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1 Running head: ATTACHED TO MEAT?

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6 Attached to meat? (Un)Willingness and intentions to adopt a more plant-based

7 diet.

8

9 **Abstract**

10 In response to calls to expand knowledge on consumer willingness to reduce
11 meat consumption and to adopt a more plant-based diet, this work advances the
12 construct of meat attachment and the Meat Attachment Questionnaire (MAQ). The
13 MAQ is a new measure referring to a positive bond towards meat consumption. It was
14 developed and validated through three sequential studies following from an in-depth
15 approach to consumer representations of meat. The construct and initial pool of items
16 were firstly developed drawing on qualitative data from 410 participants in a previous
17 work on consumers' valuation of meat. Afterwards, 1023 participants completed these
18 items and other measures, providing data to assess item selection, factor structure,
19 reliability, convergent and concurrent validity, and predictive ability. Finally, a sample
20 of 318 participants from a different cultural background completed the final version of
21 the MAQ along with other measures to assess measurement invariance, reliability and
22 predictive ability. Across samples, a four-factor solution (i.e., hedonism, affinity,
23 entitlement, and dependence) with 16 items and a second-order global dimension of
24 meat attachment fully met criteria for good model fit. The MAQ subscales and global
25 scale were associated with attitudes towards meat, subjective norm, human supremacy
26 beliefs, eating habits, and dietary identity. They also provided additional explanatory
27 variance above and beyond the core TPB variables (i.e. attitudes, subjective norm and
28 perceived behavioral control) in willingness and intentions concerning meat
29 substitution. Overall, the findings point towards the relevance of the MAQ for the study
30 of meat consumption and meat substitution, and lend support to the idea that holding a
31 pattern of attachment towards meat may hinder a shift towards a more plant-based diet.

32

33 *Keywords: Meat; Meat Attachment; Attitudes; Plant-based diets; Meat*

34 *substitution.*

35

36 Attached to meat? (Un)Willingness and intentions to adopt a more plant-based diet.

37

38 1 INTRODUCTION

39 For several millennia human beings have been drawing on meat as a means to
40 satisfy nutritional needs, a practice that is believed to have shaped our evolutionary
41 history (Leroy & Praet, 2015). Historically a scarce but cherished food, during the last
42 century there was a massive and global shift towards an increased consumption of meat
43 and animal-based products in general, and a decreased consumption of grain and plant-
44 based foods (Chopra, Galbraith, & Darnton-Hill, 2002; Delgado, Rosegrant, Steinfeld,
45 Ehui, & Curbois, 1999; Pokpin, 2011). Three main issues are identified as having
46 played a key role in triggering this shift, namely economic growth, changes in the food
47 industry, and urbanization (e.g., Delgado, 2003; Stabler, 2011). In many western
48 countries meat has become a symbol of food itself, an item taken as granted to which
49 most consumers feel they are naturally entitled to (Fiddes, 1991). However, meat's
50 central place in the menu is being increasingly challenged on the grounds of
51 environmental sustainability, health and safety concerns, and animal rights/welfare
52 arguments (Pluhar, 2010; Ruby, 2012; Tilman & Clarke, 2014; Westhoek et al., 2014).
53 For instance, animal based products tend to have higher impacts in terms of greenhouse
54 gas (GHG) emissions, water footprint, biomass use and reactive nitrogen mobilization
55 than most nutritionally equivalent plant-based foods (e.g., Ercin, Aldaya, & Hoekstra,
56 2012; González, Frostell, & Carlsson-Kanyama, 2011; Mekonnen & Hoekstra, 2012;
57 Stehfest et al., 2009). Drawing on estimates of future production and consumption,
58 scholars have voiced concerns that the impacts of the livestock sector alone may bring
59 irreversible environmental changes regardless of any technological methods of
60 addressing climate change (Raphaely & Marinova, 2014). A major transformation of

61 agrifood systems has thus been called for to meet the regulatory capacity of the earth,
62 along with a global transition towards a more plant-based diet (i.e., diets which have the
63 bulk of calories from plant sources while limiting or avoiding animal sources) (e.g.,
64 Kahiluoto, Kuisma, Kuokkanen, Mikkilä, & Linnanen, 2014; Stehfest et al., 2009). Such
65 transition can also contribute to improve health due to decreased exposure to health-
66 hazardous components (e.g., excessive ingestion of saturated fat and cholesterol) and
67 increased exposure to protective items (e.g., higher amounts of fibre, folate,
68 antioxidants, carotenoids and phytochemicals) (e.g., Sabaté, 2003; Scarborough,
69 Allender, & Clarke, 2012). Likewise, decreasing consumer demand for meat might also
70 allow for minimizing harm, suffering and death to sentient animals used in the livestock
71 industry (e.g., Foer, 2010; Singer & Mason, 2007).

72 Earlier relevant research on the topic of meat eating has applied the Theory of
73 Planned Behavior (TPB; Ajzen, 1991) to understand consumer behavior. This
74 theoretical model highlights the role of intentions as proximal determinants of food
75 choice, which in turn are affected by attitudes (i.e. an overall evaluation of the
76 behavior), subjective norm (i.e. beliefs about whether others think you should or should
77 not perform the behavior), and perceived behavioral control (i.e. the extent to which the
78 behavior is perceived as controllable). Intentions to eat meat have indeed been shown to
79 predict actual consumption (Berndsen & van der Pligt, 2005; Saba & Di Natale, 1998),
80 and all three TPB variables were observed to successfully predict intentions to eat meat,
81 although subjective norm emerged as the weakest predictor (Povey, Wellens, & Conner,
82 2001). Habit was also found to play an important role in the context of food choice,
83 including meat consumption, increasing the power of the TPB model to predict actual
84 consumption (Saba & Di Natale, 1998).

85 More recently, drawing from concerns surrounding current and projected meat
86 production and consumption patterns, there have been calls to expand knowledge on
87 consumer willingness to reduce meat consumption and to adopt a more plant-based diet
88 (e.g., Dagevos & Voordow, 2013; Stehfest et al., 2009). Evidence on this matter
89 indicates that while plant-based diets and alternatives to meat are increasingly
90 associated with several benefits, a high consumption of meat, a low regard for meat
91 substitutes, and a lack of willingness to adopt a more plant-based diet are still the
92 dominant cultural pattern in most western societies (e.g., Latvala et al., 2012; Lea,
93 Crawford, & Worsley, 2006a, 2006b; Schösler, de Boer, & Boersema, 2012; Schösler,
94 de Boer, Boersema, & Aiking, 2015). Recent findings exploring the ideological
95 underpinnings of meat consumption suggest that human-animal dominance ideologies
96 may play a role in hindering consumer behavior and willingness to change habits
97 (Dhont & Hodson, 2014), and many studies consistently show that men tend to be
98 particularly more reluctant than women to endorse meat avoidance and reduced meat
99 consumption (e.g., Kubberød, Ueland, Rødbotten, Westad, & Risvik, 2002; Prättälä et
100 al., 2007; Rothgerber, 2013; Ruby & Heine, 2011; Schösler et al., 2015).

101 Importantly, it has also been argued that meat's special status as a food item is
102 not to be neglected in this regard, as it seems to be invested with a socially constructed
103 meaning that goes beyond its biological role and nutritional properties (e.g., Fiddes,
104 1991; Holm & Møhl, 2000; Schösler et al., 2012; Twigg, 1984). In line with this
105 argument, recent findings have reinforced the idea that some consumers have an
106 affective connection towards meat that may play a role in their willingness to change
107 consumption habits (Graça, Oliveira, & Calheiros, 2015). More specifically, it has been
108 suggested that affective connection towards meat may be a continuum in which one end
109 refers to disgust (i.e., negative affect and repulsion, related with moral internalization),

110 while the other shows a pattern of attachment (i.e., high positive affect and dependence
111 towards meat, and feelings of sadness and deprivation when considering abstaining
112 from meat consumption) that may hinder a change in consumption habits (Graça et al.,
113 2015). This pattern mirrors the main characteristic of the general concept of attachment,
114 which is the presence of a positive bond and desire to maintain closeness to the object
115 of attachment (Hidalgo & Hernández, 2001).

116 The existence of an affective connection towards meat is well established
117 concerning a pattern of disgust (Rozin, Markwith, & Stroess, 1997), as is the relevance
118 of negative affective reactions towards meat (e.g. feeling guilty about meat
119 consumption) in variables such as attitudes, ambivalence, intentions, and reported meat
120 consumption (Berndsen & van der Pligt, 2004, 2005). It is also well known that in
121 addition to meeting basic needs for energy and nutrition, food choices and preferences
122 are often anchored in values, meanings and shared conventions that go beyond the
123 biological function they ensure (Beardsworth & Keil, 2002). However, the role meat
124 plays beyond nutrition has only recently started to receive attention, and the merit of
125 meat attachment as a construct and measure to help increasing knowledge on the
126 psychology of meat consumption and meat substitution is yet to be determined.

127 In response to calls to expand knowledge on consumer willingness to reduce
128 meat consumption and to adopt a more plant-based diet, this work advances the
129 construct of meat attachment by describing the validation of the Meat Attachment
130 Questionnaire (MAQ). Developed following an in-depth approach to consumer
131 representations of meat, the MAQ is a new instrument measuring a positive bond
132 towards meat consumption. Such measure may be useful for research advancing on the
133 theoretical understanding of consumer willingness to adopt a more plant-based diet, but
134 ultimately also as a tool for the assessment, design and evaluation of tailored initiatives

135 encouraging meat substitution. This work aims to: (1) propose a tentative structure for
136 the MAQ, (2) test the resulting structure in samples from different settings, (3) observe
137 evidence for the validation of the questionnaire, and (4) explore the relevance of the
138 MAQ for the study of meat consumption and meat substitution.

139

140 *1.1 Overview of the MAQ Development and Validation*

141 The MAQ was developed and validated through three sequential studies. In this
142 process we followed a mixed approach that combined a social constructionist
143 framework in generating data-driven propositions (i.e. the construct of meat attachment
144 framed in consumers' representations of meat), with a more positivistic framework
145 addressing researcher-defined variables (i.e. operationalizing the construct and testing
146 hypotheses about the validity and reliability of the questionnaire). Specifically, the
147 construct and initial pool of items were firstly developed drawing on qualitative data
148 from 410 participants in a previous work on consumers' valuation of meat (Graça et al.,
149 2015). Afterwards, in study one of the present work, 1023 participants answered these
150 items and other measures. These data provided information on item selection, factor
151 structure (principal axis factoring and confirmatory factor analysis), reliability
152 (Cronbach's alpha), and several types of validity: convergent (associations with
153 attitudes towards meat, subjective norm, gender, and human supremacy beliefs),
154 concurrent (associations with eating habits and dietary identity), and predictive ability
155 (additional explanatory variance above and beyond the effects of attitudes towards meat
156 and current consumption habits in willingness to reduce meat consumption and to
157 follow a plant-based diet). In study two, a new sample of 318 participants from a
158 different cultural background completed the final version of the MAQ along with other
159 measures. These data allowed for replicating and strengthening evidence concerning the

160 MAQ's measurement invariance (confirmatory factor analysis), reliability (Cronbach's
161 alpha), and predictive ability (additional explanatory variance above and beyond the
162 effects of TPB variables in willingness and intentions towards meat substitution).

163

164 2 STUDY ONE

165 2.1 *Methods*

166 2.1.1 Participants and procedure

167 This study was conducted through an internet platform and advertised on social
168 media. The survey was hosted online by Qualtrics.com and advertised through
169 Facebook ads to Portuguese users. A short recruitment notice presented the study as
170 "exploring people's opinions on several issues related with society and different social
171 practices, lifestyles and eating habits". Participants were rewarded with the option of
172 registering in a draw to win a 7.9" 16 GB tablet. To minimize self-selection biases, no
173 references were made in the advertisement and cover page to the specific goals of the
174 study. After data collection participants were thanked and debriefed.

175 The survey was accessible in Portuguese for nearly four months between July 3rd
176 and November 5th 2014. During this period, 1278 people clicked on the cover page to
177 participate in the study, and 1023 (aged between 18 and 69 years, $M = 26.5$, $SD = 9.7$;
178 57.8% women) completed all the measures. For the purposes of this study, participants
179 were randomly split in two samples (Table 1). Sample 1 consisted of 558 participants
180 and was used for the exploratory factor analysis. Sample 2 consisted of 516 participants
181 and was used for the confirmatory factor analysis and gathering of further evidence
182 concerning the validity of the questionnaire. Almost all respondents reported eating
183 meat at least once in a regular week (93.2%). The observed bias in terms of age (i.e.
184 skewed towards younger participants) was in line with a trend found in previous online

185 studies, and might be consequence of having chosen an online recruitment platform
186 and/or providing a tablet in a draw as the incentive for participation (e.g., Geeroms,
187 Verbeke, & Van Kenhove, 2008). Completion rate was quite high (i.e. around 80%) and
188 there was no observable particular stage in which participants dropped out after
189 beginning to fill the survey.

190

191

[INSERT TABLE 1]

192

193 2.1.2 Development of initial item pool

194 To ensure a mixed approach combining a social constructionist and a positivist
195 framework in generating items relevant to the study of meat attachment, several steps
196 were made. First, we drew on data from a previous study in which participants provided
197 responses on their representations of meat (Graça et al., 2015). These were retrieved by
198 means of two word association tasks (“Meat makes me think, feel or imagine...”; “If I
199 was forced to stop eating meat I would feel...”). Data retrieved in these tasks were
200 sequentially cleared, converged, and subjected to Multiple Correspondence Analysis
201 (MCA) along with other variables to detect and represent underlying structures in the
202 dataset (for details see Graça et al., 2015). Afterwards, several sentences were drafted
203 using three criteria: the propositions advanced in the study concerning a pattern of meat
204 attachment; the salience and semantic significance of the resulting categories taken
205 together; and the interpretation of the topological configuration observed in the MCA.
206 To favor parsimony, we then followed an iterative process in which blatant
207 redundancies were identified and reduced (although not entirely eliminated) by
208 combining/deleting draft sentences, which resulted in an initial pool of 20 items (Table
209 2) to be subjected to initial exploratory analyses.

210

211

[INSERT TABLE 2]

212

213 2.1.3 Measurement

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Meat Attachment Questionnaire. The initial item pool included 20 questions addressing a positive bond towards meat consumption (e.g., “If I was forced to stop eating meat I would feel sad”). Participants indicated the extent in which they agreed or disagreed with each statement on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Attitudes. Five semantic differential scales with 5-point each measured respondents’ attitudes towards meat (Berndsen & van der Pligt, 2004). The five items were “bad–good”, “unpleasant–pleasant”, “against–for”, “unfavorable–favorable”, “negative–positive”. In this sample internal consistency was high ($\alpha = .93$).

Subjective Norm. Subjective norm was assessed by two items (Berndsen & van der Pligt, 2004). The first item referred to perceived social pressure (“People who are important for me think that I should eat meat”), and the second measured motivation to comply (“How much do you want to do what these important people think you should?”) ($r = .38$). Both were measured using a 5-point scale, and subjective norm was computed by multiplying both scores.

Human supremacy. Beliefs about human supremacy as a dominance ideology relevant to meat consumption and substitution were measured with a six-item scale

234 (e.g., “Animals are inferior to humans”) taken from Dhont & Hodson (2014). In this
235 sample internal consistency was high ($\alpha = .87$).

236

237 *Eating habits.* Participant’s usual consumption of meat was measured with a
238 single item borrowed from (Hoek et al. 2011) using the following answering categories
239 for the frequency of meat consumption in a regular week: never, less than once per
240 week, once or twice per week, three or four times per week, five times or more per
241 week.

242

243 *Dietary Identity.* Participants were asked to indicate the extent in which they
244 personally identified themselves as: (a) meat eater, (b) omnivore, (c) vegetarian, and (d)
245 vegan, using a scale ranging from 1 (not at all) to 5 (very much) for each item.

246

247 *Willingness to follow a more plant-based diet.* Participants were presented a
248 short passage on meat (“In recent times, meat consumption is being increasingly
249 debated on the grounds of environmental sustainability, health and safety concerns, and
250 animal rights/welfare arguments”) and reported their willingness to reduce meat
251 consumption and to follow a plant-based diet with a single item each (“Please indicate
252 your willingness to: (1) reduce meat consumption, (2) follow a plant-based diet”), using
253 a Likert-type scale ranging from 1 (not willing at all) to 5 (very willing).

254

255 2.1.4 Data Analysis

256 Prior to the analysis the sample was randomly split in two. Following this split,
257 two phases of analyses were conducted (DeVellis, 1991). First, Exploratory Factor
258 Analysis (EFA) was conducted with one group (Sample 1, N = 558) on the original set

259 of 20 items, using IBM SPSS Statistics for Windows (IBM Corp. Released, 2010). We
260 used principal axis factoring as the estimation method for its usefulness in identifying
261 underlying dimensions and advantage of accounting for measurement error in the
262 solution (Gorsuch, 1983). An oblique rotation (oblimin) was performed to allow for the
263 derived factors to be intercorrelated, as would be expected (Abdi, 2003). In determining
264 the model (i.e. number of factors) that provided the best solution, we used parallel
265 analysis to compare obtained eigenvalues with those generated from random data sets,
266 and provide a ceiling for the number of factors to consider (Horn, 1965; O'Connor,
267 2000). The scree test, variance, interpretability and item loadings were also accounted
268 for (DeVellis, 1991). In determining item selection, an iterative process was used
269 combining several criteria: first, eliminating items with a factor loading $<.40$;
270 afterwards, dropping items with $<.50$ and cross-loadings $>.25$ until we reached a
271 solution in which all items retained had a factor loading $>.5$ and no significant cross-
272 loadings (Bryman & Cramer, 2011; Matsunaga, 2010). Reliability was estimated using
273 the Cronbach's Alpha.

274 In the second phase, using the other group of participants (Sample 2; $N=574$) to
275 provide evidence for the initial validation of the questionnaire, we assessed indicators
276 for internal structure, construct validity, predictive ability, and reliability. Specifically,
277 for internal structure we tested the solution obtained in the EFA (Sample 1) using a
278 Confirmatory Factor Analysis (CFA) with maximum likelihood method in AMOS 20
279 (Arbuckle, 2011). The analysis of the model fit from the CFA considered a range of
280 criteria based on different measures. The ratio χ^2/df was used to evaluate the
281 appropriateness of the model (with good to acceptable values referring to ≤ 5), since the
282 model chi-square test is sensitive to sample size (Schermelleh-Engel, Moosbrugger, &
283 Muller, 2003). Comparative fit index (CFI), Tucker Lewis index (TLI) and root-mean-

284 square error of approximation (RMSEA) were also used as model fit indices. Criteria
285 for good to acceptable model fit were $CFI \geq .90$, $TLI \geq .90$, and $RMSEA \leq .08$, with
286 higher values in CFI and TLI and lower in RMSEA referring to better-quality fit indices
287 (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004; Vandenberg & Lance, 2000).
288 Concerning construct validity, we assessed the relationship between the derived
289 subscales and the extent in which they related to external measures and indicators
290 relevant to the study of meat consumption and meat substitution (i.e. associations with
291 attitudes towards meat, subjective norm, gender, and human supremacy beliefs were to
292 be taken as indicative of convergent validity; associations with eating habits and dietary
293 identity were to be taken as indicative of concurrent validity). Regarding predictive
294 ability, we explored whether the MAQ provided additional explanatory variance above
295 and beyond the effects of attitudes towards meat and current consumption habits in
296 willingness to reduce meat consumption and to follow a plant-based diet. Finally, to test
297 reliability we used the Cronbach's alpha.

298

299 *2.2 Results*

300 *2.2.1 Sample 1: Exploratory Factor Analysis and Reliability*

301 An initial assessment to verify the adequacy of the data for exploratory factor
302 analysis was performed for the set of 20 items. The percentage of missing data was
303 0.4% and cases were deleted listwise. Absolute values of skewness ranged from to -1.43
304 to .380, showing no problems of severe departure from a normal distribution. The
305 Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of .95 and
306 Bartlett's test of sphericity was highly significant: $\chi^2(190) = 6990.25$, $p < .001$.

307 Parallel analysis revealed that four factors had eigenvalues greater than chance
308 (using a 95% confidence interval). Scree test, variance accounted for, interpretability

309 and item loadings also pointed towards a break at four factors. We thus initially
310 considered a solution of four factors explaining 68% of the variance for the 20 items.
311 During the process of determining item selection, four items were dropped based on low
312 factor loadings and high cross-loadings. Analyses confirmed the four-factor solution for
313 the 16 items with 72.3% of the variance accounted for (see Table 3). The labels given to
314 the four factors were Hedonism (four items; higher scores referring to meat represented
315 as a source of pleasure; e.g., “A good steak is without comparison”), Affinity (four
316 items; higher scores indicative of affinity towards meat consumption, measured in
317 opposition to feelings of repulsion; “I feel bad when I think of eating meat”, reversed
318 score), Entitlement (three items; higher scores referring to feelings of entitlement
319 towards meat consumption; “To eat meat is an unquestionable right of every person”),
320 and Dependence (five items; higher scores indicating feelings of dependence on meat;
321 e.g., “If I was forced to stop eating meat I would feel sad”). Cronbach’s Alpha
322 suggested good consistency levels in these three-to-five item tentative subscales, which
323 were subject to further validation in the second phase of analysis.

324

[INSERT TABLE 3]

326

327 2.2.2 Sample 2: Confirmatory Factor Analysis and further evidence for initial validation

328 *Confirmatory Factor Analysis*

329 An assessment to verify the adequacy of the data for confirmatory factor
330 analysis was performed for the set of 16 items in the holdout sample, again showing no
331 problems of severe departure from a normal distribution (i.e. absolute values of
332 skewness ranged from to -1.14 to .191). The percentage of missing data was 0.4% and
333 cases were deleted listwise. Confirmatory factor analysis was then conducted testing the

334 four factor solution obtained in the EFA, with a second order global dimension of meat
335 attachment (Figure 1). The model fully met criteria for good fit ($\chi^2/df = 2.7$; TLI = .96;
336 CFI = .97; RMSEA = .05 [.05, .06]). In subsequent analysis we thus gathered further
337 evidence for the initial validation of the MAQ using the four subscales and also the
338 global measure of meat attachment. All subscales showed moderate to strong
339 correlations with each other and strong correlations with the global scale (Table 4).

340

341 [INSERT FIGURE 1]

342

343 *Reliability*

344 Reliability analyses for the MAQ global and subscales showed strong values of
345 internal consistency (Table 4). The MAQ global scale had a Cronbach alpha of .92 and
346 the subscales showed values ranging from .77 to .90.

347

348 *Convergent and Concurrent Validity*

349 We expected that scores on all the measures from the MAQ would: (1) show
350 positive correlations with a measure of attitudes towards meat, subjective norm
351 concerning meat consumption, meat eating habits and human supremacy beliefs; (2)
352 show an association with dietary identity (i.e., positive correlations with self-
353 identification as omnivore and as meat consumer, and negative correlations with self-
354 identification as vegetarian and as vegan); and (3) yield significantly higher scores for
355 men than for women. As predicted, all measures from the MAQ showed moderate to
356 strong positive correlations with attitudes towards meat, and positive associations with
357 subjective norm concerning meat consumption and human supremacy beliefs (Table 5).
358 They also showed positive correlations with eating habits and yielded the anticipated

359 pattern of associations with dietary identity, showing moderate to strong relationships
360 with persons identifying as meat consumers, weaker but still positive associations as
361 omnivores, and negative correlations with self-identification scores as vegetarian and as
362 vegan (Table 5). Concerning gender differences, one-way ANOVAs revealed that men
363 tended to score systematically higher than women on all four subscales and global scale
364 (Table 6).

365

366 [INSERT TABLES 4, 5 & 6]

367

368 *Predictive Ability*

369 Concerning predictive ability, we explored whether the MAQ provides
370 additional explanatory variance above and beyond the effects of attitudes towards meat
371 and current habits in willingness to change meat consumption and to follow a plant-
372 based diet. Five hierarchical regressions were performed to examine the predictive
373 ability of the MAC global scale and subscales' scores using willingness to reduce meat
374 consumption as the criterion variable. Five additional hierarchical regressions were
375 performed with willingness to follow a plant-based diet as the criterion variable. For
376 each separate regression analysis, in Step 1 we entered the related study variables (i.e.
377 attitudes towards meat and current habits), and in Step 2 the MAQ global or subscale
378 scores. Incremental variances of MAQ global and subscale scores in predicting
379 willingness to reduce meat consumption above and beyond related variables were all
380 significant (Table 7), ranging from 3% (MAQ Hedonism) to 14% (MAQ Global Scale).
381 The same trend was observed concerning willingness to follow a plant-based diet (Table
382 7), with all the MAQ measures adding 3% (MAQ Hedonism) to 11% (MAQ Global
383 Scale) in the amount of variance explained. All the regression models were checked for
384 indications of multicollinearity by examining the variance inflation factor (VIF) and

385 tolerance values (VIF values > 10 and tolerance < .10 are typically considered
386 problematic; Cohen, Cohen, West, & Aiken, 2003). No violations of limits were found
387 (VIF range: 1.15–2.52; tolerance between .40 and .87).

388

389 [INSERT TABLE 7]

390

391 *2.3 Conclusion*

392 A four-factor solution with 16 items for the MAQ scale was obtained and
393 evaluated in study one: hedonism, affinity, entitlement, and dependence. Results
394 suggested that a four factor model with a second-order global dimension of the
395 construct of meat attachment fully met criteria for good model fit. Reliability analyses
396 for the MAQ global and subscales showed strong values of internal consistency. All
397 predictions concerning the assessment of convergent and concurrent validity found
398 support. Results for predictive ability suggested that meat attachment is a different
399 construct from previous related measures and adds explanatory capacity in
400 understanding consumer willingness to reduce meat consumption and adopt a more
401 plant-based diet.

402

403 3 STUDY TWO

404 *3.1 Methods*

405 3.1.1 Participants and procedure

406 Participants for the second study were recruited through Amazon Mechanical
407 Turk (MTurk-<http://www.mturk.com/mturk/>), a crowdsourcing internet marketplace
408 where requesters post task opportunities and workers choose which tasks to do for a
409 monetary payment set by the requester. To strengthen evidence for the validation of the

410 MAQ, MTurk was chosen in light of evidence that participants tend to be more
411 demographically diverse than standard internet samples, realistic compensation rates do
412 not affect data quality, and the data obtained are at least as reliable as those obtained via
413 traditional methods (Buhrmester, Kwang, & Gosling, 2011). A short recruitment notice
414 was advertised to U.S. based participants and presented the study as exploring “people’s
415 opinions about food and different eating habits”, along with a link to the Qualtrics
416 website hosting the survey. Participants were paid \$.75 for their participation. Before
417 beginning the survey, participants were informed about the study’s procedures and
418 anonymity was ensured. The survey was accessible in English in March 2nd 2015. Three
419 hundred and eighteen persons (aged between 18 and 72 years, $M = 36.3$, $SD = 11.2$)
420 participated in the study. One hundred and eighty five were male (58,2%) and 133 were
421 female (41,8%). Most participants had completed higher education (204; 64,4%),
422 followed by secondary (89; 28,1%) and primary (24; 7.6%). As regards their
423 employment status, around two thirds were employed (227; 71,4%), 37 were
424 unemployed (11,6%), 23 were students (7,2%) and 31 were retired or held a different
425 status (9,1%).

426

427 3.1.2 Measurement

428 *Meat Attachment Questionnaire, Attitudes and Subjective Norm.* The same
429 instruments as in study one were used to measure meat attachment (final version
430 comprising of 16 items), attitudes (Berndsen & van der Pligt, 2004; $\alpha = .97$ in the
431 current sample) and subjective norm (Berndsen & van der Pligt, 2004; $r = .38$ in the
432 current sample).

433

434 *Perceived Behavioral Control*. A measure of Perceived Behavioral Control
435 (PBC) concerning changing meat consumption was built based on theory of planned
436 behavior questionnaire development guidelines (Francis et al., 2004). The measure
437 consisted of three items (“Concerning meat consumption: I am confident that I could
438 change my habits if I wanted to; Whether I change my habits or not is entirely up to me;
439 Changing my habits or not is something that is under my control”) with a 5-point
440 Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Internal
441 consistency was adequate ($\alpha = .69$).

442

443 *Willingness and intentions towards meat substitution*. Participants were
444 presented a short passage on meat (“In recent times, meat consumption is being
445 increasingly debated on the grounds of environmental sustainability, health and safety
446 concerns, and animal rights/welfare arguments”) and reported their willingness (“Please
447 tell us about your willingness to...”) and intentions (“Specifically, in the next six
448 months, do you intent to...”) to (i) reduce meat consumption, (ii) avoid eating meat, and
449 (iii) follow a plant-based diet, using a 5-point Likert-type scale (ranging from 1 – Very
450 unwilling to 5 – Very willing and 1 – Surely not to 5 – Surely yes, respectively).
451 Responses were averaged to form a general measure of willingness ($\alpha = .91$) and
452 intentions ($\alpha = .90$) concerning meat substitution.

453

454 3.1.3 Data Analysis

455 A replication of the MAQ’s structure and extension of its predictive ability were
456 assessed with a different sample to provide further support for its validity and relevance
457 in the study of meat consumption and substitution. While new variables were included
458 (i.e. PBC and two composites of focal behaviors) to extend findings from study one and

459 others were excluded (e.g., dietary identity) to keep the survey short, the analytical
460 procedures and criteria for model fit were the same as in study one.

461

462 *3.2 Results*

463 *Internal Structure*

464 An initial assessment to verify the adequacy of the data for confirmatory factor
465 analysis was performed for the 16 items. No missing data was observed. Absolute
466 values of skewness ranged from to -1.6 to .34. Confirmatory factor analysis was then
467 conducted testing the model consisting of a four-factor structure with a second-order
468 dimension of the construct of meat attachment (Figure 2). The model fully met criteria
469 for good fit ($\chi^2/df = 2.3$; TLI = .97; CFI = .97; RMSEA = .06 [.05, .08]). All subscales
470 showed moderate to strong correlations with each other and strong correlations with the
471 global scale (Table 8).

472

473 [INSERT TABLE 8]

474 [INSERT FIGURE 2]

475

476 *Predictive Ability*

477 Concerning predictive ability, we explored whether the MAQ provided
478 additional explanatory variance above and beyond the effects of the core TPB variables
479 in willingness and intentions concerning meat substitution. Five hierarchical regressions
480 were performed to examine the predictive ability of the MAC global scale and
481 subscales' scores using willingness as the criterion variable. Five additional hierarchical
482 regressions were performed with intentions as the criterion variable. For each separate
483 regression analysis, in Step 1 we entered the TPB variables (i.e. attitudes, subjective

484 norm, perceived behavioral control), and in Step 2 the MAQ global or subscale scores.
485 Incremental variances of MAQ global and subscale scores in predicting willingness
486 concerning meat substitution were all significant (Table 9), ranging from 3% (MAQ
487 Hedonism) to 15% (MAQ Global Scale). The same trend was observed concerning
488 intentions (Table 9), with all the MAQ measures adding 2% (MAQ Entitlement) to 8%
489 (MAQ Global Scale) in the amount of variance explained. No problems of
490 multicollinearity were detected in these analyses (VIF range: 1.04–3.84; tolerance
491 between 0.26 and .96).

492

493 [INSERT TABLE 9]

494

495 *3.3 Conclusion*

496 Evidence gathered in study one concerning the structure and predictive ability of
497 the questionnaire were replicated and extended using a sample from a different setting
498 in study two. As in the first study, a four-factor solution with a global second-order
499 dimension of meat attachment fully met criteria for good model fit, providing evidence
500 for measurement invariance. Likewise, reliability analyses showed strong values of
501 internal consistency. Results for predictive ability reinforced the evidence that meat
502 attachment is a different construct from previous measures relevant to the study of meat
503 consumption and adds explanatory capacity to understand consumer willingness and
504 intentions towards meat substitution.

505

506 3 GENERAL DISCUSSION

507 In response to calls to expand knowledge on consumer willingness to reduce
508 meat consumption and to adopt a more plant-based diet (e.g., Dagevos & Voordow,

509 2013; Stehfest et al., 2009), this work advances the construct of meat attachment by
510 describing the validation of the Meat Attachment Questionnaire (MAQ). Overall, our
511 findings indicate that a four-dimensional model of meat attachment comprising of
512 hedonism, affinity, entitlement, and dependence, along with a global score of meat
513 attachment, is a valid and reliable measure of consumers' positive bond towards meat
514 consumption. This measure may help advancing in the psychology of meat consumption
515 and substitution in three different ways: building theory, improving methodology, and
516 informing practice and policy.

517

518 3.1. Building Theory

519 Concerning theory development, the topic of meat consumption and substitution
520 is still rich in abstract and intangible notions that are often viewed as if requiring no
521 additional understanding and explanation, such as the general representation of meat as
522 a cherished and dominant food among the majority of consumers in most western
523 societies (Fiddes, 1991; Holm & Møhl, 2000; Latvala et al., 2012; Schösler et al., 2012;
524 Twigg, 1984). As put forward by Fiddes (1991), moving beyond these abstract notions,
525 it is the core of these appraisals that must be investigated: the issue is not why we eat
526 meat at all, but rather why we do so consistently and in such quantities, and often with
527 such ceremony and strong emotional responses. Specifying and refining the construct of
528 meat attachment, which can be broadly defined as a positive bond towards meat
529 consumption, offers a helpful advance in this regard. In the current work, exploratory
530 and confirmatory factor analysis revealed four dimensions within the construct, namely
531 hedonism (i.e. higher scores referring to meat represented as a source of pleasure),
532 affinity (i.e. higher scores indicative of affinity towards meat consumption), entitlement
533 (i.e. higher scores referring to feelings of entitlement towards meat consumption) and

534 dependence (i.e. higher scores indicating feelings of dependence on meat consumption).
535 All dimensions were interrelated with each other and strongly correlated with a global
536 measure of meat attachment. Thus, as with the general concept of attachment, which is
537 portrayed as multifaceted in shaping the bond between individuals and the object of
538 attachment (e.g., Hidalgo & Hernández, 2001; Scannell & Gifford, 2010), meat
539 attachment seems to comprise an interplay of cognitive and affective elements acting
540 together to shape consumer's positive bond with meat consumption. Across samples, a
541 four-factor model with 16 items and a second-order global dimension of meat
542 attachment fully met criteria for good model fit. Analysis for convergent and concurrent
543 validity showed that the MAQ yielded the anticipated pattern of associations to other
544 constructs and variables previously shown to be relevant to the study of meat
545 consumption and meat substitution, such as attitudes towards meat (e.g., Saba & Di
546 Natale, 1999), subjective norm (e.g., Povey et al., 2001), gender (e.g., Prättälä et al.,
547 2007), human supremacy belief as a dominance ideology in the field of animal-human
548 relations (Dhont & Hodson, 2014), eating habits (e.g., Berndsen & van der Pligt, 2004),
549 and dietary identity (Fox & Ward, 2008). Specifically, associations with attitudes
550 towards meat, subjective norm, gender, and human supremacy beliefs were taken as
551 indicative of convergent validity. In turn, associations with eating habits and dietary
552 identity were taken as indicative of concurrent validity. Regarding predictive ability, in
553 study one the MAQ provided additional explanatory variance above and beyond the
554 effects of attitudes towards meat and current consumption habits in willingness to
555 reduce meat consumption and to follow a plant-based diet, while showing no problems
556 of multicollinearity. In study two these results were replicated and extended in a sample
557 from a different cultural background, providing additional explanatory variance above
558 and beyond the core TPB variables (i.e. attitudes, subjective norm and perceived

559 behavioral control; Ajzen, 1991) in willingness and intentions towards meat
560 substitution. Taken as a whole, these findings suggest that meat attachment is a
561 separate, self-standing and relevant psychological construct in what respects meat
562 consumption and meat substitution. They also lend support to the idea that holding a
563 pattern of attachment towards meat consumption may hinder personal willingness and
564 intentions to adopt a more plant-based diet (Graça et al., 2015).

565

566 3.2. Improving Methodology

567 As for improving methodology, the design and test of new measures addressing
568 consumer valuation of meat provide the necessary tools for researchers to meet the
569 pressing demand to understand consumer willingness to shift towards a more plant-
570 based diet. In tandem with developing and testing theory, operationalizing and making
571 constructs measurable is necessary to observe associations, establish causalities and test
572 propositions. In other words, given the still young but increasing scholarly attention to
573 meat reduction and substitution, more instruments are needed for research in this topic
574 to keep advancing. For example, studies exploring acceptance of meat substitutes in a
575 meal context (e.g. Hoek et al., 2011; Elzerman, Hoek, van Boekel, & Luning, 2011)
576 may benefit from measures to control for individual differences in consumer valuation
577 of meat, and explore different solutions for different segments of consumers. Such
578 measures may also assist for instance in studies exploring consumer acceptance of lab-
579 grown meat (e.g. Laestadius & Caldwell, 2015; Verbeke, Sans, & Van Loo, 2015;
580 Werbeke et al., 2015). Methodologically, given its psychometric properties, favorable
581 initial evidence concerning its validity, parsimony, and versatility (i.e. can be used to
582 assess each dimension in separate or as a global measure of meat attachment), the MAQ
583 is a candidate to be used in such research.

584

585 3.3. Informing Practice and Policy

586 As for informing practice and policy, in the longer term, familiarization with the
587 construct of meat attachment, the dimensions that comprise it and learning how it
588 relates with willingness and intentions concerning meat substitution, may empower
589 practitioners and policy makers to design, deliver and evaluate tailored interventions
590 and initiatives facilitating a shift towards a more plant-based diet. For instance,
591 providing targeted information and campaigns for reducing meat consumption,
592 particularly in high-risk groups or populations vulnerable to misinformation, is
593 advanced as a policy suggestion to encourage people to eat less meat and more plant-
594 based protein sources (Raphaely & Marinova, 2014). On this note, it has been proposed
595 that consumers already with lower levels of meat attachment are more open to
596 information on the impacts of meat and the benefits of changing habits, whereas for
597 consumers more attached to meat, some initiatives to encourage reducing meat-eating
598 may actually trigger defense or loss-aversion mechanisms, thus increasing entrenchment
599 in meat-eating justifications (Graça et al., 2015; Rothgerber, 2014). It can even be
600 expected that consumers higher in meat attachment will be especially prone to
601 rationalize meat consumption, which in turn is shown to be associated with commitment
602 to eat meat (Piazza et al., 2015). While these hypotheses will require experimental
603 testing in the near future, there are indeed concerns that campaigns seeking to encourage
604 reduced meat consumption may be at risk of being accused of questioning consumers
605 individual right to consume what they want, which is arguably reinforced by the cultural
606 significance of meat consumption in the West (e.g., Doyle, 2011; Laestadius et al.,
607 2014; de Boer, Schösler, & Boersema, 2013). Looking forward, empowering
608 practitioners and policy makers on the issue of meat attachment may allow for

609 expanding knowledge on how to work with these dimensions (i.e. hedonism, affinity,
610 entitlement, and dependence on meat) at the individual and societal levels (e.g., which
611 tools to provide; what contents to deliver, and to who; how to frame communication), to
612 encourage willingness and intentions to change habits. While more research is still
613 needed before this is feasible, it may be a promising path to pursue, integrating evidence
614 also on other drivers and barriers either already found (e.g., Pohjolainen, Vinnari, &
615 Jokinen, 2015; Zur & Klöckner, 2014) or yet to be discovered. Of course, encouraging
616 consumers to choose to eat less meat is just the ‘tip of the iceberg’ (Spurling,
617 McMeekin, Shove, Southerton, & Welch, 2013). To elicit and support personal
618 willingness and intentions to adopt a more plant-based diet, solid endeavors are likely to
619 have to bypass meat attachment and other barriers at the individual level, but probably
620 also ensure that plant-based meals are embedded and easily available in the surrounding
621 environments’ routines, conventions, resources and institutions (Spurling et al., 2013;
622 Vinnari & Vinnari, 2014).

623

624 3.4. Limitations and Other Future Directions

625 In spite of the possibilities advanced, the present work is not without limitations.
626 One concern was that the sample in study one was slightly biased in terms of age (i.e.
627 skewed towards younger participants). Given the large sample size, older participants
628 were nonetheless represented by fairly high absolute numbers. In addition, evidence
629 obtained with the sample from study two, which was more balanced in terms of
630 participants’ characteristics and recruited in a different setting and cultural background,
631 suggests that the findings from the first study were valid, not influenced by this bias
632 and, to some extent, generalizable. Another noteworthy issue is that the MAQ’s
633 subscales and global scale seem to share a considerable amount of variance, judging

634 from the moderate to strong associations with each other. There were differences in the
635 strength of the associations between the subscales, global scale, and the network of
636 variables assessed in the different types of validity, which imply the existence of
637 discriminatory value in the subscales even if the global scale seemed to hold more
638 promise in terms of adding explanatory capacity. Thus, while the global scale is a
639 particularly good candidate to be included in future research, it is expected that the
640 different subscales may also add value for more fine grained analyses and
641 interpretations. For instance, when assessing predictive ability, across both studies the
642 predictive power of dependence subscale greatly overshadowed that of the other three
643 and added almost as much predictive power as the entire MAQ. This may suggest that
644 feelings of dependence towards meat consumption, as framed in the construct of meat
645 attachment, are a core issue in hindering a shift towards a more plant-based diet, which
646 ought to be explored in the future. On a different note, another matter worth noticing is
647 that in spite of showing weak but significant associations with the MAQ in study one,
648 the variable referring to subjective norm yielded no predictive capacity in willingness
649 and intentions concerning meat substitution in study two, when coupled with the other
650 core TPB variables (i.e., attitudes and perceived behavioral control). This finding was
651 not entirely unexpected since subjective norm did emerge in previous research on meat
652 consumption as the weakest predictor in the TPB model (e.g., Povey et al., 2001). We
653 echo previous interpretations suggesting that the influence of normative pressure from
654 specific referent groups on intentions may only be evident for high identifiers with the
655 specific group, and reiterate the suggestion that in future studies a measure of group
656 identification is also taken in addition to the standard measures of subjective norm
657 (Povey et al., 2001; Terry & Hogg, 1996). Finally, the present work is narrowed by its
658 scope and cross-sectional nature. One important caveat is the downside of one of its

659 major strengths, which is departing from data-driven propositions to improve
660 understanding on the psychology of meat consumption and substitution. While
661 providing a contribution to this topic and helping to build new theory in various ways,
662 as discussed above, we are still far from being able to sketch what may become a proper
663 theory of meat attachment. Such a theory will clarify the psychological nature of the
664 construct as a whole and its dimensions in particular, and illuminate its position with
665 reference to other well established theoretical frameworks that seek to explain consumer
666 behavior. For instance, when testing the instrument's predictive ability, inclusion of
667 meat attachment alongside TPB elements reduced greatly their direct effect on
668 willingness and intentions towards meat substitution, suggesting a mediation
669 mechanism that ought to be clarified in the future and holds promising research
670 possibilities. Likewise, future research towards building a theory of meat attachment
671 will need to shed light on the process of becoming attached to meat (e.g., how meat
672 attachment develops during childhood and adolescence until one becomes a more self-
673 determined consumer), and explore possible moderators that strengthen or weaken this
674 process. This is important because much of our relationship with food and food choice
675 occurs at a non-conscious level within deep-rooted patterns of habit and behavior
676 (Köster, 2009), so it may be particularly challenging to bring the issue of meat
677 consumption to higher levels of reasoning without triggering personal defense or loss-
678 aversion mechanisms when a pattern of meat attachment is already established (Graça et
679 al., 2015).

680

681 3.5 Main Conclusions

682 Meat attachment refers to a positive bond towards meat consumption and
683 comprises four dimensions, namely hedonism, affinity, entitlement, and dependence. Its

684 measure yielded favorable initial evidence concerning validity indicators, measurement
685 invariance and psychometric properties. Meat attachment showed negative associations
686 with willingness and intentions to reduce meat consumption and to follow a more plant-
687 based diet. That is, consumers that were more attached to meat consumption were also
688 less inclined to consider changing their eating habits. They were also more likely to eat
689 meat more often, hold more positive attitudes towards meat, perceive more social
690 pressure to eat meat, endorse values of human dominance over animals, and identify
691 more strongly as meat eaters and omnivores, and less as vegetarians or vegans. Men
692 tended to score higher than women in all dimensions of meat attachment. Overall, the
693 results obtained and propositions advanced in the current work, suggest that the
694 construct of meat attachment and proposed questionnaire is a relevant first step for a
695 variety of present and future applications and research questions on the psychology of
696 meat consumption and meat substitution.

697

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703

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Table 1. *Study one: Samples' characteristics*

Variable	Category	Sample 1		Sample 2	
		N	%	N	%
Gender	Male	225	45	223	43.4
	Female	275	55	291	56.6
Age	< 23	246	50.3	240	48
	23-40	198	40.5	212	42.4
	> 40	45	9.2	48	9.6
Education	Basic	16	3.2	11	2.2
	Secondary	211	42.3	227	44.2
	Higher	272	54.5	275	53.6
Employment Status	Employed	156	31.2	170	33
	Unemployed	31	6.2	40	7.8
	Student	308	61.6	296	57.5
	Other	5	1	9	1.9

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Table 2. *Initial pool of items referring to the meanings that consumers*

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associate with meat

To eat meat is one of the good pleasures in life.
Meat is irreplaceable in my diet.
According to our position in the food chain, we have the right to eat meat.
I feel bad when I think of eating meat.
I love meals with meat.
To eat meat is disrespectful towards life and the environment.
To eat meat is an unquestionable right of every person.
Meat consumption is crucial to my balance.
A full meal is a meal with meat.
I'm a big fan of meat.
If I couldn't eat meat I would feel weak.
If I was forced to stop eating meat I would feel sad.
Meat reminds me of diseases.
By eating meat I'm reminded of the death and suffering of animals.
Eating meat is a natural and undisputable practice.
I don't picture myself without eating meat regularly.
Meat sickens me.
I would feel fine with a meatless diet.
Meat consumption is a natural act of one's affirmation as a human being.
A good steak is without comparison.

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915 Table 3. *Study one - Item and Scale Information from the Exploratory Factor Analysis*
 916 *for the Meat Attachment Questionnaire*

Item	Factor loadings				M	SD	h^2
	1	2	3	4			
Hedonism							
1. To eat meat is one of the good pleasures in life.	.79	.08	.01	.01	3.55	1.06	.72
6. I love meals with meat.	.69	.14	.02	.10	3.69	1.03	.73
13. I'm a big fan of meat.	.67	.05	.05	.23	3.46	1.01	.80
9. A good steak is without comparison.	.60	-.02	.20	.09	3.39	1.16	.61
Affinity							
17. By eating meat I'm reminded of the death and suffering of animals.*	.06	.82	-.01	.02	3.65	1.16	.74
7. To eat meat is disrespectful towards life and the environment.*	-.14	.77	.13	.13	3.67	1.07	.67
5. I feel bad when I think of eating meat.*	.12	.70	.13	-.07	4.00	1.09	.67
16. Meat reminds me of diseases.*	.21	.60	-.04	-.02	4.00	1.05	.50
Entitlement							
8. To eat meat is an unquestionable right of every person.	.03	.04	.77	-.09	3.30	1.06	.57
4. According to our position in the food chain, we have the right to eat meat.	.03	.03	.69	.03	3.15	1.04	.55
18. Eating meat is a natural and undisputable practice.	-.01	.06	.55	.24	3.18	1.04	.53
Dependence							
20. I don't picture myself without eating meat regularly.	.14	.02	.02	.72	3.09	1.23	.69
14. If I couldn't eat meat I would feel weak.	.05	-.17	.11	.71	2.60	1.07	.57
10. I would feel fine with a meatless diet.*	-.07	.19	-.03	.69	2.85	1.20	.52
15. If I was forced to stop eating meat I would feel sad.	.17	.04	-.01	.62	2.92	1.24	.57
2. Meat is irreplaceable in my diet.	.26	.07	.09	.52	3.06	1.22	.64
Eigenvalue	7.91	1.69	1.14	.83			
Percentage of variance	49.4	10.5	7.1	5.2			
Cronbach's alpha	.89	.86	.76	.86			

917 *Notes.* h^2 = Item communalities. Factor loadings $>|.50|$ are presented in bold.

918 * = Reverse-scored items.

919

920 Table 4. *Study one - Subscale and global scale reliabilities, means, standard deviations,*
 921 *and correlations*

MAQ Scale and subscales	α	M	SD	1	2	3	4	5
1. Hedonism	.90	3.56	.94	-				
2. Affinity	.86	3.91	.87	.61*	-			
3. Entitlement	.77	3.19	.87	.57*	.51*	-		
4. Dependence	.86	2.88	.94	.72*	.49*	.57*	-	
5. Global scale	.93	3.40	.75	.88*	.80*	.75*	.86*	-

922 * $p < .01$

923

924 Table 5. *Study one - Correlations with other measures and indicators relevant to the*
 925 *study of meat consumption and meat substitution*

MAQ Scale and subscales	Attitudes	Subjective Norm	Human Supremacy	Habits	Dietary identity			
					Meat eater	Omnivore	Vegetarian	Vegan
1. Hedonism	.67*	.35*	.31*	.67*	.70*	.36*	-.48*	-.43*
2. Affinity	.61*	.21*	.42*	.51*	.51*	.30*	-.49*	-.45*
3. Entitlement	.50*	.21*	.45*	.41*	.44*	.26*	-.37*	-.31*
4. Dependence	.61*	.32*	.36*	.56*	.60*	.24*	-.47*	-.33*
5. Global scale	.73*	.33*	.45*	.66*	.68*	.35*	-.55*	-.46*

926 * $p < .01$

927

928 Table 6. *Study one - Mean differences between men (N = 223) and women (N = 291) on*
 929 *the Meat Attachment Questionnaire (MAQ) scale and subscales*

MAQ Scale and subscales	Men		Women		F(1,512)	Cohen's <i>d</i>
	M	SD	M	SD		
1. Hedonism	3.78	.84	3.40	.81	20.50**	.41
2. Affinity	4.10	.83	3.84	.88	7.83*	.30
3. Entitlement	3.33	.88	3.03	.88	14.91**	.34
4. Dependence	3.08	.90	2.71	.96	20.07**	.40
5. Global scale	3.57	.70	3.26	.78	22.15**	.42

930 * $p < .01$ ** $p < .001$

931

Table 7. Study one - Hierarchical regressions for predictive ability in willingness to reduce meat consumption and to follow a plant-based diet above and beyond related variables

Variable	Reduce meat consumption						Follow a plant-based diet					
	B	SE	β	ΔR^2	ΔF	dfs	B	SE	β	ΔR^2	ΔF	dfs
Step 1				.22***	67.89	2, 493				.39***	168.31	2, 517
Attitudes	-.44	.05	-.37***				-.51	.06	-.41***			
Current habits	-.21	.06	-.16***				-.35	.06	-.28***			
Step 2 - Hedonism				.03***	21.17	1, 492				.03***	25.13	1, 516
Attitudes	-.32	.06	-.27***				-.37	.06	-.30***			
Current habits	-.12	.06	-.09*				-.23	.06	-.18***			
MAQ Hedonism	-.29	.06	-.23***				-.34	.07	-.25***			
Step 2 - Affinity				.05***	35.24	1, 492				.06***	60.13	1, 516
Attitudes	-.30	.06	-.25***				-.31	.06	-.25***			
Current habits	-.17	.06	-.13**				-.26	.05	-.21**			
MAQ Affinity	-.38	.06	-.27***				-.48	.06	-.33***			
Step 2 - Entitlement				.06***	40.08	1,492				.04***	33.16	1, 516
Attitudes	-.34	.05	-.28***				-.40	.06	-.32***			
Current habits	-.20	.06	-.15**				-.31	.05	-.25***			
MAQ Entitlement	-.33	.05	-.26***				-.32	.06	-.22***			
Step 2 - Dependence				.12***	90.54	1,492				.09***	87.89	1, 516
Attitudes	-.24	.05	-.20***				-.30	.06	-.24***			
Current habits	-.09	.06	-.07				-.21	.05	-.18***			
MAQ Dependence	-.49	.05	-.42***				-.52	.06	-.39***			
Step 2 - Global Scale				.14***	103.91	1, 492				.11***	118.91	1, 516
Attitudes	-.13	.06	-.11*				-.15	.06	-.12*			
Current habits	-.07	.06	-.05				-.14	.05	-.12**			
MAQ Global Scale	-.79	.08	-.49***				-.88	.08	-.54***			

* $p < .05$ ** $p < .01$ *** $p < .001$

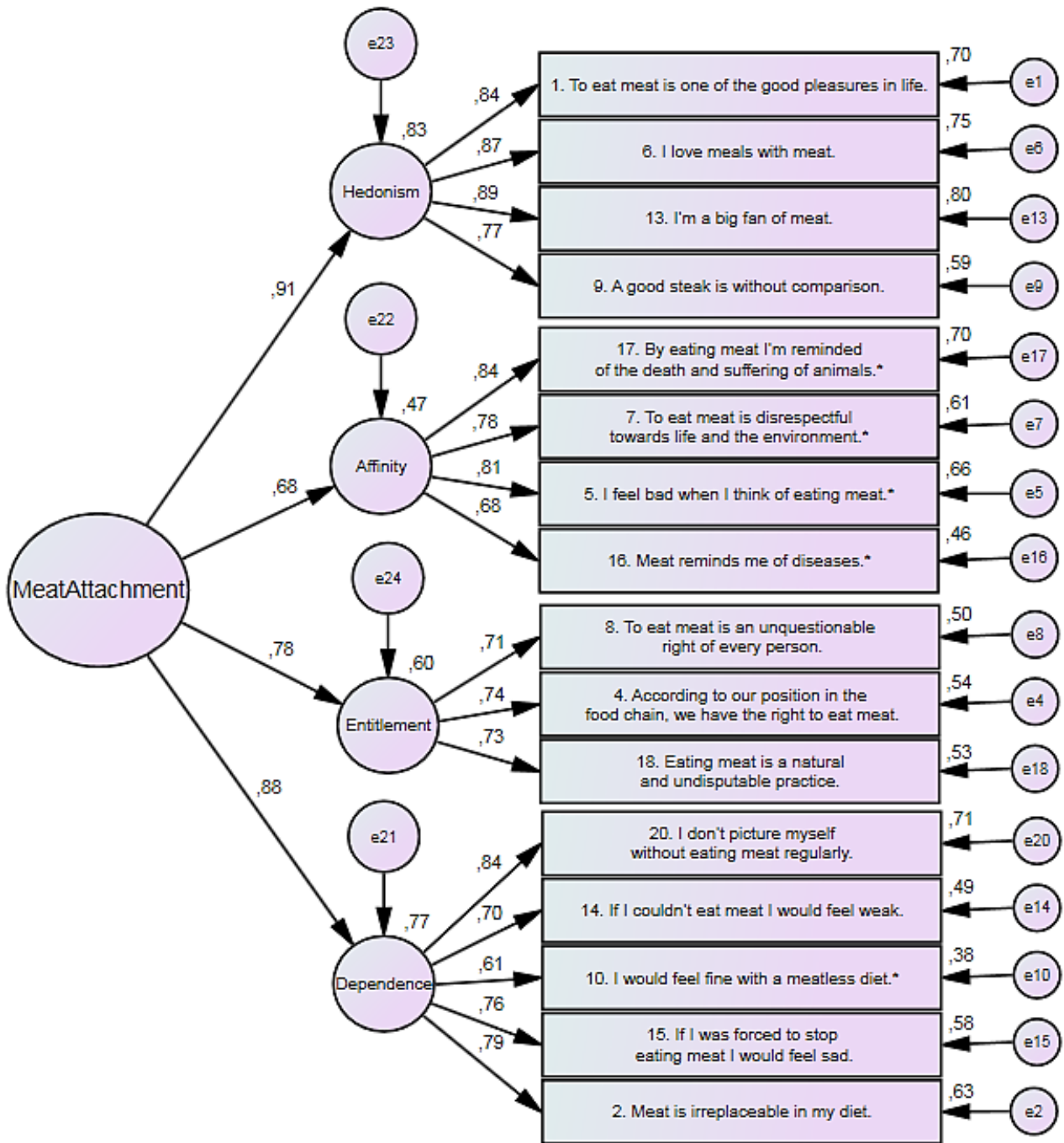
935 Table 8. *Study two - Subscale and global scale reliabilities, means, standard deviations,*
 936 *and correlations*

MAQ Scale and subscales	α	M	SD	1	2	3	4	5
1. Hedonism	.92	3.78	1.06	-				
2. Affinity	.88	4	1.03	.63*	-			
3. Entitlement	.86	3.6	1.06	.68*	.66*	-		
4. Dependence	.91	3.21	1.16	.78*	.58*	.66*	-	
5. Global scale	.95	3.62	.94	.90*	.81*	.84*	.90*	-

937 * $p < .01$

Variable	Willingness						Intentions					
	B	SE	β	ΔR^2	ΔF	dfs	B	SE	β	ΔR^2	ΔF	dfs
Step 1				.49***	98.8	3, 314				.61***	165	3, 314
Attitudes	-.77	.05	-.63***				-.90	.05	-.77***			
Subjective norm	.00	.00	-.04				.00	.00	.03			
PBC	.27	.07	.17***				.21	.07	.13***			
Step 2 - Hedonism				.03***	21.02	1, 313				.03***	23.24	1, 313
Attitudes	-.46	.09	-.38***				-.62	.07	-.53***			
Subjective norm	.00	.00	-.03				.00	.00	.04			
PBC	.27	.07	.16***				.20	.06	.13***			
MAQ Hedonism	-.38	.08	-.32***				-.34	.07	-.29***			
Step 2 - Affinity				.06***	37.62	1, 313				.03***	28.53	1, 313
Attitudes	-.46	.07	-.38***				-.67	.06	-.57***			
Subjective norm	.00	.00	-.06				.00	.00	-.01			
PBC	.30	.06	.18***				.23	.06	.14***			
MAQ Affinity	-.43	.07	-.34***				-.32	.06	-.26***			
Step 2 - Entitlement				.06***	41.09	1, 313				.02***	14.63	1, 313
Attitudes	-.50	.07	-.41***				-.76	.06	-.65***			
Subjective norm	.00	.00	-.05				.00	.00	.03			
PBC	.27	.06	.16***				.21	.06	.13***			
MAQ Entitlement	-.40	.06	-.33***				-.21	.06	-.18***			
Step 2 - Dependence				.13***	101.50	1, 313				.06***	57.63	1, 313
Attitudes	-.33	.07	-.27***				-.60	.07	-.51***			
Subjective norm	.00	.00	-.03				.00	.00	.07*			
PBC	.12	.06	.08*				.11	.05	.07*			
MAQ Dependence	-.61	.06	-.55***				-.41	.05	-.38***			
Step 2 - Global Scale				.15***	128.31	1, 313				.08***	75.67	1, 313
Attitudes	-.01	.08	-.01				-.38	.07	-.32***			
Subjective norm	.00	.00	-.02				.00	.00	-.05			
PBC	.20	.06	.12**				.16	.05	.10**			
MAQ Global Scale	-1.03	.09	-.75***				-.71	.08	-.53***			

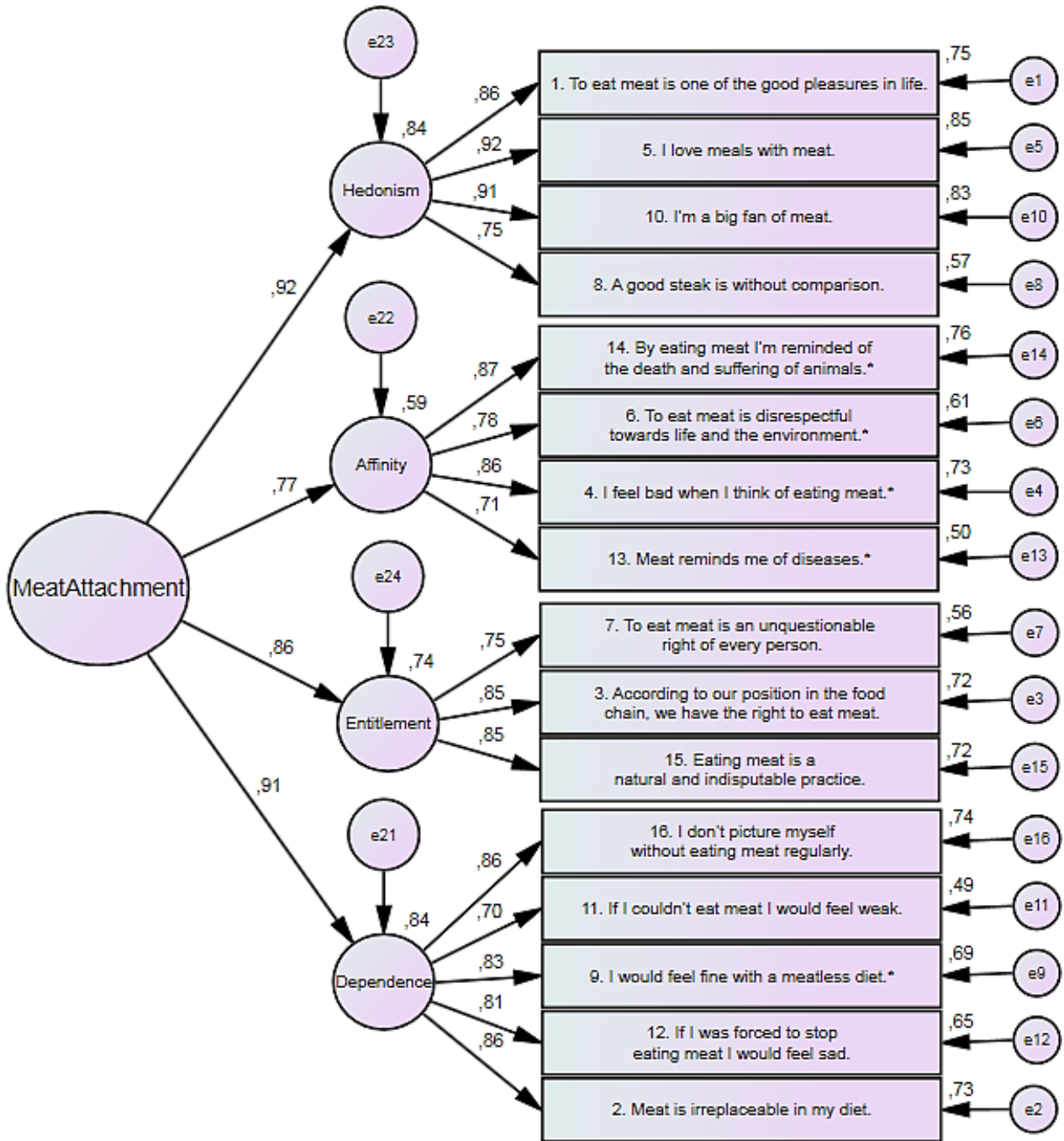
* $p < .05$ ** $p < .01$ *** $p < .001$



941

942 Figure 1. Study one - Confirmatory factor analysis of the Meat Attachment Questionnaire, four-
 943 factor structure with a second-order dimension. Standardized coefficients are presented.

944



945

946 Figure 2. Study two - Confirmatory factor analysis of the Meat Attachment Questionnaire, four-
 947 factor structure with a second-order dimension. Standardized coefficients are presented.

948