaviors, personality features, values, and self-concept would also speak

to the similarity of these motives across people with different dietary preferences. We were unable to find previous empirical research on the awareness or recognition of meat-eating motivations among vegetarians.

2. Method

We used three samples in this study, which was declared exempt by the local IRB. Data are available at https://osf.io/t38wr/?view_only=a3f99c9516ba464c98f28c7d42729b86. Items were written by the authors, with the goal of capturing the distinctive aspects of the four dimensions identified by Piazza et al. (2015). The items represented “reasons to eat meat”, and the instrument instructed participants to rate each reason on a scale of personal importance, being sure to vary their responses to emphasize the most important reasons to them, personally (1 = *least important*; 7 = *most important*; see Appendix for full description). The items and these instructions were intended to distinguish the 4 Ns from one another as much as possible, while retaining their content validity (which we expected to include some actual overlap, reflecting the fact that different meat-eating motives are likely to correlate positively in nature). Participants in sample 1 were given all 32 candidate MEMI items and participants in samples 2 and 3 were given 22 candidate items. These 22 items were selected after trimming the original set and adding two new items based on the results from sample 1, as described in detail below. The complete list of items is available at https://osf.io/t38wr/?view_only=a3f99c9516ba464c98f28c7d42729b86; items for the final version are given in the Appendix.

2.1. Sample 1

2.1.1. Sample 1 participants

Our first sample consisted of 739 out of 757 undergraduate participants who completed at least 80% of an online survey to receive course credit (mean age = 20.01, SD = 3.60). There were 615 women; 186 participants reported Hispanic ethnicity; 178 were white, 10 black, 363 Asian, 4 Pacific Islander, 84 multiracial, and 95 reported another race or did not report race.

2.1.2. Sample 1 measures

Participants completed 32 candidate items for our meat-eating motivation scale. We selected criterion measures designed to assess variables from the three domains discussed above.

2.1.2.1. Eating attitudes and behaviors. The *4N Scale* (Piazza et al., 2015) is a 16-item measure of justifications to eat meat ($\alpha = .91$). It has subscales designed to measure the belief that meat-eating is natural, necessary, normal, and nice. The *Dietarian Identity Questionnaire* (DIQ; Rosenfeld & Burrow, 2018) is a measure of dietary identity. It has 8 scales that assess the centrality of diet to the person's identity ($\alpha = 0.93$), perceptions about how one is regarded by others based on their diet privately ($\alpha = 0.84$), perceptions about how one is regarded by others based on their diet publicly ($\alpha = 0.93$), out-group regard, or the importance of having friends with similar dietary patterns ($\alpha = .96$), prosocial motivations for diet ($\alpha = 0.95$), personal motivations for diet ($\alpha = 0.85$), moral motivations for diet ($\alpha = 0.86$), and dietary strictness ($\alpha = 0.90$). The *Vegetarian Eating Motives Inventory* (VEMI; Hopwood et al., 2020) measures the three most common motives for being vegetarian in Western cultures: health ($\alpha = 0.90$), the environment ($\alpha = 0.89$), and animal rights ($\alpha = 0.93$).

2.1.2.2. Personality traits and problems. The *IPIP-120* (Maples, Guan, Carter, & Miller, 2014) is a measure of the big 5 personality traits neuroticism ($\alpha = .85$), extraversion ($\alpha = 0.86$), openness to experience ($\alpha = 0.77$), agreeableness ($\alpha = 0.83$), and conscientiousness ($\alpha = 0.88$). The *Brief Personality Inventory for DSM-5* (PID-5; American Psychiatric

Association APA, 2013) is a measure of maladaptive personality traits including negative affectivity ($\alpha = 0.73$), detachment ($\alpha = 0.69$), antagonism ($\alpha = 0.74$), disinhibition ($\alpha = 0.78$), and psychoticism ($\alpha = 0.75$). The *Inventory of Interpersonal Problems – Short Circumplex* (IIP-SC; Soldz, Budman, Demby, & Merry, 1995) is a 32-item measure of interpersonal problems, with items focusing on behaviors the respondent does too much or not enough with others ($\alpha = 0.92$).

2.1.2.3. Values and self-concept. The *Agentive and Communal Values Scale* (ACV; Trapnell & Paulhus, 2012) measures values related to agency ($\alpha = 0.83$) and communion ($\alpha = 0.82$).

Data from this sample was used in a previous manuscript in which we examined correlates of motivations for vegetarian diet (Hopwood, Bleidorn, Schwaba, & Chen, 2019, sample 4). We did not use any of the items we generated for our new scale in this study.

2.2. Sample 2

2.2.1. Sample 2 participants

Sample 2 consisted of 754 out of 771 participants from a university subject pool who completed at least 80% of survey items (mean age = 19.51, SD = 1.99). There were 619 women, 131 men, and 4 other genders. There were 342 Asian, 210 white, 15 black, 2 Native American, 2 Pacific Islander, 63 multiracial participants and 110 members of other races; 184 reported Latinx ethnicity.

2.2.2. Sample 2 measures

Participants completed 22 candidate MEMI items, as described below.

2.2.2.1. Eating attitudes and behaviors. Participants completed three measures of eating attitudes and behaviors. As in sample 1, participants completed the *Vegetarian Eating Motives Inventory* (VEMI; Hopwood et al., 2020; health $\alpha = 0.85$, environment $\alpha = 0.90$, animal rights $\alpha = 0.95$). Participants also completed a single item asking if they eat red meat. Four items, rated on a 1 (not at all) to 5 (very much) scale, were combined to assess hunting and fishing, respectively – “do you enjoy hunting/fishing” and “do you think hunting/fishing is an admirable hobby”. These were collapsed into a single hunting and fishing scale ($\alpha = 0.79$).

2.2.2.2. Personality traits and problems. Participants completed several measures of personality features. We used the 60-item version of the *International Personality Item Pool* (Maples-Keller et al., 2019) to assess the normal range traits neuroticism ($\alpha = 0.81$), extraversion ($\alpha = 0.84$), openness ($\alpha = 0.72$), agreeableness ($\alpha = 0.79$), and conscientiousness ($\alpha = 0.79$). We again used the *Brief Personality Inventory for DSM-5* (American Psychiatric Association APA, 2013) to assess maladaptive traits negative affectivity ($\alpha = 0.75$), detachment ($\alpha = 0.67$), psychoticism ($\alpha = 0.70$), antagonism ($\alpha = 0.76$), and disinhibition ($\alpha = 0.76$). We used the callousness ($\alpha = 0.75$), rashness ($\alpha = 0.78$), and self-centeredness ($\alpha = 0.79$) scales from the *Elemental Psychopathy Assessment* (Lynam et al., 2011) and the entitlement ($\alpha = 0.83$), indifference ($\alpha = 0.85$), and lack of empathy ($\alpha = 0.78$) scales from the *Five Factor Narcissism Inventory* (Glover, Miller, Lynam, Crego, & Widiger, 2012) to assess maladaptive antagonism facets. We assessed hedonic traits with the Life of Pleasure scale (Peterson, Park, & Seligman, 2005; $\alpha = 0.77$), and again used the IIP-SC to measure interpersonal problems ($\alpha = 0.91$).

2.2.2.3. Values and self-concept. We administered several measures of values and self-concept, including the *Speciesism Scale* (Caviola et al., 2019; $\alpha = 0.75$), the *Social Dominance Orientation scale* (Pratto, Sidanius, Stallworth, & Malle, 1994; $\alpha = 0.93$). We assessed conservatism with the 12-item social and economic conservatism scale (SECS; Everett, 2013, α

= 0.76), gender roles with the 12-item *Bem Sex Role Inventory* (Mateo & Fernández, 1991; masculinity $\alpha = 0.79$, femininity $\alpha = 0.84$), values with the ACV (agency $\alpha = 0.76$, communion $\alpha = 0.76$), and self-concept clarity with the *Self-Concept Clarity scale* (SCC; Campbell et al., 1996; $\alpha = 0.88$).

Data from this study was used in one previous report, in which we examined associations between personality traits and speciesism, hunting/fishing, and the VEMI animal rights scale (Hopwood et al., 2021). MEMI items were not used in that study.

2.3. Sample 3

2.3.1. Sample 3 participants

Sample 3 consisted of 682 participants from the Prolific data collection service (<https://www.prolific.co>). We initially invited 387 participants to participate in the study if they were not vegetarian and 343 to participate in the study if they were vegetarian. These invitations were sent to people who had previously registered with Prolific as either vegetarian or not – the invitations themselves did not specifically mention dietary habits. Of these participants, 356 in the non-vegetarian sample and 326 in the vegetarian sample completed the survey. However, 91 of the individuals invited into the vegetarian version of the study responded affirmatively to having “generally eaten meat” (Rose-nfeld & Burrow, 2018) within the survey, and 16 of the individuals invited into the non-vegetarian version of the survey indicated that they do not generally eat meat. We classified respondents as vegetarian only if they reported not generally eating meat (people in this group could have eaten animal products such as milk or eggs; i.e., they identified as vegetarian or vegan). This left 431 (356 – 16 + 91) participants in the meat-eating group and 251 (326 – 91 + 16) in the vegetarian group. There were 246 men, 422 women, and 14 people reporting other genders; the average age was 31.04 (SD = 11.18, range = 18–80). Most respondents (495) were white; 40 were black, 82 Asian, 3 Pacific Islander, 43 multiracial, and 19 other races; 58 reported Latinx ethnicity. The vast majority of respondents (661) were North American; others came from Europe (16), Asia (3), South America (1), or Oceania (1).

2.3.2. Sample 3 measures

Participants completed 22 candidate MEMI items, as described below.

2.3.2.1. Eating attitudes and behaviors. Participants completed the 8 scales of the DIQ (centrality $\alpha = 0.95$, private regard $\alpha = 0.86$, public regard $\alpha = 0.94$, outgroup regard $\alpha = .95$, prosocial motivations $\alpha = 0.97$, personal motivations $\alpha = 0.83$, moral motivations $\alpha = 0.93$, strictness $\alpha = 0.94$), the VEMI (health $\alpha = 0.91$, environment $\alpha = 0.95$, animal rights $\alpha = 0.97$), and the same hunting/fishing ($\alpha = 0.84$ among omnivores) and meat-eating items as in sample 2.

2.3.2.2. Personality traits and problems. As in sample 2, participants completed the IPIP-60 (neuroticism $\alpha = 0.86$, extraversion $\alpha = 0.87$, openness $\alpha = .76$, agreeableness $\alpha = 0.78$, and conscientiousness $\alpha = 0.81$) and *Brief Personality Inventory for DSM-5* traits (negative affectivity $\alpha = 0.74$, detachment $\alpha = 0.73$, antagonism $\alpha = 0.68$, disinhibition $\alpha = 0.81$, psychoticism $\alpha = .79$), life of pleasure scale ($\alpha = 0.80$), the callousness ($\alpha = 0.79$), rashness ($\alpha = 0.82$) and self-centeredness ($\alpha = 0.81$) scales from the *Elemental Psychopathy Assessment*, and the entitlement ($\alpha = 0.85$), indifference ($\alpha = 0.89$), and lack of empathy ($\alpha = 0.84$) scales from the *Five Factor Narcissism Inventory*, and the IIP ($\alpha = 0.91$).

2.3.2.3. Values and self-concept. Participants completed the same measures of speciesism ($\alpha = 0.82$), social dominance ($\alpha = 0.95$), agentic ($\alpha = 0.76$) and communal ($\alpha = 0.81$) values, conservatism ($\alpha = 0.86$),

masculinity ($\alpha = 0.82$), femininity $\alpha = 0.87$), and self-concept clarity ($\alpha = 0.92$) as in sample 2.

Data from this study were previously used in two other manuscripts. In the first, we examined the measurement invariance of the VEMI scales across vegetarian and omnivore respondents (Hopwood et al., 2021). In the second, we examined associations between personality traits and speciesism, hunting/fishing, and the VEMI animal rights scale (Hopwood et al., 2021). MEMI items were not included in either of these studies.

3. Results

3.1. MEMI development

Maximum Likelihood Exploratory Factor Analysis was applied to the correlation matrix of the 32 candidate MEMI items in sample 1. Four factors had eigenvalues significantly larger than 1 according to parallel analysis (12.91, 3.45, 2.06, 1.26). These factors were rotated via Promax with Kaiser normalization. We eliminated items that loaded too weakly (e.g., <0.40) on their intended scale and/or too highly (e.g., >0.40) on an unintended scale. We also removed three well-functioning items from the nice scale because we sought to have five items per scale. Overall, we removed 12 items for these reasons. However, the fourth factor, which reflected the natural construct, only had three sizeable loadings and each of them had substantial cross-loadings. In general, there seemed to be significant overlap between the natural dimension with the normal and necessary dimensions. As such, we wrote two new items designed to target the natural dimension more specifically: “it is human nature to eat meat” and “eating meat is part of our biology”.

We collected the resulting 22 items in two new samples, one gathered in an undergraduate subject pool, and one gathered in Prolific. EFA models again suggested four reliable factors in each sample, and items generally loaded on their intended dimensions. However, three items had problematic cross-loadings (>0.40) in both samples. These three items were removed, resulting in a 19-item measure with four (Natural) or five (Normal, Necessary, Nice) items per scale (Appendix).

To confirm the fit of these models, we submitted them to CFA models with WLSMV estimation in all three samples. This includes the data from sample 1, albeit without the two items we added to the normal scale for samples 2 and 3. As shown in Table 1, this model fit the data well in all three samples. Scale items and pattern coefficients are shown in Table 2. Each item proved to be a reliable indicator of the latent constructs in all three samples. As such, we were satisfied that we had identified a well-fitting four-dimensional model of motives for eating meat.

Latent variable correlations from these models are depicted in Table 3. That table shows that each of the four motives to eat meat were strongly related to each other motive. This finding suggests that, although people may have distinct reasons for eating meat, people who are motivated by one factor are also likely to be relatively more motivated by the others. This supports the use of the total score of the MEMI (or of the 4N Scale), for research on the general motivation to eat meat.

3.2. MEMI validity

Scale scores across all study samples, with the third sample split into omnivore and vegetarian groups, are presented in Table 4. As expected, vegetarians had much lower scores than participants in the non-vegetarian groups. The other groups had fairly similar scores for all

Table 1
CFA model fit for the MEMI across three samples.

Sample	χ^2	Df	CFI	TLI	RMSEA	90% CI
1	11958.12	136	.982	.978	.051	.045–.058
2	417.94	146	.985	.982	.050	.044–.055
3	194.20	146	.999	.998	.022	.013–.030

Table 2

Standardized path coefficients in CFA models of the MEMI items across three samples.

MEMI Item	Sample 1	Sample 2	Sample 3
Natural			
1	.66	.54	.74
9		.82	.87
21	.85	.88	.92
22		.88	.94
Normal			
3	.66	.67	.67
7	.57	.63	.55
11	.81	.86	.96
15	.85	.84	.80
19	.65	.63	.55
Necessary			
2	.59	.65	.82
6	.85	.81	.81
10	.80	.81	.89
14	.62	.69	.79
18	.83	.83	.89
Nice			
4	.76	.79	.88
8	.82	.86	.90
12	.79	.72	.88
16	.81	.83	.92
20	.74	.77	.81

Table 3

Latent intercorrelations between MEMI scales in three samples.

	Natural	Normal	Necessary
Normal			
Sample 1	.70		
Sample 2	.62		
Sample 3	.64		
Necessary			
Sample 1	.64	.47	
Sample 2	.66	.45	
Sample 3	.78	.56	
Nice			
Sample 1	.46	.37	.64
Sample 2	.57	.38	.69
Sample 3	.68	.54	.75

four scales. However, rates varied appreciably across scales. Specifically, whereas the scores for the necessary and nice scales tended to average around 4 to 4.5, scores for the natural scale averaged around 3 and scores for the normal scale averaged around 2.5. This pattern was mirrored in the vegetarian sample, albeit with lower levels across all scales for vegetarians. This suggests that, in general, beliefs that eating meat is necessary and tastes nice are more common motivators for eating meat than beliefs that eating meat is natural or normal.

We next examined gender differences and correlates of the MEMI scales across these samples. Table 5 shows MEMI scale scores for men and women (the number of people reporting other genders was too small to meaningfully examine means in this group). Two patterns emerged from this analysis. First, gender differences were minimal among vegetarians, with the only scale achieving statistical significance ($p < .01$)

being normal. Second, men had significantly ($p < .01$) higher scores for all natural, normal, and nice scales across all three samples, with effect sizes in the 0.3 to 0.5 range. Although men also tended to have higher scores on the necessary scale as well, these differences were smaller (~ 0.2) than for the other three scales and not significant in 2 of 3 non-vegetarian samples.

We examined MEMI correlates across all samples, again splitting the third sample into omnivorous and vegetarian sub-groups. Results are presented in Table 6. Given the large number of correlates and our focus on associations that replicate across samples, we describe these results in terms of the three major validation domains: eating attitudes and behaviors, personality traits and problems, and values and self-concept.

3.2.1. Eating attitudes and behaviors

All four MEMI scales had very strong positive correlations with the 4N Scale total score in the first sample. The multiple correlation from a model in which the four MEMI scales were regressed on the 4N Scale total score was 0.83. This finding can reassure researchers that the emerging literature using the 4N Scale can inform hypotheses and constrain interpretations about overall motivation to eat meat, as assessed by the MEMI.

Several findings, replicated in sample 1 and sample 3 omnivores, stand out with regard to dietarian identity. First, meat-eating motivations involving conforming to social norms (necessary) were positively related to the similar concept of outgroup regard, as well as moral motives. Second, prosocial motives were negatively related to the belief that meat tastes nice. Third, personal motives were positively related to the belief that meat is necessary for health. Finally, people who say that meat tastes nice were less likely to report strict diets. This pattern suggests that there are strong but non-overlapping connections between motives to eat meat and dietarian identity.

Table 5

Gender differences in MEMI scales across three samples.

Sample	Men		Women		d	t	p
	Mean	SD	Mean	SD			
Natural							
1	3.18	1.50	2.71	1.38	.34	3.35	.001
2	3.71	1.52	3.13	1.39	.41	4.25	<.001
3 Omnivores	3.60	1.63	2.81	1.61	.49	5.01	<.001
3 Vegetarians	1.56	.88	1.57	.96	-.01	.08	.93
Normal							
1	3.13	1.52	2.76	1.37	.27	2.71	.007
2	3.06	1.29	2.62	1.34	.33	3.44	.001
3 Omnivores	2.70	1.37	2.02	.99	.59	5.93	<.001
3 Vegetarians	1.87	1.02	1.51	.85	.40	2.70	.007
Necessary							
1	4.84	1.33	4.51	1.35	.25	2.43	.02
2	4.79	1.27	4.51	1.30	.22	2.25	.03
3 Omnivores	4.51	1.36	4.13	1.47	.27	2.74	.006
3 Vegetarians	2.43	1.34	2.37	1.31	.05	.28	.78
Nice							
1	5.17	1.39	4.43	1.46	.51	5.09	<.001
2	4.83	1.36	4.35	1.42	.34	3.50	<.001
3 Omnivores	4.87	1.26	4.11	1.55	.53	5.38	<.001
3 Vegetarians	2.15	1.34	2.07	1.35	.06	.39	.70

Table 4

MEMI scores in three study samples.

Sample	Natural		Normal		Necessary		Nice	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	2.78	1.41	2.82	1.40	4.56	1.35	4.54	1.47
2	3.22	1.43	2.69	1.34	4.56	1.30	4.42	1.42
3 Omnivores	3.16	1.67	2.32	1.22	4.30	1.44	4.45	1.48
3 Vegetarians	1.55	.93	1.61	.91	2.39	1.33	2.09	1.33

Note. Scores significantly differed across omnivore and vegetarian respondents for all three MEMI scales ($p < .01$).

Table 6
Correlations of MEMI scales with criterion variables in three samples.

Criterion Variable	Natural			Normal			Necessary			Nice		
	<i>r</i>	95% CI	<i>p</i>	<i>r</i>	95% CI	<i>p</i>	<i>r</i>	95% CI	<i>p</i>	<i>r</i>	95% CI	<i>p</i>
Sample 1												
4N Scale	.64	.59, .68	<.01	.38	.32, .45	<.01	.68	.63, .72	<.01	.68	.64, .72	<.01
Dietary Identity												
Centrality	.15	.07, .22	<.01	.23	.04, .16	<.01	.11	.02, .19	<.01	-.04	-.13, .04	.24
Private Regard	.13	.05, .20	<.01	.10	.02, .17	.01	.10	.02, .18	<.01	.06	-.03, .15	.13
Public Regard	.00	-.08, .07	.91	.00	-.08, .07	.99	.12	.05, .20	<.01	.11	.03, .19	<.01
Outgroup Regard	-.32	-.39, -.25	<.01	.39	-.46, -.32	<.01	-.07	-.15, -.01	.05	-.05	-.12, .03	.19
Prosocial Motives	.11	.04, .20	<.01	.18	.11, .27	<.01	-.01	-.09, .09	.88	-.18	-.26, .11	<.01
Personal Motives	.04	-.04, .12	.30	-.01	-.08, .06	.73	.21	.13, .30	<.01	.01	-.07, .10	.80
Moral Motives	.21	.14, .29	<.01	.29	.22, .37	<.01	.02	-.07, .10	.69	-.13	-.21, -.05	<.01
Strictness	.04	-.04, .13	.24	.03	-.04, .11	.39	-.18	-.27, -.09	<.01	-.31	-.39, -.21	<.01
Vegetarian Motives												
Health	-.03	-.11, .06	.38	.09	.02, .16	.01	.10	.03, .18	<.01	-.06	-.13, .02	.14
Environment	-.26	-.33, -.18	<.01	-.08	-.15, -.01	.02	-.29	-.36, -.21	<.01	-.32	-.39, -.25	<.01
Animal Rights	-.17	-.23, -.09	<.01	-.10	-.17, -.01	<.01	-.18	-.26, -.11	<.01	-.27	-.34, -.20	<.01
Personality Traits												
Neuroticism	.01	-.06, .08	.82	.05	-.03, .12	.21	-.01	-.09, .07	.73	.04	-.03, .12	.23
Extraversion	.03	-.05, .10	.45	-.03	-.11, .04	.39	.11	.03, .18	<.01	-.01	-.09, .07	.84
Openness	-.28	-.35, -.22	<.01	-.30	-.36, -.23	<.01	-.18	-.26, -.10	<.01	-.14	-.21, -.06	<.01
Agreeableness	-.31	-.38, -.23	<.01	-.36	-.43, -.30	<.01	-.15	-.22, -.06	<.01	-.14	-.21, -.07	<.01
Conscientiousness	-.17	-.24, -.10	<.01	-.24	-.31, -.17	<.01	-.03	-.11, .05	.48	-.07	-.15, .00	.04
Maladaptive Traits												
Negative Affectivity	.05	-.01, .13	.05	.08	.01, .16	.02	.03	-.04, .11	.40	.05	-.02, .13	.16
Detachment	.19	.12, .26	<.01	.19	.13, .27	<.01	.02	-.05, .10	.57	.02	-.05, .10	.51
Antagonism	.26	.19, .34	<.01	.33	.26, .40	<.01	.14	.07, .21	<.01	.19	.12, .26	<.01
Disinhibition	.19	.12, .27	<.01	.27	.20, .34	<.01	.10	.03, .18	<.01	.11	.04, .19	<.01
Psychoticism	.14	.06, .21	<.01	.11	.04, .19	<.01	.05	-.03, .13	.18	.06	-.01, .14	.11
Interpersonal Problems	.21	.13, .28	<.01	.23	.16, .30	<.01	.07	.00, .14	.08	.12	.05, .18	<.01
Values												
Agency	.23	.15, .30	<.01	.30	.24, .37	<.01	.20	.13, .27	<.01	.17	.09, .24	<.01
Communion	-.14	-.20, -.07	<.01	-.14	-.21, -.07	<.01	.00	-.06, .07	.99	-.01	-.08, .05	.74
Sample 2												
Vegetarian Motives												
Health	.06	-.02, .13	.11	.17	-.10, .24	<.01	.14	.06, .21	<.01	-.06	-.13, .02	.10
Environment	-.31	-.38, -.23	<.01	-.09	-.16, -.02	.02	-.34	-.41, -.26	<.01	-.34	-.41, -.28	<.01
Animal Rights	-.19	-.27, -.11	<.01	.00	-.08, .07	.98	-.20	-.27, -.12	<.01	-.28	-.35, -.20	<.01
Eating Meat	.31	.25, .37	<.01	.09	.02, .16	.01	.36	.28, .42	<.01	.51	.45, .57	<.01
Hunting and Fishing	.26	.19, .33	<.01	.09	.01, .16	.02	.25	.18, .31	<.01	.23	.17, .30	<.01
Personality Traits												
Neuroticism	.03	-.04, .11	.35	.03	-.04, .10	.43	-.05	-.12, .03	.14	.00	-.07, .08	.91
Extraversion	.02	-.05, .09	.55	-.01	-.09, .06	.72	.04	-.05, .11	.32	.00	-.08, .08	.95
Openness	-.05	-.12, .03	.21	-.11	-.18, -.04	<.01	-.07	-.15, .00	.05	-.05	-.13, .03	.17
Agreeableness	-.13	-.20, -.05	<.01	-.10	-.18, -.03	<.01	-.01	-.09, .06	.70	-.10	-.18, -.02	<.01
Conscientiousness	-.13	-.19, -.05	<.01	-.19	-.25, -.12	<.01	-.03	-.11, .04	.42	-.13	-.20, -.06	<.01
Maladaptive Traits												
Negative Affectivity	.02	-.05, .10	.52	.06	-.02, .13	.11	-.03	-.09, .05	.50	.00	-.07, .08	.96
Detachment	.04	-.04, .11	.28	.13	.05, .21	<.01	.06	-.13, .02	.13	-.01	-.09, .07	.87
Antagonism	.18	.11, .25	<.01	.23	.16, .30	<.01	.08	.01, .15	.02	.19	.12, .26	<.01
Disinhibition	.16	.09, .23	<.01	.24	.18, .31	<.01	.07	.00, .14	.07	.10	.03, .18	<.01
Psychoticism	.11	.03, .18	<.01	.12	.04, .19	<.01	.14	.06, .22	<.01	.14	.06, .21	<.01
Life of Pleasure	.11	.03, .18	<.01	.12	.05, .19	<.01	.14	.07, .22	<.01	.14	.06, .22	<.01
Callousness	.13	.07, .19	<.01	.11	.03, .18	<.01	.06	-.01, .12	.12	.09	.02, .15	.02
Rashness	.13	.07, .20	<.01	.17	.10, .23	<.01	.05	-.02, .12	.16	.07	.00, .14	.06
Self-Centeredness	.15	.08, .23	<.01	.10	.02, .18	<.01	.05	-.03, .12	.22	.12	.04, .19	<.01
Entitlement	.23	.16, .30	<.01	.28	.21, .35	<.01	.15	.09, .22	<.01	.18	.12, .25	<.01
Indifference	.05	-.03, .13	.14	.02	-.05, .09	.64	.05	-.03, .13	.15	-.01	-.09, .07	.77
Lack of Empathy	.20	.13, .27	<.01	.16	.09, .23	<.01	.11	.04, .18	<.01	.12	.05, .19	<.01
Interpersonal Problems	.07	.00, .14	.05	.16	.09, .23	<.01	-.02	-.09, .05	.56	-.04	-.02, .11	.24
Values												
Agency	.27	.19, .34	<.01	.29	.23, .36	<.01	.20	.12, .27	<.01	.19	.11, .26	<.01
Communion	-.03	-.11, .04	.38	-.01	-.07, .07	.89	.07	-.01, .14	.07	-.08	-.16, -.01	.03
Speciesism	.29	.22, .36	<.01	.21	.13, .28	<.01	.19	.13, .26	<.01	.27	.20, .33	<.01
Conservatism	.30	.22, .37	<.01	.19	.12, .26	<.01	.37	.30, .43	<.01	.18	.10, .25	<.01
Social Dominance Orientation	.30	.24, .37	<.01	.35	.29, .42	<.01	.20	.15, .27	<.01	.15	.09, .21	<.01
Femininity	-.04	-.11, .04	.27	.00	-.08, .07	.94	.04	-.05, .12	.30	-.05	-.13, .02	.14
Masculinity	.03	-.04, .11	.35	-.07	-.15, .01	.05	.05	-.02, .13	.14	.00	-.08, .07	.91
Self-Concept Clarity	-.02	-.09, .06	.62	-.09	-.26, -.02	.01	.06	-.02, .14	.12	.05	-.03, .13	.21
Sample 3 Omnivores												
Dietary Identity												
Centrality	.06	-.04, .16	.20	.20	.09, .30	<.01	.08	-.02, .18	.10	-.11	-.21, -.01	.03
Private Regard	.21	.11, .30	<.01	.16	.05, .27	<.01	.16	.05, .25	<.01	-.02	-.12, .10	.75
Public Regard	-.04	-.14, .06	.42	.04	-.07, .14	.44	.01	-.10, .11	.90	.01	-.10, .10	.89
Outgroup Regard	-.12	-.23, -.01	.01	-.30	-.42, -.17	<.01	-.06	-.17, .06	.23	.07	-.02, .19	.13

(continued on next page)

Table 6 (continued)

Criterion Variable	Natural			Normal			Necessary			Nice		
	<i>r</i>	95% CI	<i>p</i>	<i>r</i>	95% CI	<i>p</i>	<i>r</i>	95% CI	<i>p</i>	<i>r</i>	95% CI	<i>p</i>
Prosocial Motives	-.12	-.21, -.02	.01	.11	.01, .22	.02	-.11	-.21, .00	.03	-.32	-.42, -.22	<.01
Personal Motives	-.01	-.11, .08	.83	-.01	-.10, .09	.89	.18	.07, .27	<.01	-.17	-.27, -.07	<.01
Moral Motives	.01	-.09, .12	.85	.20	.08, .31	<.01	-.04	-.14, .08	.47	-.25	-.36, -.15	<.01
Strictness	-.22	-.31, -.14	<.01	-.10	-.19, .00	.04	-.26	-.36, -.15	<.01	-.36	-.45, -.27	<.01
Vegetarian Motives												
Health	.06	-.04, .16	.23	.11	.01, .20	.02	.14	.05, .24	<.01	-.05	-.15, .06	.31
Environment	-.48	-.55, -.29	<.01	-.10	-.20, -.01	.03	-.34	-.43, -.24	<.01	-.43	-.51, -.34	<.01
Animal Rights	-.29	-.38, -.20	<.01	-.14	-.24, -.04	<.01	-.22	-.31, -.12	<.01	-.42	-.50, -.34	<.01
Eating Meat	.40	.33, .47	<.01	.23	.15, .31	<.01	.39	.30, .46	<.01	.51	.42, .59	<.01
Hunting and Fishing	.43	.34, .51	<.01	.24	.11, .34	<.01	.33	.24, .41	<.01	.32	.25, .40	<.01
Personality Traits												
Neuroticism	-.07	-.17, .04	.17	-.06	-.14, .04	.26	-.09	-.18, .01	.07	-.03	-.13, .07	.51
Extraversion	.07	-.03, .16	.07	.16	.06, .25	<.01	.11	.00, .20	.03	.04	-.06, .15	.41
Openness	-.36	-.45, -.28	<.01	-.25	-.35, -.15	<.01	-.21	-.30, -.11	<.01	-.27	-.35, -.18	<.01
Agreeableness	-.31	-.41, -.22	<.01	-.23	-.33, -.13	<.01	-.20	-.29, -.10	<.01	-.28	-.37, -.18	<.01
Conscientiousness	.07	-.04, .17	.16	.00	-.11, .10	.97	.09	-.01, .19	.05	.00	-.10, .10	.99
Maladaptive Traits												
Negative Affectivity	.04	-.06, .14	.45	.07	-.03, .19	.13	.01	-.08, .11	.80	-.01	-.11, .09	.78
Detachment	.08	-.01, .18	.09	.07	-.03, .18	.17	.02	-.07, .13	.65	.01	-.09, .10	.92
Antagonism	.24	.14, .34	<.01	.28	.16, .39	<.01	.17	.07, .25	<.01	.20	.12, .29	<.01
Disinhibition	.11	.02, .21	.02	.19	.10, .30	<.01	.03	-.07, .13	.52	.07	-.02, .17	.14
Psychoticism	.06	-.03, .15	.20	.17	.09, .27	<.01	.06	-.05, .15	.25	-.03	-.12, .08	.57
Life of Pleasure	.18	.08, .28	<.01	.16	.06, .25	<.01	.17	.08, .27	<.01	.16	.07, .26	<.01
Callousness	.35	.25, .44	<.01	.27	.16, .39	<.01	.18	.08, .27	<.01	.26	.16, .34	<.01
Rashness	.10	-.01, .20	.05	.19	.10, .30	<.01	.03	-.08, .13	.61	-.01	-.11, .10	.80
Self-Centeredness	.31	.20, .40	<.01	.23	.13, .33	<.01	.16	.05, .25	<.01	.27	.17, .36	<.01
Entitlement	.26	.15, .35	<.01	.31	.19, .41	<.01	.25	.16, .33	<.01	.18	.10, .26	<.01
Indifference	.16	.06, .25	<.01	.00	-.10, .10	.96	.15	.07, .24	<.01	.09	.00, .18	.07
Lack of Empathy	.30	.20, .40	<.01	.23	.12, .35	<.01	.16	.07, .26	<.01	.30	.22, .38	<.01
Interpersonal Problems	.06	-.05, .17	.20	.12	.01, .25	.01	.07	-.11, .11	.89	.01	-.09, .11	.92
Values												
Agency	.29	.20, .38	<.01	.38	.29, .46	<.01	.24	.16, .33	<.01	.23	.13, .32	<.01
Communism	-.05	-.15, .05	.32	.09	.19, .27	.05	-.02	-.12, .07	.73	-.06	-.15, .03	.23
Speciesism	.44	.35, .51	<.01	.30	.21, .39	<.01	.35	.25, .43	<.01	.43	.35, .51	<.01
Conservatism	.46	.38, .54	<.01	.26	.17, .35	<.01	.41	.33, .49	<.01	.35	.27, .43	<.01
Social Dominance Orientation	.47	.39, .54	<.01	.34	.24, .44	<.01	.31	.23, .38	<.01	.32	.23, .42	<.01
Femininity	-.12	-.22, -.02	.01	-.13	-.23, -.03	<.01	.01	-.10, .12	.80	-.20	-.21, -.03	<.01
Masculinity	.12	.01, .22	.01	.06	-.06, .16	.26	.12	.01, .23	.01	.07	.04, .19	.13
Self-Concept Clarity	-.01	-.11, .09	.88	-.06	-.15, .04	.25	.04	-.06, .14	.40	.00	-.10, .10	.99
Sample 3 Vegetarians												
Dietary Identity												
Centrality	-.10	-.22, .01	.13	-.05	-.17, .06	.44	-.19	-.32, -.07	<.01	-.21	-.34, -.08	<.01
Private Regard	-.13	-.27, .01	.04	-.03	-.15, .10	.67	-.14	-.26, .02	.03	-.11	-.22, .00	.09
Public Regard	.24	.11, .37	<.01	.11	-.01, .23	.09	.26	.15, .38	<.01	.06	-.04, .17	.33
Outgroup Regard	.12	-.03, .27	.06	.06	.19, -.19	.37	.21	.09, .34	<.01	.10	-.02, .20	.12
Prosocial Motives	-.27	-.41, -.13	<.01	-.19	-.28, -.08	<.01	-.25	-.39, -.12	<.01	-.16	-.27, -.06	.01
Personal Motives	-.11	-.24, .02	<.01	.00	-.11, .11	.99	-.11	-.24, .03	.09	-.08	-.22, .06	.23
Moral Motives	-.18	-.32, -.05	<.01	-.11	-.23, .00	.07	-.27	-.39, -.14	<.01	-.16	-.27, -.04	.01
Strictness	-.21	-.34, -.07	<.01	-.38	-.50, -.26	<.01	-.15	-.28, -.02	.02	-.24	-.38, -.10	<.01
Vegetarian Motives												
Health	.16	.06, .26	.01	.14	.04, .23	.03	.05	-.07, .16	.47	-.04	-.20, .11	.53
Environment	-.25	-.39, -.13	<.01	-.18	-.29, -.08	<.01	-.24	-.38, -.10	<.01	-.15	-.30, -.03	.01
Animal Rights	-.23	-.35, -.10	<.01	-.17	-.27, -.07	<.01	-.23	-.36, -.09	<.01	-.28	-.44, -.13	<.01
Personality Traits												
Neuroticism	-.09	-.20, .03	.16	-.04	-.15, .08	.57	-.02	-.15, .11	.80	.01	-.12, .13	.91
Extraversion	.06	-.08, .18	.39	.12	-.01, .24	.06	.03	-.11, .16	.62	.01	-.12, .13	.93
Openness	-.18	-.31, -.05	<.01	-.20	-.32, -.06	<.01	-.14	-.26, -.03	.03	-.02	-.15, .11	.77
Agreeableness	-.19	-.32, -.07	<.01	-.20	-.33, -.07	<.01	-.09	-.20, .03	.17	-.18	-.30, -.05	<.01
Conscientiousness	-.01	-.15, .11	.83	.00	-.13, .12	.99	.03	-.10, .17	.61	-.02	-.15, .11	.76
Maladaptive Traits												
Negative Affectivity	-.06	-.19, .07	.32	-.03	-.16, .10	.66	-.01	-.15, .14	.86	.02	-.13, .15	.77
Detachment	-.03	-.13, .09	.66	-.02	-.11, .08	.73	.07	-.05, .21	.26	-.02	-.12, .10	.77
Antagonism	.18	.02, .35	<.01	.24	.10, .38	<.01	.12	-.01, .26	.07	.16	.03, .30	.01
Disinhibition	.04	-.10, .18	.53	.02	-.13, .16	.79	-.03	-.16, .10	.63	-.03	-.16, .12	.67
Psychoticism	.04	-.08, .16	.56	.08	-.05, .19	.23	.07	-.05, .20	.30	.06	-.06, .19	.33
Life of Pleasure	.17	.04, .29	<.01	.14	.01, .26	.02	.10	-.02, .21	.10	.09	-.04, .20	.16
Callousness	.21	.08, .35	<.01	.20	.07, .33	<.01	.09	-.03, .22	.16	.12	.00, .23	.07
Rashness	.03	-.12, .17	.68	.05	-.09, .20	.41	-.02	-.14, .12	.82	.05	-.09, .19	.44
Self-Centeredness	.13	.00, .27	.04	.18	.05, .32	<.01	.06	-.05, .19	.34	.14	.02, .25	.03
Entitlement	.22	.08, .39	<.01	.16	.01, .33	.01	.07	-.07, .22	.29	.06	-.06, .20	.06
Indifference	.06	-.05, .19	.32	-.01	-.13, .11	.87	-.04	-.17, .10	.56	.03	-.10, .15	.59
Lack of Empathy	.23	.11, .38	<.01	.26	.13, .40	<.01	.12	-.01, .25	.07	.18	.05, .30	<.01
Interpersonal Problems	.05	-.07, .19	.43	.05	-.07, .18	.39	.06	-.07, .20	.36	.06	-.05, .19	.33
Values												

(continued on next page)

Table 6 (continued)

Criterion Variable	Natural			Normal			Necessary			Nice		
	r	95% CI	p	r	95% CI	p	r	95% CI	p	r	95% CI	p
Agency	.23	.08, .38	<.01	.26	.12, .39	<.01	.11	-.02, .23	.09	.09	-.02, .22	.14
Communion	-.07	-.18, .05	.31	.03	-.09, .15	.62	-.04	-.17, .10	.55	-.01	-.11, .08	.87
Speciesism	.30	.17, .44	<.01	.26	.12, .39	<.01	.27	.14, .40	<.01	.34	.19, .47	<.01
Conservatism	.30	.19, .41	<.01	.29	.16, .41	<.01	.20	.08, .32	<.01	.07	-.06, .19	.30
Social Dominance Orientation	.21	.08, .33	<.01	.26	.10, .41	<.01	.11	-.03, .24	.07	.11	-.01, .24	.08
Femininity	-.09	-.23, .04	.15	-.04	-.15, .08	.56	-.09	-.21, .05	.15	-.05	-.15, .07	.45
Masculinity	.09	-.02, .20	.17	.08	-.06, .21	.19	.01	-.13, .14	.92	.02	-.10, .16	.74
Self-Concept Clarity	-.02	-.14, .10	.74	-.03	-.16, .09	.59	-.07	-.20, .08	.28	-.03	-.16, .10	.68

The natural, necessary, and nice MEMI scales were consistently negatively related to environmental and animal-rights motivations to be vegetarian. In contrast, associations between vegetarian motivations and the normal scale were weak, and health motivations to be vegetarian were not consistently related to any MEMI scale. This pattern indicates that the motives to eat meat are not simply the opposite of motives to be vegetarian, and that these two frameworks could be used together to more comprehensively examine motivational factors related to eating or abstaining from meat and other animal biproducts.

A similar finding was observed for eating meat and hunting/fishing. These variables had strong and consistent positive associations with the natural, necessary, and nice scales, but were not strongly associated with the normal scale.

3.2.2. Personality

The most consistent pattern with regard to normal range personality traits was that higher motivations to eat meat were related to lower agreeableness and openness. This finding mirrors previously reported differences between vegetarians and omnivores, particularly with regard to openness (Forestell & Nezelek, 2018; Pfeiler & Egloff, 2018a, b). We included measures of maladaptive personality because of research suggesting a link between personality disorder features and meat-eating (Hopwood et al., 2021). The most consistent finding in these results was that antagonistic and disinhibited traits were related positively to the natural and normal scales of the MEMI. Recall that these were also the scales with somewhat lower mean scores (Table 4), suggesting that these motives are somewhat more socially deviant, and in particular more related to interpersonal dysfunction and hostility, than the necessary and nice motives. We explored that further with measures of more specific traits related to maladaptive interpersonal behavior. These two scales also had consistent positive associations with interpersonal problems, callousness, rashness, entitlement, and lack of empathy. This finding interestingly suggests that motives to eat meat based on the beliefs that it is natural and normal are less common and less psychologically healthy than motives based on the beliefs that meat is necessary for health or tastes good. We expected the MEMI nice scale to show a specific positive association with the life of pleasure scale (i.e., hedonism), but in fact all MEMI scales had significant but small associations with this construct.

3.2.3. Values and self-concept

All four MEMI scales were consistently and strongly positively related to agentic motivations, speciesism, conservatism, and social dominance orientation. In contrast, correlations tended to be small and inconsistent with communal motivations, gender orientations, and self-concept clarity. Overall, this suggests that a very general pattern of values related to getting ahead (vs. getting along), authoritarianism, and valuing personal freedom promote meat eating in general, but that these values are not differentially related to meat-eating motivations.

3.3. Structure and correlates of the MEMI in omnivore and vegetarian samples

Our third aim was to determine whether the structure and correlates of motives to eat meat would be the same in vegetarians as omnivores. We tested three levels of measurement invariance of the MEMI across vegetarian and omnivore respondents in Sample 3. We first tested configural invariance, or the degree to which the same items load on higher order variables across samples. We next tested metric invariance, or the degree to which the path coefficients of these indicators are the same across samples. Finally, we tested scalar invariance, or the degree to which item intercepts are the same across samples. We judged models with both CFI and RMSEA differences > 0.01 as our cutoff for invariance (Cheung & Rensvold, 1999; Chen, 2007).

As shown in Table 7, the MEMI items met our criteria for configural, metric, and scalar invariance. This suggests that the instrument functions equally well in both omnivore and vegetarian samples. Specifically, the same items indicate each of the four meat-eating motives in roughly the same amounts, and each item carries the same meaning regardless of dietary habits. Practically, this supports the use of the MEMI to study meat-eating motivations whether or not respondents eat meat or other animal products, as well as score comparisons and correlates across these samples.

As expected, in this sample the vegetarians had much lower scores on all three MEMI scales than omnivores (Table 4). Correlates of the MEMI were fairly similar as well, with some exceptions (Table 7). Among vegetarians, the nice scale was again negatively related to prosocial motives and dietary strictness. All meat-eating motivations were negatively related to vegetarian dietary motives involving the environment and animal rights. The most consistent correlates with personality were associations between the natural and normal motives and antagonistic traits, as well as specific traits and values such as callousness, self-centeredness, entitlement, lack of empathy, agency, speciesism, conservatism, and social dominance orientation. These results indicate that there is substantial psychological variation among vegetarians, that many vegetarians understand or are sympathetic to meat-eating motives even if they do not eat meat, and that variation in meat-eating motives among vegetarians tends to have the same pattern of correlations as among non-vegetarians, with some potentially interesting exceptions. For instance, whereas the normal scale was negatively associated with outgroup regard for omnivores, outgroup regard was positively associated with the necessary scale for vegetarians. That pattern may suggest that people who eat meat because they think it is normal may tend to be judgmental about people whose dietary behaviors, such as vegetarian diet, sets them apart, whereas vegetarians who understand that others

Table 7

Measurement Invariance of MEMI across vegetarians and non-vegetarians in Sample 3.

Invariance Standard	χ^2	df	CFI	RMSEA
Configural	264.84	292	.877	.063
Metric	421.21	307	.874	.062
Scalar	471.29	322	.865	.063

may find eating meat necessary for health are less likely to judge them for eating meat. Overall, these findings suggest that significant psychological information may be lost when people are compared solely on the basis of dieting behavior, as opposed to the underlying reasons for that behavior (Rosenfeld & Burrow, 2017b).

4. Discussion

The goals of this study were to a) determine whether the four main moral justifications for eating meat, identified in previous research, the “4 Ns,” operate more generally as motives for eating meat, and could be distinguished in a measurement model, b) to examine the correlates of meat-eating motivations, and c) to determine whether meat-eating motivations function similarly in omnivore and vegetarian individuals. We generated a 19-item measure that fit data from four independent samples, including a sample of vegetarians, and included distinct scales measuring beliefs that meat is natural, normal, necessary, and nice. We then summarized psychological profiles associated with each of these motives, as elaborated below. Finally, we showed that the structure and correlates of meat-eating motives is very similar across omnivores and vegetarians.

4.1. The MEMI

One practical result of this study is the development of a robust measure of meat-eating motives with empirically distinct scales. The total score was highly related to the popular 4N Scale. This suggests that either the MEMI or 4N Scale could be used to study meat-eating motives or justifications, in general, whereas the MEMI would be preferable for researchers interested in distinguishing individuals who endorse different meat-eating motives. As the results of this study showed, such a scale provides a means for investigating the complexity of these different motivations.

4.2. Psychological profiles of meat-eating motivations

Although the natural and normal scales were empirically distinct, they were similar in having relatively lower endorsement rates and in their patterns of correlation with external variables. Both constructs were associated with maladaptive personality features, self-focused values, and interpersonal antagonism and dysfunction. Taken together, this pattern suggests that most people are not motivated to eat meat for reasons related to psychological immaturity (Hopwood et al., 2021). Some are, and these motives can manifest either as beliefs that meat-eating is natural or that it is socially normal. In either case, people who emphasize these reasons to eat meat may be more likely to be antagonistic, self-centered, and to have interpersonal problems. Further research is needed to determine how these constructs differ from one another in terms of their correlates and implications for dietary behavior and psychological adjustment.

Eating meat because it is necessary for health is distinguished by its association with a traditional, conservative world view. This is not necessarily an invalid motive, in that animal products provide some nutrients that can be challenging to consume in a poorly-planned vegetarian diet (e.g., iron; Haider, Schwingshackl, Hoffmann, & Ekmekcioglu, 2018). However, by and large, people who have access and means to purchase or produce a variety of plant-based foods are healthier than people who eat meat, even though diets that include meat can also be healthy (Key, Appleby, & Rosell, 2006; McEvoy, Temple, & Woodside, 2012). In that sense, motives to either eat meat or to be vegetarian out of concerns for personal health have a somewhat more ambiguous connection to evidence than social justice or environmental motives, but health motives are common in both directions.

Another common motive to eat meat is the subjective belief that it tastes nice (Rosenfeld & Tomiyama, 2020). For many people, eating is not considered a moral behavior, but rather a means to an end and a

source of pleasure (although hedonism itself can be understood as a moral position; Veenhoven, 2003). Seen through that lens, eating meat is a rational behavior for people who like the taste. In this study, the motive to eat meat because it tastes nice was distinguished primarily by its negative associations with moral variables such as prosocial concerns, or concerns about the environment or animal rights. People who cite this motive also tend to be less strict with their diets, albeit not because they are rash or impulsive. We presume this finding reflects that such people eat whatever tastes good, generally speaking.

4.3. Motivational variation among omnivores and vegetarians

Most research focuses on differences between vegetarians and meat-eaters (or other groups categorized by dietary behavior, such as vegans, reducetarians, etc.). Although this is obviously an important distinction in this area of research, this type of design can mask important psychological variation within these groups. In a previous study, we found that motives to be vegetarian are distinct from one another, reliably associated with distinct patterns of correlates, and invariant across vegetarian and non-vegetarian respondents. In this study, we showed that vegetarian motives are related to but not the opposite of motives to eat meat, and that meat-eating motives are also distinct from one another, reliably associated with distinct patterns of correlates, and invariant across vegetarian and non-vegetarian respondents. Overall, this suggests that a lot can be learned by examining psychological variability within people who have particular dietary habits. That is, it would be fruitful for psychological researchers to ask both “why do you eat meat” and “why are you vegetarian”.

4.4. Study limitations and future directions

A major limitation of this study was that all data were gathered via self-report questionnaires. Future research using multiple methods, and in particular behavioral methods to assess actual eating behavior, and motivations in the context of proximal food choices, is an important extension to these findings. Likewise, our samples were relatively homogeneous and restricted to western, primarily North American cultures. There are good reasons to think that motivational factors underlying dietary choices vary by culture (Sproesser, Klusmann, Schupp, & Renner, 2017), and this is important direction for future research.

To the degree that these findings reveal important differences between motivations to eat meat, a next step will be to identify the sources of those differences. In particular research should focus on the degree to which these motives are related to relatively stable temperamental factors, factors related to upbringing and culture, social networks, or exposure to different kinds of information. Future research should also explore the possibility that individual differences in meat-eating motives could be leveraged to persuade people towards certain diets, for instance by testing the efficacy of intervention strategies tailored to individuals’ motivational profiles.

We took a top-down approach to examining meat-eating motivations, largely based on work focused on meat-eating justifications. It is possible that there are other important motivations not assessed by the MEMI, and that these motivations were not identified because of our scale development approach. In general, the current work is narrowly focused on meat-eating motivations, and should be integrated with frameworks designed to comprehensively assess eating motivations in general (e.g., Sproesser et al., 2017). Finally, there are a number of domains of human-animal interaction that could involve animal exploitation beyond eating (e.g., wildlife tourism, zoos and circuses, animal labor; Piazza, Cooper, & Slater-Johnson, 2020). Future research on motives related to these behaviors, and their similarity to motivations in the eating domain, would be an interesting extension to this work.

In addition to having four discriminable scales, the MEMI also differs from the 4N Scale in its focus. The 4N Scale was designed to measure moral rationalizations, or cognitions that people use to defend their

choices to others or resolve cognitive dissonance that comes with eating meat when certain aspects of eating meat are not consistent with personal values. Rationalizations are efforts to resolve social and psychological conflicts about eating meat that serve as a justification for continuing that behavior (Bastian & Loughnan, 2017). In contrast, motivations are not necessarily conflictual; they are simply the reasons people give for wanting to eat meat, whether they have conflicts about that or not. Although there is a clear conceptual distinction between rationalizations and motives, they are also similar, and future empirical work should endeavor to determine if, how, and why they are different.

5. Conclusion

We developed the Motivations to Eat Meat Inventory (MEMI), a 19-

item measure with empirically distinguishable scales measuring four motives to eat meat: natural, normal, necessary, and nice. This four-factor model was invariant across omnivore and vegetarian participants. We used the measure to generate profiles of psychological characteristics associated with each motive. We found that, in general, the natural and normal dimensions were less commonly endorsed and tended to be more strongly related to maladaptive personality characteristics, and in particular self-centered values and interpersonal hostility. In contrast, the necessary and nice dimensions were more common, and related to traditional and hedonistic values, respectively. This measure provides a useful tool for researchers interested in the different reasons people have for eating meat, and a foundation for future work focused on why people eat meat.

Appendix. The Motives to Eat Meat Inventory

Scale	Item	Below there is a list of reasons to eat meat and other animal products like eggs and dairy. Please rate how important different reasons are for you, personally. You should give a range of ratings to indicate the reasons that are especially important for you, those that are relatively unimportant, and those that are moderately important. Scale: 7 Most important 6 5 4 Moderately important 3 2 1 Least important
Natural	1	It goes against nature to eat only plants.
Necessary	2	Our bodies need the protein.
Normal	3	I want to fit in.
Nice	4	It is delicious.
Necessary	5	It makes people strong and vigorous.
Normal	6	I don't want other people to be uncomfortable.
Nice	7	It is in all of the best tasting food.
Natural	8	It could be unnatural not to eat meat.
Necessary	9	It is necessary for good health.
Normal	10	It is just one of the things people do.
Nice	11	It gives me pleasure.
Necessary	12	I want to be sure I get all of the vitamins and minerals I need.
Normal	13	Everybody does it.
Nice	14	It has good flavor.
Necessary	15	It gives me strength and endurance.
Normal	16	I don't want to stand out.
Nice	17	Meals without it don't taste good.
Natural	18	It is human nature to eat meat.
Natural	19	Eating meat is part of our biology.

Note. When administered to vegetarians or the like, we add an instruction that the items should be answered based on the reasons the respondent might or would have to eat meat, even though they do not.

Author acknowledgments

The authors thank UC Davis for making resources available to complete this work.

Author contributions

Drs. Hopwood and Bleidorn designed the study, which was directly inspired by the work of Dr. Piazza. Ms. Chen collected and cleaned the data. Dr. Hopwood and Ms. Chen analyzed the data. Dr. Hopwood prepared the first draft. All authors edited the paper.

Ethical statement

This research was declared exempt by local ethics boards.

Study 1: UC Davis, 1372555–2.

Studies 2,3: UC Davis, 1552312–1.

Data and materials are available at https://osf.io/t38wr/?view_only=a3f99c9516ba464c98f28c7d42729b86.

The authors declare no conflicts to report. This work was not funded by an external agency.

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