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Estimating the Effects of Trait Knowledge on Social Perception

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Abstract

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Research in social cognition has predominantly investigated perceptual and inferential processes separately, however real-world social interactions usually involve integration between person inferences (e.g., generous, selfish) and the perception of physical appearance (e.g., thin, tall). Therefore, in the current work, we investigated the integration of different person-relevant signals, by estimating the extent to which bias in one social information processing system influences another. Following an initial stimulus-validation experiment (Experiment 1, N=55), two further pre-registered experiments (Experiments 2, N=55 & 3; N=123) employed a priming paradigm to measure the effects of extraversion-diagnostic information on subsequent health and body-size judgements of a target body. The results were consistent across both priming experiments and supported our predictions: compared to trait-neutral control statements, extraversion-diagnostic statements increased judgements of health and decreased those of body size. As such, we show that trait-based knowledge does not only influence mappings towards similar types of person judgments, such as health judgments. Rather, even a brief re-configuration of trait-space alters mappings towards non-trait judgments, which are based on body size and shape. The results complement prior neuroimaging findings that showed functional interactions between the body-selective brain regions in the ventral visual stream and the theory of mind network when forming impressions of others. Therefore, we provide a functional signature of how distinct information processing units exchange signals and integrate information in order to form impressions. Overall, the current study underscores the value of behavioural work in complementing neuroscience when investigating the role and properties of functional integration during impression formation. Additionally, it stresses the potential limitations of an over-reliance on studying separate systems in isolation.

1. Introduction

51
52 When interacting with another person, we combine many distinct features and recognise that
53 these belong to a single entity. For example, physical features, such as what someone looks
54 like (e.g., tall and slim) are integrated with judgments regarding their character (e.g.,
55 outgoing and friendly). Such integrated person representations coordinate social behaviour by
56 signalling who to approach and avoid, as well as how and when to interact with others.
57 Although distinct person features must clearly be integrated, researchers studying the
58 neurobiological underpinnings of social cognition typically address perceptual and inferential
59 processes separately. Consequently, the nature of interplay between perceptual and inferential
60 person representations is largely unknown. For example, it is unclear to what extent holding a
61 particular social judgement about someone (e.g., friendly) might bias how we “see” them in a
62 perceptual sense (e.g., slimmer). In the current study, therefore, we estimate the impact of
63 drawing trait inferences on person perception. By doing so, we aim to build new links
64 between two sub-disciplines of social cognition and assess the hypothesis that a holistic
65 person representation in part comprises reciprocally connected person feature representations.

66 Research in social cognition and social neuroscience has largely focussed on
67 understanding how separate sub-systems operate during social information processing, which
68 span perceptual, cognitive and emotional processes (Adolphs, 2009; Frith & Frith, 2012). For
69 example, person perception research aims to understand systems whose roles include
70 detecting the presence and appearance of others (Kanwisher, 2010). In contrast, person
71 inference research is focussed on investigating the systems that enable one to reason and
72 make inferences about other people’s “hidden” mental states and trait-based character (Frith
73 & Frith, 1999; Saxe & Kanwisher, 2003; van Overwalle, 2009). These sub-disciplines of
74 social cognition research have made significant advances to understanding social information

75 processing, whilst largely remaining separate research entities that operate in their own silos
76 with little communication.

77 In everyday life, however, we integrate multiple sources of information to form
78 complete person representations, which are likely to encompass the interaction of perceptual
79 and inferential processes. For example, the identification of another person's face or body
80 often leads to spontaneous person inferences, whereby trait-based character impressions are
81 formed on limited or incomplete social cues (Ambady & Rosenthal, 1992; Todorov et al.,
82 2015). Indeed, one of the most studied aspects of impression formation concerns traits
83 imbued by facets of a person's visual appearance, including facial expressions, body shape,
84 gestures and posture (Naumann et al., 2009; Oosterhof & Todorov, 2008; Puhl & Heuer,
85 2009). However, we do not solely rely on visual appearance to form judgments of people's
86 character. Trait-diagnostic information can be extracted from the perception of others'
87 behaviour, whether observed directly or learned about indirectly, such as when talking with a
88 friend or when reading a book (Mitchell, 2009; Mitchell et al., 2006). Furthermore, accurate
89 visual representations of body shape can be derived from verbal descriptions, which shows a
90 close link between verbal and visual body representations (Hill, Streuber, Hahn, Black, &
91 O'Toole, 2016). Ultimately, therefore, disparate modalities of person-specific information
92 (visual percept, written or spoken word), are integrated to form a single holistic person-
93 representation. Therefore, without studying perceptual and inferential processes together, it
94 seems difficult to build a more complete understanding of how holistic person representations
95 manifest.

96 To date, the study of person perception has been dominated by research on faces (e.g.
97 Kanwisher et al., 1997; Todorov et al., 2015). Bodies, however, also signal important social
98 information (de Gelder, 2006; de Gelder et al., 2010; Hu et al., 2018), and at times express
99 unique information that faces conceal (Aviezer et al., 2012). Moreover, given globally

100 increasing obesity rates (Wang et al., 2011), body weight is becoming an ever more salient
101 dimension along which people can vary, which is likely to elevate the social consequences of
102 inferences based on body shape (Puhl & Heuer, 2009). Indeed, from a public health
103 perspective, the nature and content of trait judgements that arise from perceptions of weight
104 have been shown to have negative health consequences for those individuals perceived as
105 being overweight (Daly et al., 2019). Understanding the role of body perception in social
106 cognition, therefore, has downstream implications for understanding and remediating the
107 processes which may lead to potentially damaging prejudice and stigmatisation.

108 The separation of research specialisations into perceptual and inferential processes is
109 mirrored by a focus within these sub-disciplines on largely non-overlapping brain circuits.
110 Indeed, two largely separate neural circuits have been associated with body perception and
111 person inference. In terms of body perception, brain regions along the ventral visual stream in
112 the Extrastriate Body Area (EBA; Downing, Jiang, Shuman, & Kanwisher, 2001) and
113 Fusiform Body Area (FBA; Peelen & Downing, 2007; Schwarzlose, Baker, & Kanwisher,
114 2005) show greater activation in response to bodies or body parts in comparison to control
115 stimuli such as chairs and cars (Downing & Peelen, 2011). Together, it has been argued that
116 EBA and FBA are primarily sensitive to body shape and posture processing, rather than more
117 elaborate cognitive processes such as emotion or identity processing (Downing & Peelen,
118 2011; Kemmerer, 2011).

119 The second neural system of relevance to the current work is one associated with
120 person inferences. The mentalising or theory of mind network is a system of regions which
121 engage when mental states such as beliefs, desires and attitudes are ascribed to others (Frith
122 & Frith, 1999). The theory of mind network spans the temporo-parietal junction (TPJ),
123 medial prefrontal cortex (mPFC), anterior cingulate cortex (ACC), temporal poles (TPs),
124 Precuneus (PreC) and superior temporal sulcus (STS) (Saxe & Kanwisher, 2003; van

125 Overwalle, 2009). The theory of mind network is thought to be responsible for generating
126 inferences about people on the basis of learned or observed behaviour, such as whether they
127 are outgoing or friendly, and as such, it is has been associated impression formation (Mitchell
128 et al., 2005, 2006).

129 Much like human neuroscience in general, social neuroscience research has primarily
130 identified the function of segregated brain networks, which span perceptual, cognitive and
131 affective processes (functional segregation; see Adolphs, 2009; Kanwisher, 2010). Less
132 research has investigated the function of interplay between multiple systems (functional
133 integration; Bullmore & Sporns, 2009; Park & Friston, 2013). Newer research in social
134 neuroscience is beginning to emerge, however, which places greater emphasis on
135 understanding functional integration between component processing units. For instance, with
136 regard to body perception and trait inference research, neuroimaging studies have
137 demonstrated functional coupling between body perception and theory of mind regions
138 during impression formation when participants are presented with trait-diagnostic
139 information alongside an image of a person's body (Ramsey, 2018). Such functional
140 integration between neural circuits associated with person perception and person inference
141 have been shown to be involved when forming impressions (Greven et al., 2016), as well as
142 when recalling stored social knowledge (Greven & Ramsey, 2017a) and evaluating ingroup
143 versus outgroup members (Greven & Ramsey, 2017b). Therefore, these studies are beginning
144 to demonstrate that for a more complete understanding of social information processing
145 during body perception, functional integration must be considered alongside functional
146 segregation (Quadflieg et al., 2011; Ramsey, 2018; Ramsey et al., 2011).

147 The demonstration of functional coupling between distinct neural networks when
148 forming impressions is only a starting point, however. The functional relevance of this
149 interplay is still poorly understood. Indeed, neuroscience research needs behavioural research

150 to help provide a relevant context to interpret brain-based findings (Krakauer et al., 2017).
151 Key questions remain unanswered concerning the nature and structure of links between ‘trait
152 space’ and ‘face/body space’ when forming impressions (Over & Cook, 2018). How and
153 when are distinct person features bound together? What are the functional consequences of
154 reconfiguring ‘trait space’ for judgments that rely on ‘face/body space’? Indeed, the
155 consequences of delivering mutually relevant person information to two separate systems has
156 not received much attention. Historically, much more research has investigated how multiple
157 features within a single modality are weighted to produce an overall percept or judgment state
158 (Anderson, 1962; Asch, 1946; Hendrick et al., 1975).

159 The current behavioural work, therefore, seeks to address this gap in understanding by
160 estimating the extent to which a trait-based person inference can influence other types of
161 person inference and person perception. A considerable amount of prior work has
162 investigated how images of faces and bodies trigger spontaneous trait inferences (Greven et
163 al., 2019; Naumann et al., 2009; Puhl & Heuer, 2009; Sutherland et al., 2013; Todorov et al.,
164 2015). Here, we test the opposite flow of information by hypothesising that person inferences
165 generated in the theory of mind network can influence other person inferences, as well as
166 person perception processes in the ventral visual stream. More specifically, we hypothesise
167 that forming a person inference based on trait knowledge (e.g., extraversion) will have
168 functional consequences for related person inferences (e.g., health), as well as purely shape-
169 based body judgments (e.g., size and shape). Such findings would suggest that re-structuring
170 ‘trait space’ with new person information can generalise and bias judgments of other types of
171 person inference that place similar demands on person inference systems (e.g., health
172 judgments), as well as judgments that place low demands on person inference systems and
173 that largely rely on visual feature processing along the ventral visual stream (e.g., body-size
174 judgments).

175 Investigating the relationships between distinct types of person knowledge is
176 important for several reasons. First, in terms of understanding basic cognitive and brain
177 systems, the findings illuminate how and when separate social information processing
178 systems integrate information across ‘trait space’ and ‘face/body space’ (Over & Cook,
179 2018). This is important due to the lack of research that focusses on understanding functional
180 integration in general (Park & Friston, 2013) and in social perception research (Kanwisher,
181 2010; Ramsey, 2018). By doing so, the current work will provide a functional description of
182 the links between perceptual and inferential processes during body perception, and thus build
183 new links between sub-disciplines of psychology and neuroscience that typically do not
184 overlap. Second, on a more societal and social level, given the health consequences for those
185 individuals who are perceived as being overweight (Daly et al., 2019), as well as the growing
186 obesity rates globally (Wang et al., 2011), understanding the mechanisms that might mediate
187 such perceptions could have important longer-term consequences for society.

188 The current paper comprises three experiments. The first experiment was primarily
189 focussed on developing stimuli to make sure that we select bodies that cue the required type
190 of person inferences. The two subsequent experiments then use these bodies to test if trait
191 inferences regarding a person’s character bias judgments based on body shape. We chose
192 extraversion as an example of a trait inference to test our general question of interest, but
193 other dimensions and features would also have addressed the same basic question.

194 **2. Experiment 1 – Stimuli Development**

195 **2.1 Introduction**

196 Although prior research has established how clearly distinct body shape exemplars (e.g.,
197 muscly versus obese) impact trait inferences (Greven et al., 2019), the nature of trait
198 attributions across small intervals of body shape/size dimensions remain largely unknown.
199 Experiment 1, therefore, sought to establish the relationship between intervals of body size

200 (from low to high body fat) and trait judgements and thereby validate which body stimuli
201 would ultimately be used in subsequent priming studies. Computer-generated body images
202 were created using *MakeHuman* (version 1.1.1; www.makehumancommunity.org), a python-
203 based program for creating anatomically realistic 3D human models (*toons*). The basic model
204 was adjusted to produce both a slim and overweight archetype, which were then saved as
205 target meshes so that toons could be created procedurally across increments of these
206 extremes.

207 This preparatory experiment sought to establish the relative change in visual and trait-
208 based ratings of bodies across increasing increments of body size, by asking participants to
209 make judgements about a series of 15 body-sizes in response to four questions: “How
210 outgoing?”, “How attractive?”, “How healthy?” and “How heavy?”. The purpose was to map
211 out the responses to each and establish their independence from each other; it was expected
212 that the incremental changes in response to the body size question (How heavy?) would be
213 roughly the inverse of those observed in response to the others. Attractiveness was included
214 on the basis that this may otherwise be used as a heuristic for the other trait ratings.

215 **2.2 Method**

216 Our first experiment sought to identify the judgements made about a series of newly
217 developed body stimuli. We sought to collect judgments across 50 participants in order to
218 provide a reasonable index of typical responses to our dependent variables. Given that the
219 results in this initial experiment were expected to be relatively clear, a target of 50
220 participants was judged to be sufficiently powerful for the purposes of estimating the average
221 rating for each body size increment. In addition, a total of 50 per cell of a design is
222 increasingly considered the minimum sample size for conventional psychological research
223 given the reduced ability of smaller sample sizes to produce robust estimates of effect sizes
224 (Simmons et al., 2018).

225 2.2.1 Participants

226 Fifty-five participants took part in the study in exchange for monetary compensation
227 or course credit (13 males, $Mean_{age}=24.15$, $SD_{age}=5.05$, age range = 18 to 38). All
228 participants provided informed consent before completing the task. Participants were
229 excluded from a given cell of the design if their mean response for that combination of
230 factors (15 body size increment and 4 questions) was 2.5 standard deviations from the mean
231 of that cell. This criterion excluded 1% of data points, and the minimum number of
232 participants within a cell was 53. Thirty-three of the cells included all 55 participants. All
233 procedures were approved by the Research Ethics and Governance Committee of the School
234 of Psychology at Bangor University.

235 2.2.2 Materials

236 A short script was produced using the coding utility in *MakeHuman*, to create and
237 render JPG images of toons ranging from low to high body fat. Four different identities (2
238 male and 2 female) which differed in skin texture were created at 15 body size increments,
239 resulting in a total of 60 bodies. Basic clothing assets (white underwear) were downloaded
240 from the *makehumancommunity.org* forum and added to the toons before they were screen
241 grabbed as 1523x882 PNG images. These were then cropped to 785x774 and had their faces
242 obscured with a solid black square (see Figure 1.).

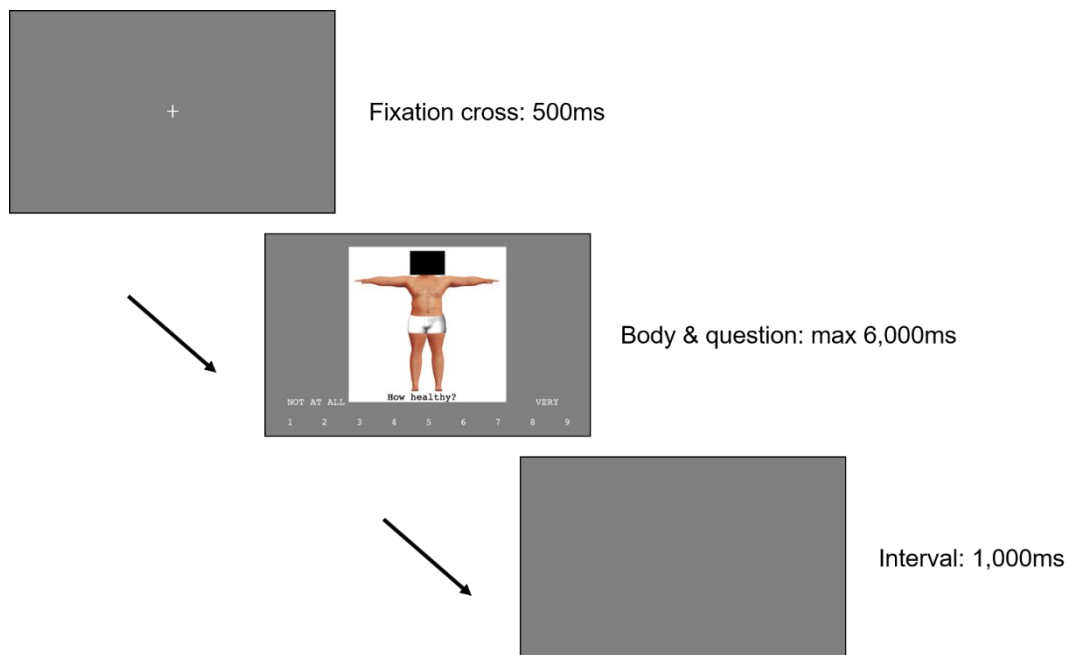


243

244 *Figure 1.* Example stimuli. Body sizes 1 (left), 8 (middle) and 15 (right)

245 2.2.3 Task and Procedure

246 A body-rating task was produced and implemented in *MATLAB* 2015b, using
247 Psychtoolbox 3 (www.psychtoolbox.org). On each trial participants were presented with a
248 body and a question, which they had to respond to with a 1-9 key press within 6 seconds (see
249 Figure 2.). Participants were advised that they could take a break after every 40 trials, and
250 press space to resume the task. In total the task had 240 trials.

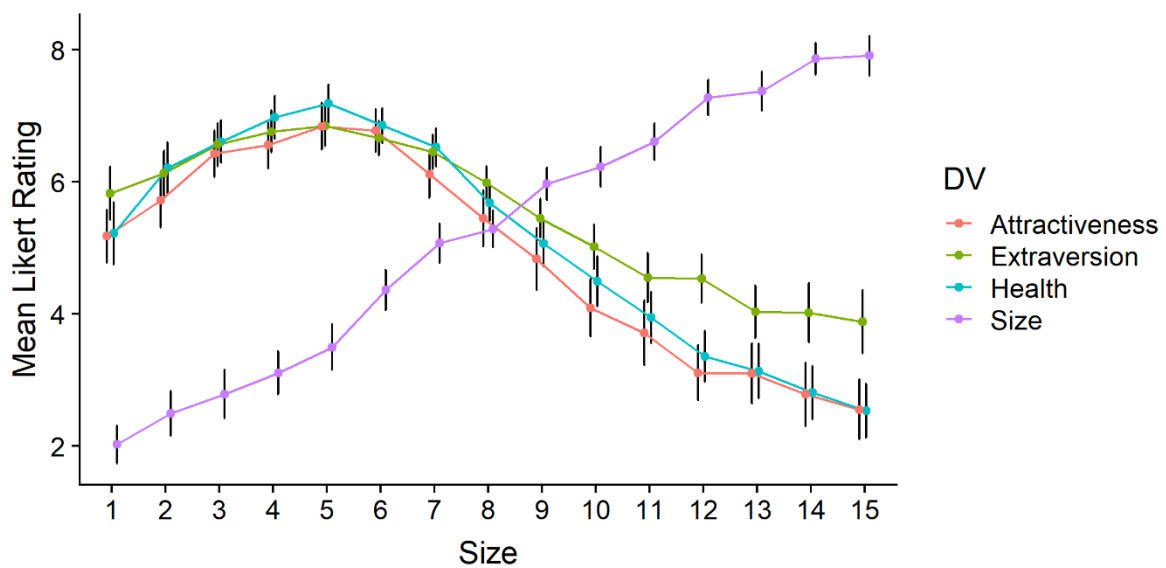


252 *Figure 2.* Trial of body-rating task

253 **2.3 Results and Discussion**

254 Means and 95% confidence intervals were calculated and plotted for each combination of
255 body size increment and dependent variable (Figure 3). With the exception of more
256 “extreme” body sizes at the thin end of the range, increasing increments of body size
257 generally brought about lower ratings of health, extraversion and attractiveness on an
258 incremental basis. In contrast, body size judgements generally increased across increasing
259 increments of size (see Figure 3.). Cronbach’s Alphas were also calculated for each
260 dependent variable of interest showing high consistency and agreement across measures (see
261 Supplementary Table 9). Previous studies investigating size judgements of incrementally


262 increasing body sizes of real or computer-generated bodies have observed a sigmoid curve as
 263 ratings of body sizes at the extreme ends of the scale are less noticeable (Weber’s law) (Alexi
 264 et al., 2019; Cornelissen et al., 2016). It is possible that this is caused in part by participants’
 265 tendency to avoid the extreme ends of a finite Likert scale, and that measurement error can
 266 only occur in one direction once the end of the scale is reached. As such, it is not clear
 267 whether impeded size estimation at the extreme ends of a stimuli set is an artefact of testing
 268 methods or a genuine property of the psychophysics of body perception.



269
 270 *Figure 3.* Mean Likert ratings of each variable by body size.

271 A grand mean and pooled standard deviation were calculated for body sizes 5-12 (as
 272 to exclude bodies without a clear change in judgements between increments), and the
 273 distances from the grand mean in standard deviation units are shown below (see Table 1.).

	Body Size							
	5	6	7	8	9	10	11	12
How Outgoing?	1.24	1.04	0.82	0.32	-0.26	-0.72	-1.22	-1.24
How Attractive?	1.22	1.18	0.71	0.23	-0.20	-0.72	-0.99	-1.42
How Healthy?	1.28	1.04	0.81	0.21	-0.23	-0.64	-1.03	-1.44
How Heavy?	-1.65	-0.95	-0.38	-0.20	0.35	0.56	0.87	1.41



274

275 *Table 1.* Distances from grand mean of bodies 5-12 in standard deviation units. Bodies
 276 selected for experiments 2 and 3 are highlighted.

277 Bodies 5, 6, 7 and 8 were selected to be used in the two subsequent priming
 278 experiments. These bodies were selected because they showed relatively large increases in
 279 judgments of size, as well as relatively large decreases in the other judgements. As we expect
 280 the impact of trait-inference priming on judgments of size to be relatively small, we chose
 281 bodies that we thought would maximise our sensitivity to detect a change in judgments of
 282 size after manipulating trait judgments.

283

3. Experiment 2

3.1 Introduction

285 To investigate how person inferences influence subsequent body-perception, we presented
 286 participants with two separate pieces of information about target persons before asking them
 287 to make judgements about them. First, we gave participants a statement, which either primed
 288 extraversion or was trait-neutral, and then secondly, we showed participants a body image
 289 that varied in size and identity across trials. Bodies were subsequently judged on one of three
 290 possible dimensions: extraversion (“How outgoing?”), health (“How healthy?”), and body
 291 size (“How heavy?”).

292 Extraversion ratings were included as a ‘positive control’, as these judgements would
293 be expected to increase on prime trials relative to neutral ones. The inclusion of a positive
294 control ensured that participant’s judgements of a target’s extraversion were affected by our
295 priming stimuli, and that our design was sensitive to effects of priming in general. It also
296 served as a reference point for interpreting effect sizes given that the change in extraversion
297 ratings between conditions would likely be the largest and clearest. Health ratings were
298 included to test whether primed extraversion content would generalise to other person-
299 inferences. The final condition, size ratings, assessed whether the imputed trait information
300 would yield effects on person perception. It was predicted that priming with statements
301 diagnostic of extraversion would increase subsequent judgements of health and decrease
302 those of body-size.

303 **3.2 Method**

304 *3.2.1 Participants*

305 Sixty-five Bangor University students were recruited through Bangor University’s
306 student participation panel in exchange for course credit (11 males, $M_{age}=19.98$, $SD_{age}=3.27$).
307 Our sample size was determined by an a priori power analysis using *G*Power* (Faul et al.,
308 2007), which indicated that a sample of 52 would give 80% power to detect a Cohen’s *d* of
309 0.35 with a one-tailed paired-samples t-test for each of our two dependent variables of
310 interest (health and body-size). This would conventionally be considered a small-to-medium
311 effect (Cohen, 1988). Our stopping rule was therefore to have 52 useable observations by the
312 cessation of data collection. As separate t-tests were used for each dependent variable, final
313 sample sizes differed for each analysis. Following data pre-processing and outlier removal,
314 final sample sizes for each dependent variable were 57 for Extraversion, 57 for Health and 60
315 for Body Size. Our predetermined experimental design, sample size and analysis approach
316 were pre-registered online (<https://aspredicted.org/blind.php?x=65ye4c>).

317 3.2.2 *Materials*

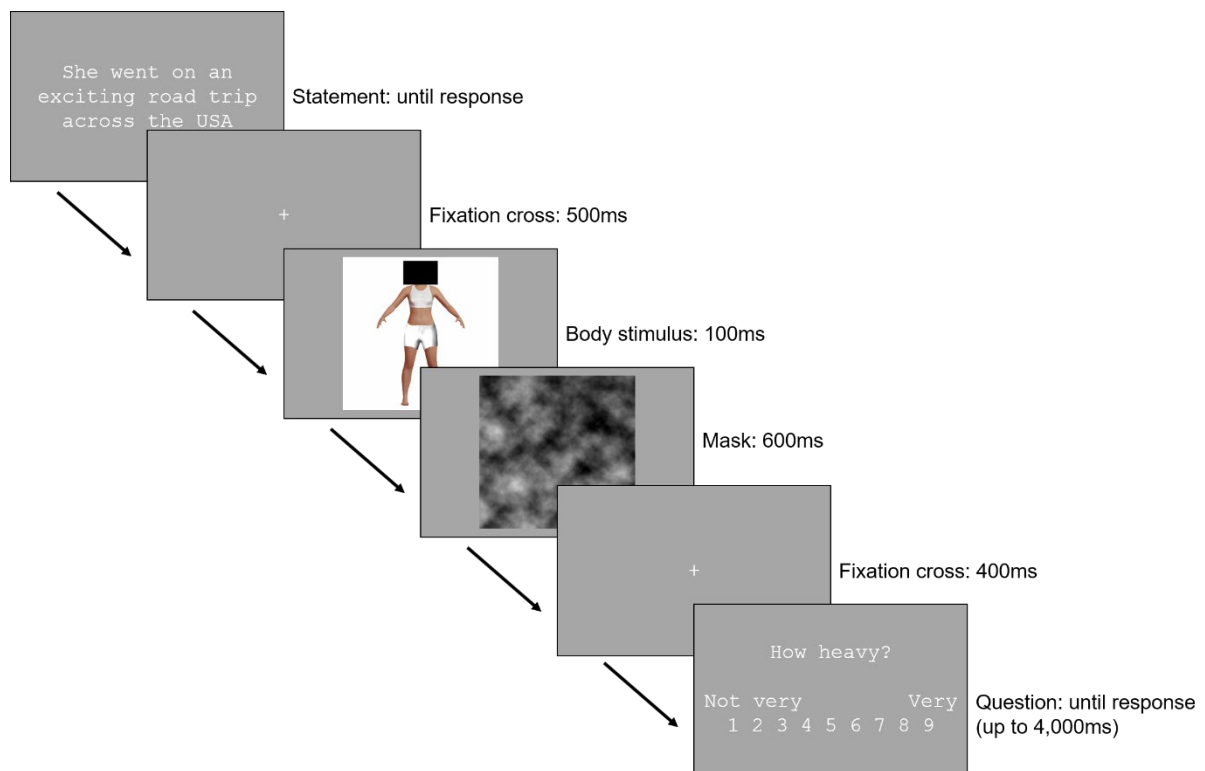
318 The four body sizes selected from Experiment 1 (sizes 5, 6, 7 and 8) were used for the
319 priming task. Three body identities were created at these sizes, with minor adjustments made
320 to skin tone and subtle characteristics such as naval position and proportions. All of the
321 stimuli in the experiment were female to reduce the number of permutations required
322 throughout the experiment and thus avoid participant fatigue.

323 A series of 20 extraversion-diagnostic (prime) statements were produced to reflect
324 five of the adjectives comprising the taxonomy of extraversion as defined by the Big Five
325 Inventory (BFI) (John & Srivastava, 1999). The trait adjective “energetic” was omitted due to
326 its close affiliation with our health dependent measure. Several trait-neutral statements were
327 taken from Mitchell et al. (2006) and supplemented with newly generated ones making a total
328 of 40 statements (20 prime and 20 neutral). These statements were validated by a sample of
329 15 participants recruited online, who were asked to rate the extent to which each statement
330 reflected behaviour typical of openness, conscientiousness, extraversion, agreeableness,
331 neuroticism, and health. Participants responded on a 5-point Likert scale ranging from “Not
332 at all”, to “Extremely”. 15 statements with the highest mean extraversion ratings were
333 selected as the priming stimuli, and the 15 lowest were selected as the neutral counterparts
334 (see Supplementary Data 1). The difference between statements was confirmed using a t-test
335 comparing the mean extraversion ratings attributed to each set of 15 statements, which
336 revealed a large difference between statements in the two conditions, $t(14)=10.72$, $p<.001$,
337 $d=2.77$ [1.63, 3.89], mean difference = 2.38 [1.90, 2.85] (square brackets denote 95%
338 confidence intervals for all statistics in the article). Numerically, the priming statements
339 received an average extraversion rating of 4.28, while the neutral ones received an average
340 rating of 1.90.

341 Although the survey did not explicitly measure introversion, it is possible that low
342 extraversion ratings could reflect a judgement of high introversion. Although this would not
343 greatly affect our predictions, as we expect low levels of extraversion to be associated with a
344 heavier body shape and lower health, there are implications for the interpretation of effect
345 size estimates, which we address later (see General Discussion). Importantly, it should be
346 noted that statements we designate as ‘trait-neutral’ are likely to contain some trait-diagnostic
347 information, and our experimental conditions could equally be thought of as ‘high-
348 extraversion’ and ‘low-extraversion’.

349 *3.2.3 Task*

350 The experimental task was produced in MATLAB (2015b) using PsychToolbox
351 (version 3; www.psychtoolbox.org). The task involved four body sizes, 30 statements (15
352 extraversion-diagnostic [prime], 15 trait-neutral [neutral]) and three questions (“How
353 outgoing?” [positive control], “How healthy?”, “How heavy?”), all of which were presented
354 in every possible permutation in a single randomised experimental block, giving a total of
355 360 experimental trials (body identity was selected randomly on each trial). Each trial would
356 commence with a statement appearing on-screen until the participant pressed the space key
357 (e.g. “She went on an exciting road trip across the USA”). A fixation cross was then
358 presented for 500ms, followed by the target body stimulus for 100ms. The body stimulus was
359 then backward-masked for 400ms to reduce the visual after-effect of the image. Finally, one
360 of the three questions appeared and remained on-screen until the participant’s response or up
361 to a maximum of 4,000ms (see Figure 4.).



362

363 *Figure 4.* Example of experimental trial in priming task

364 Every 24 trials, a catch-trial would be initiated. Catch trials began with the usual
 365 statement and fixation cross, however instead of a body stimulus, participants were instead
 366 presented with a second ‘true or false’ statement and were asked to press either 1 (false) or 9
 367 (true) with regards to whether the second statement concorded with the first. For example, the
 368 extraversion-diagnostic statement: “She spoke to her friend on Skype for an hour”, could be
 369 followed by “She spoke to her father on Skype”, alongside “False” and “True” in place of the
 370 “Not very” and “Very” cues.

371 In addition to the main task, participants filled out a questionnaire measuring basic
 372 demographic information and the short Need for Cognition Scale (sNCS; Cacioppo et al.,
 373 1984). This sNCS scale was included as part of an exploratory set of analyses due to its
 374 historic relevance to phenomena of social cognition (Petty et al., 2008; Wolf et al., 2017).

375 *Data analysis*

376 All data analyses and plots were produced in *R* (R Core Team, 2020). First, trials
377 without a response were removed, and four participants who scored below chance on the
378 catch-trials (< 8 out of 15) were removed. Secondly, trials with a reaction time of ≤ 100 ms
379 were filtered out of the dataset; this step removed less than one percent of the data remaining
380 after initial exclusions. One participant had fewer than 360 experimental trials before any
381 filtering, indicating that the computer had crashed and exited the experiment early. Following
382 filtering, however, this participant had a roughly equal number of trials for each condition as
383 the other participants, and therefore they were kept in the sample. The minimum percentage
384 of trials completed by any participant was 80%; 36 participants completed over 99% of trials.
385 Data were then split into the three respective outcome measures (extraversion [positive
386 control], health and body size) to be processed and analysed separately.

387 Mean Likert scale responses were computed per-participant for both priming
388 conditions (prime and neutral), first averaging across body size and identity. For the purposes
389 of analysis, participants identified as ± 2.5 SD from the group mean in either priming
390 condition were excluded in accordance with our preregistered analysis pipeline. Those with
391 difference scores ± 2.5 SD from the group mean difference (prime - neutral) were kept in our
392 main analyses, however all analyses were repeated with them excluded to provide alternative
393 effect size estimates (see Supplementary Tables 1-6.). Shapiro-Wilk statistics were also
394 calculated to highlight cases in which these extreme scores introduced skewness to cells of
395 our analyses, and therefore indicate where the alternative analysis may offer a more accurate
396 effect size estimate.

397 We report one-tailed t-tests as our main confirmatory hypothesis tests based on our
398 directional predictions. We do not use inferential statistics to assess any other hypotheses,
399 such as effects in the opposite direction to that predicted, however we include descriptive
400 statistics and exploratory analyses, which would highlight any additional or unexpected

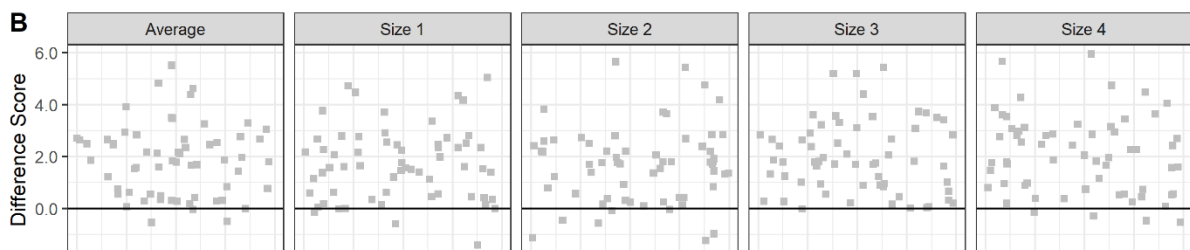
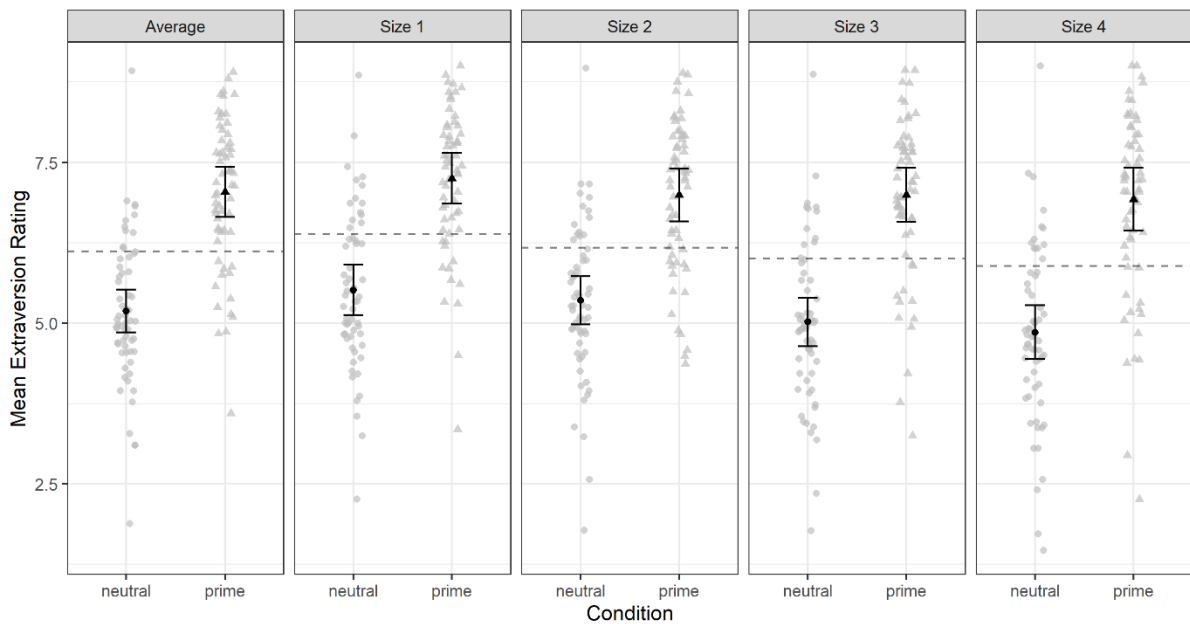
401 patterns in the data (McBee & Field, 2017). Such exploratory analyses and freely available
402 raw data can add value by serving to motivate hypothesis-testing strategies in future research
403 (Scheel et al., 2021; Tong, 2019).

404 3.3 Results

405 3.3.1 Extraversion Ratings (positive control)

406 Mean extraversion ratings for the prime and neutral conditions were compared with a
407 one-tailed paired samples t-test to establish the effectiveness of our priming manipulation in
408 increasing participant's judgements of target's levels of extraversion. Mean extraversion
409 ratings, both average and broken down by the four body sizes, are shown below alongside
410 difference scores (prime - neutral) showing the distribution around zero (see Figure 5.).

A Extraversion Ratings by Prime & Body Size



411

412 *Figure 5.* (A) Participants' mean ratings for each condition and aggregated mean scores.

413 Error bars show 95% CIs. Dashed lines indicate the average of prime and neutral. (B)

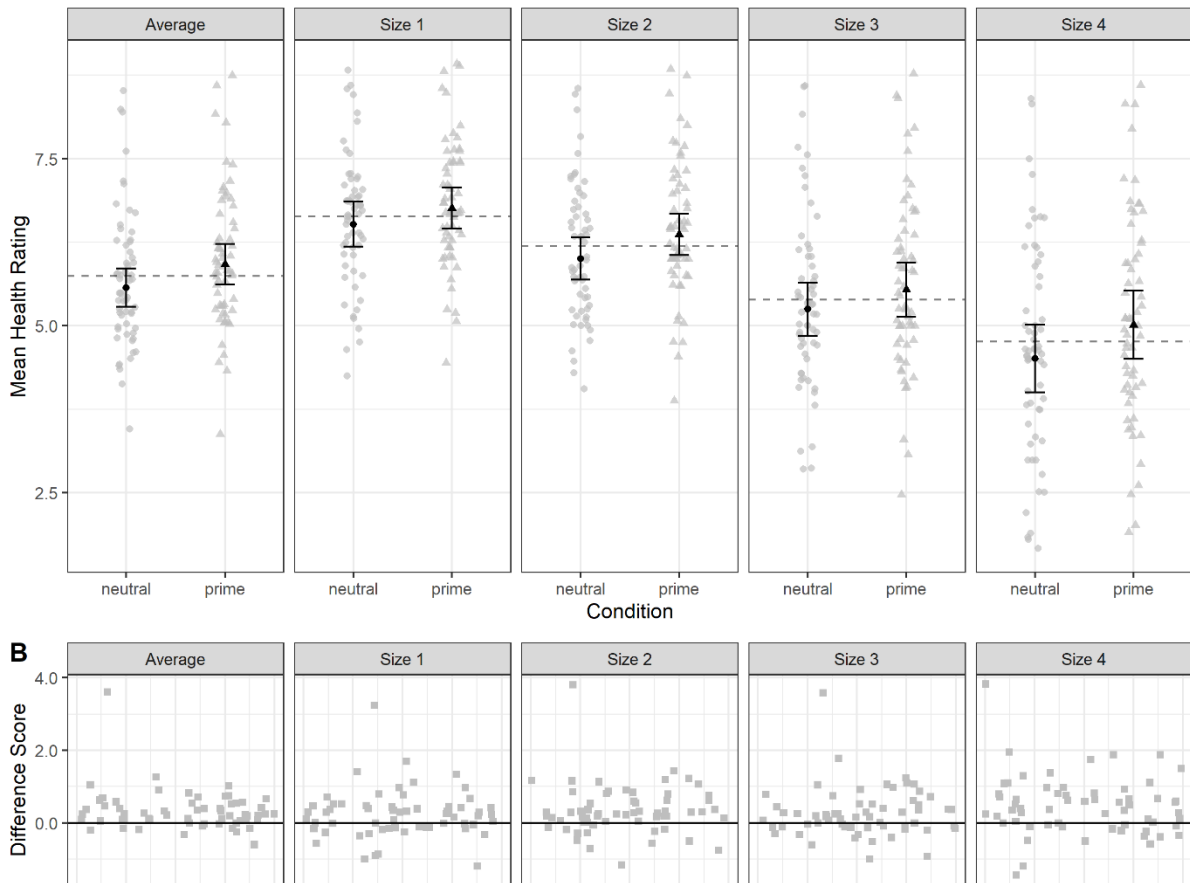
414 Participants' difference scores, showing distribution around zero (null).

415 As expected, a paired samples t-test indicated a clear effect of extraversion primes on
416 subsequent extraversion judgements, $t(56)=10.76$, $p<.001$, $d=1.41$ [1.10, ∞]. Mean difference
417 = 1.85 [1.57, ∞]. The average difference score across participants and body sizes approached
418 two points on the scale and was consistent in terms of direction with nearly all participants
419 between zero and 4 points of difference.

420 *3.3.2 Health Ratings*

421 Mean health ratings for the prime and neutral conditions were compared with a one-
422 tailed paired samples t-test. Mean health ratings, both average and broken down by the four
423 body sizes, are shown below alongside difference scores (prime - neutral) showing the
424 distribution around zero (see Figure 6.).

A Health Ratings by Prime & Body Size



425

426 *Figure 6. (A) Participants' mean ratings for each condition and aggregated mean scores.*

427 *Error bars show 95% CIs. Dashed lines indicate the average of prime and neutral. (B)*

428 *Participants' difference scores, showing distribution around zero (null).*

429 *In line with our prediction, a paired samples t-test indicated that extraversion primes*

430 *influenced subsequent judgements of health in the expected direction, $t(56)=4.61, p<.001,$*

431 *$d=0.61 [0.37, \infty]$. Mean difference = $0.35 [0.22, \infty]$. The average difference across*

432 *participants and body sizes was approximately a third of a point on the scale and it was*

433 *relatively consistent in terms of direction with most participants above zero but below 1 point*

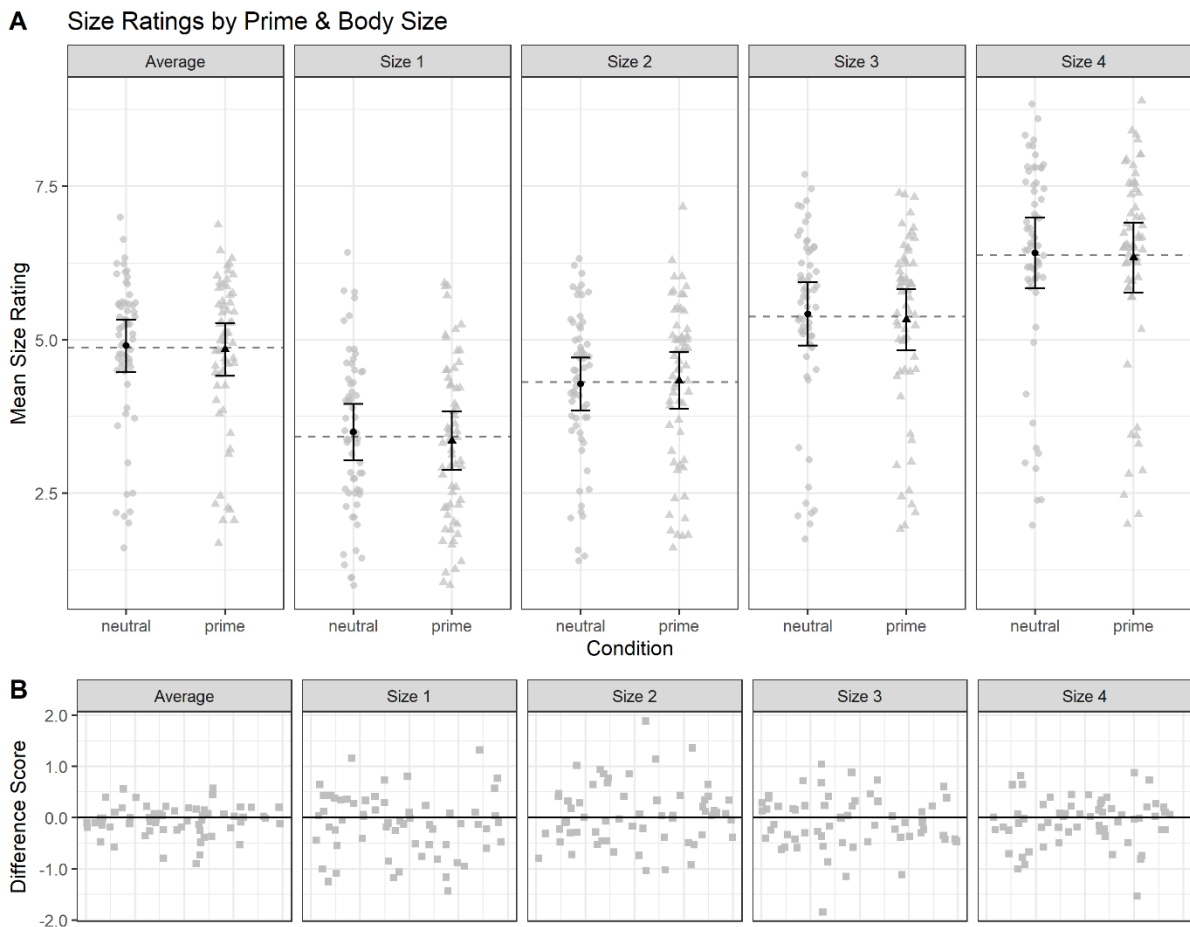
434 *of difference.*

435 3.3.3 Body Size Ratings

436 *Mean body size ratings for the prime and neutral conditions were compared with a*

437 *one-tailed paired samples t-test. Mean size ratings, both average and broken down by the four*

438 body sizes, are shown below alongside difference scores (prime - neutral) showing the
439 distribution around zero (see Figure 7.).



440

441 *Figure 7. (A) Participants' mean ratings for each condition and aggregated mean scores.*

442 *Error bars show 95% CIs. Dashed lines indicate the average of prime and neutral. (B)*

443 *Participants' difference scores, showing distribution around zero (null).*

444 A paired samples t-test failed to give clear statistical support to our hypothesis that

445 extraversion primes would decrease subsequent judgements of body size, $t(59)=-1.66$,

446 $p=.052$, $d=0.21$ $[-\infty, 0.002]$. Mean difference = -0.06 $[\infty, 0.0006]$. However, the results of the

447 test were in the expected direction, but the effect size was smaller than our design was

448 powered to detect within the pre-determined confidence level. The average difference score

449 across participants and body sizes was small (less than 0.1 point on the scale, Cohen's $d =$

450 0.21) and the direction of effect was variable around zero, with some participants showing a
451 small positive effect (which was opposite to the direction that we predicted).

452 *3.3.4 Exploratory Analyses*

453 No associations were found between Need for Cognition and mean difference of
454 ratings (prime – neutral) for any of our dependent measures (see Supplementary Table 7 and
455 Supplementary Figures 2-5). Two sets of Cronbach’s Alphas were calculated per dependent
456 measure to test both inter-item consistency and inter-rater agreement. These show moderate
457 inter-item consistency and high inter-rater agreement (see Supplementary Table 9). All data
458 are made available for the pursuit of alternate exploratory hypotheses (<https://osf.io/z9ds8/>).

459 **3.4 Discussion**

460 The results from Experiment 2 provided clear evidence for the predicted effect of
461 extraversion-diagnostic information on judgements of extraversion and health. Therefore, we
462 are confident that the extraversion prime was working as expected and that priming
463 extraversion generalises to person inferences associated with health. However, there was not
464 the same level of support for judgments of body-size, although the effect was in the expected
465 direction. Given the small effect on body size judgments ($d=0.21$) and recent widespread
466 suggestions to increase rigour and credibility in psychological science (Munafò et al., 2017;
467 Ramsey, 2020; Simmons et al., 2011, 2018; Vazire, 2018), we decided to replicate the
468 procedure with a more sensitive dependent measure and a larger sample size.

469 **4. Experiment 3**

470 **4.1 Introduction**

471 Experiment 3 served to replicate experiment 2 and confirm the presence and magnitude of the
472 observed effects. Given the small effect on our body-size dependent measure, we decided to
473 approximately double our sample size for Experiment 3. In addition to this, given that the
474 mean difference for both of our dependent measures was within a single point of the likert

475 scale used, we increased the sensitivity of our dependent variable measure by using a 0-100
476 visual analogue scale (VAS). Finally, the sNCS was removed, and instead a questionnaire
477 measuring big five personality dimensions was included (Big Five Aspect Scales [BFAS];
478 DeYoung et al., 2007). The inclusion of the BFAS was used as an exploratory measure to test
479 whether difference scores for our dependent variables were associated with trait dimensions
480 in conventional personality space.

481 All hypotheses, procedures, materials and data analysis protocols were otherwise
482 identical to Experiment 2, and the experimental details were pre-registered in the same
483 manner also (<https://aspredicted.org/blind.php?x=ck3zf9>). Our preregistered stopping rule for
484 this experiment was defined as the point at which we had 110 useable participant datasets. A
485 sensitivity analysis in G*Power indicated that N=110 would give us 80% power to detect an
486 effect of $d = 0.23$, slightly higher than our computed effect size in Experiment 2, but feasible
487 considering the resources available.

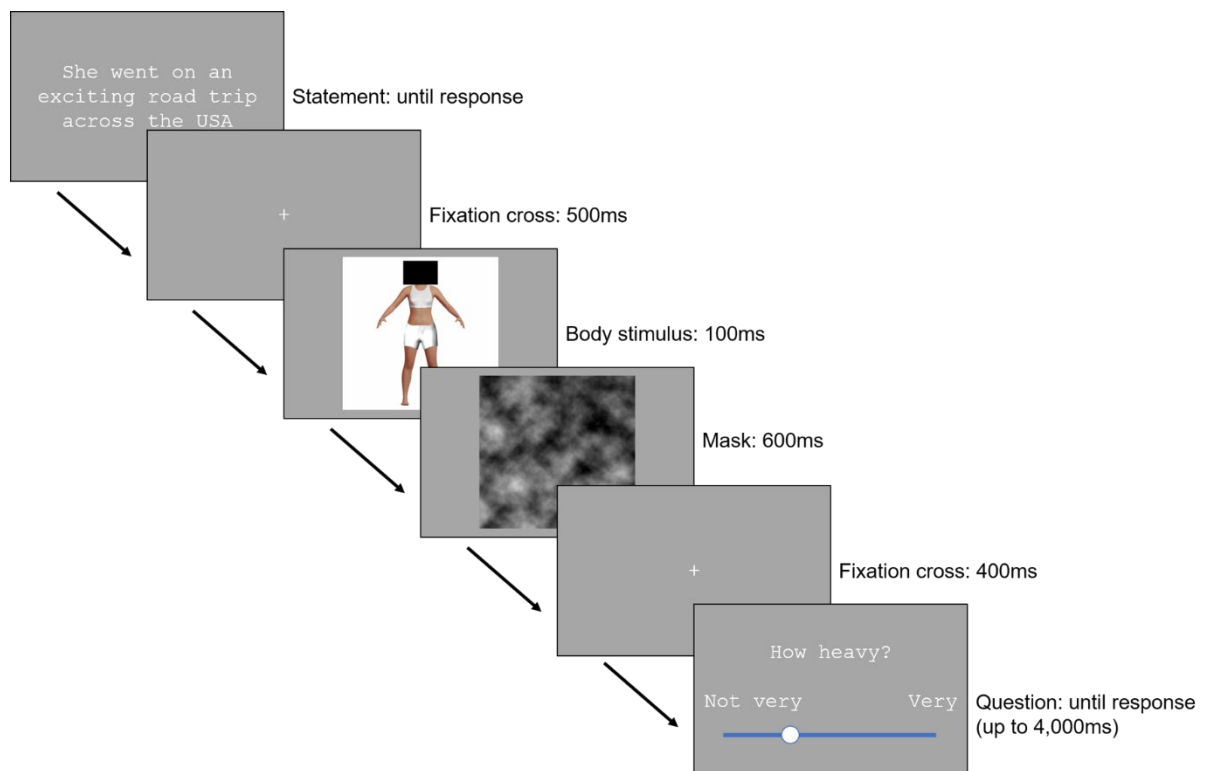
488 **4.2 Method**

489 *4.2.1 Participants*

490 One-hundred-and-twenty-three Bangor University students were recruited through
491 Bangor University's student participation panel in exchange for course credit (22 males, 1 not
492 specified, $M_{age}=20.9$, $SD_{age}=4.16$). Following data pre-processing and outlier removal, final
493 sample sizes for each dependent variable were 109 for Extraversion, 108 for Health and 106
494 for Body Size.

495 *4.2.2 Visual Analogue Scale*

496 Our replication used a VAS in place of the likert scale used in Experiment 2. During
497 the response phase of a trial participants chose a position on this scale by moving the mouse
498 left and right, before clicking to record the response. This was then stored as a number from
499 0-100, but participants could not see the number itself (see Figure 8.).



500

501 *Figure 8.* Example of experimental trial with VAS

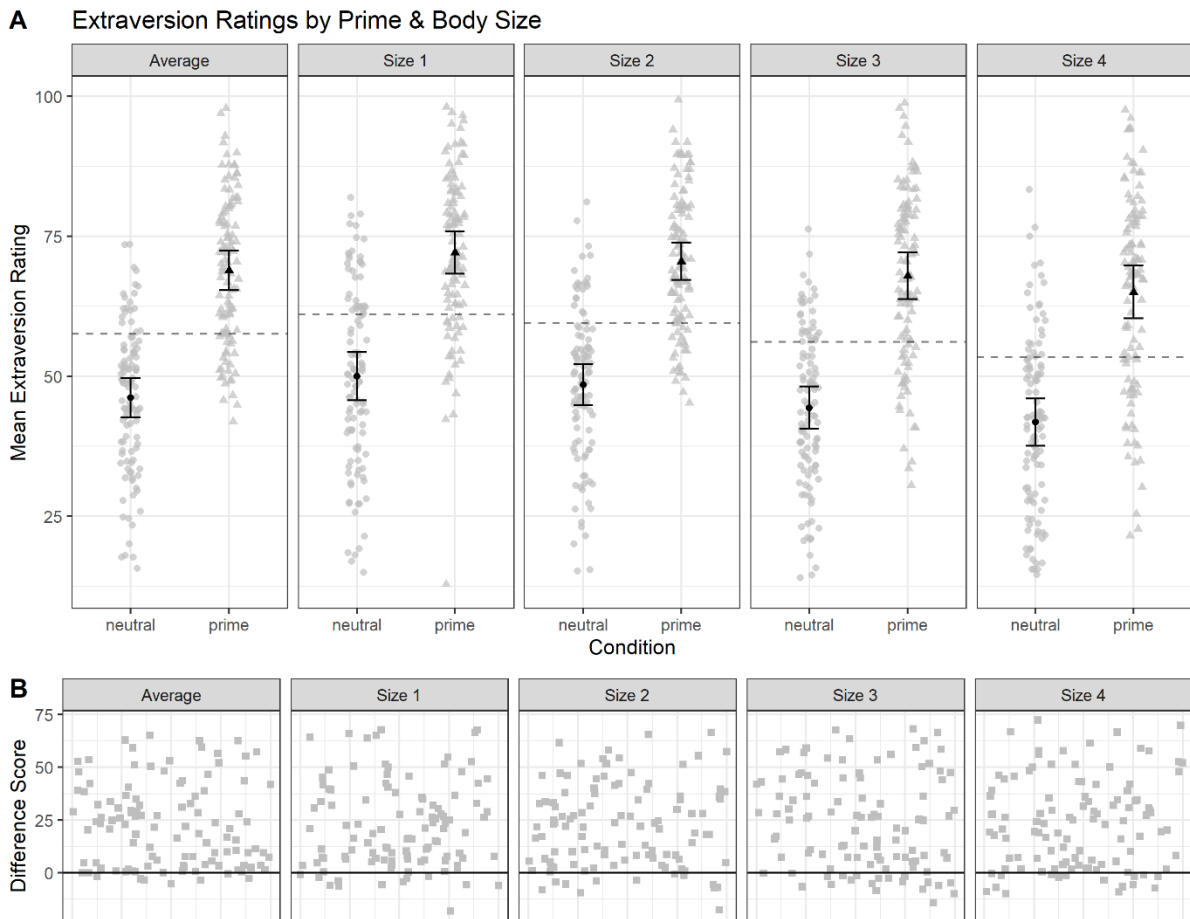
502 4.2.3 Data analysis

503 Data pre-processing protocols were identical to those used in Experiment 2. Less than
504 half a percent of data was discarded based on the reaction time threshold of 100ms. The
505 minimum percentage of trials completed by any participant was 77%; 61 participants
506 completed over 99% of trials.

507 4.3 Results

508 4.3.1 Extraversion Ratings (positive control)

509 Mean extraversion ratings, both average and broken down by the four body sizes, are shown
510 below alongside difference scores (prime - neutral) showing the distribution around zero (see
511 Figure 9.).



512

513 *Figure 9. (A) Participants' mean ratings for each condition and aggregated mean scores.*

514 *Error bars show 95% CIs. Dashed lines indicate the average of prime and neutral. (B)*

515 *Participants' difference scores, showing distribution around zero (null).*

516 *A paired samples t-test indicated a clear effect of extraversion primes on subsequent*

517 *extraversion judgements in the expected direction, $t(108)=12.01, p<.001, d=1.15 [0.95, \infty]$.*

518 *Mean difference = 22.73 [19.59, ∞]. The mean difference on the VAS was over 20 with*

519 *nearly every participant above zero and many participants ranging up to 60 points in*

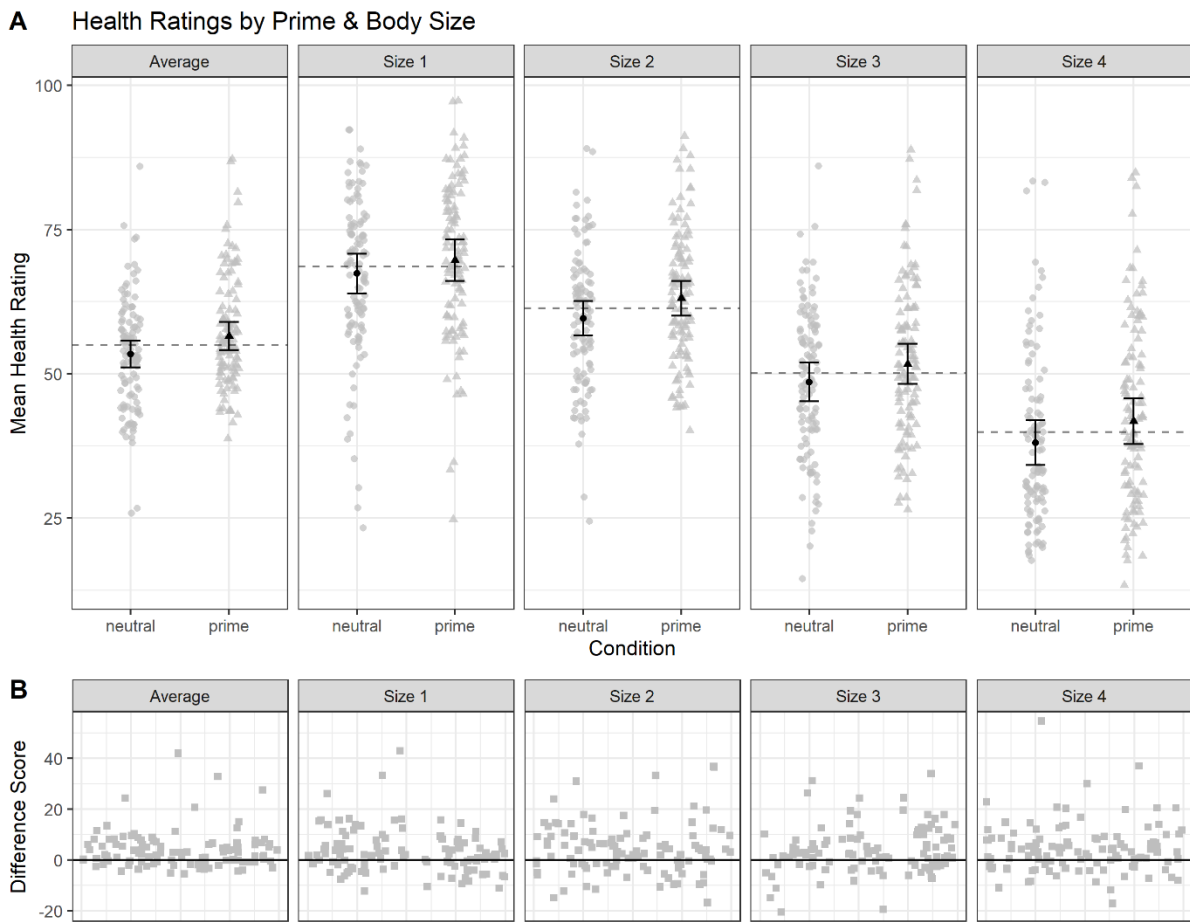
520 *difference.*

521 *4.3.2 Health Ratings*

522 *Mean health ratings for the prime and neutral conditions were compared with a one-tailed*

523 *paired samples t-test. Mean health ratings, both average and broken down by the four body*

524 sizes, are shown below alongside difference scores (prime - neutral) showing the distribution
525 around zero (see Figure 10.).



526

527 *Figure 10. (A) Participants' mean ratings for each condition and aggregated mean scores.*

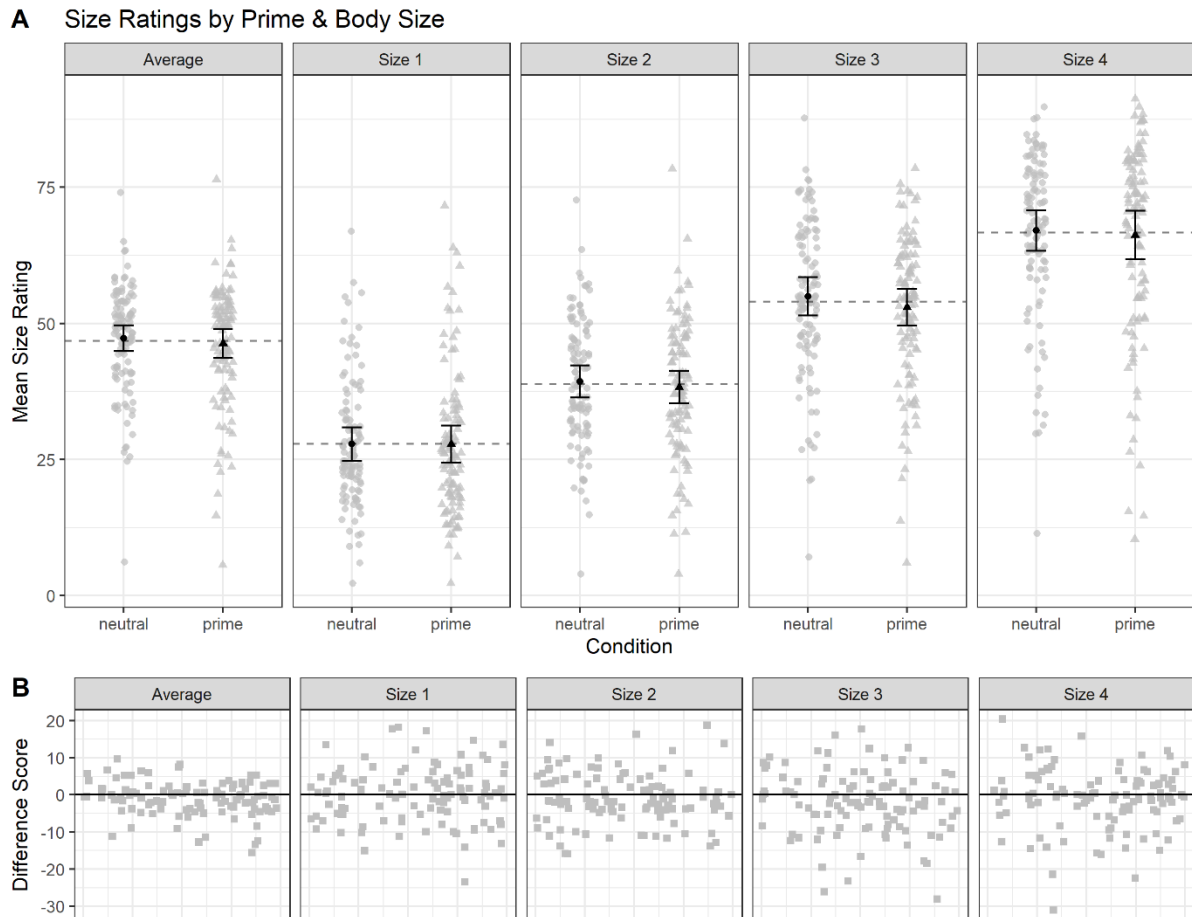
528 *Error bars show 95% CIs. Dashed lines indicate the average of prime and neutral. (B)*

529 *Participants' difference scores, showing distribution around zero (null).*

530 In line with our prediction, a paired samples t-test indicated extraversion primes
531 influenced subsequent judgements of health in the expected direction, $t(107)=5.65, p<.001,$
532 $d=0.54 [0.37, \infty]$. Mean difference = 3.980 [2.81, ∞]. The mean difference was approximately
533 four points on the VAS with most participants between zero and 10 points. A number of
534 participants did show a small negative difference, however.

535 *4.3.3 Body Size Ratings*

536 Mean body size ratings for the prime and neutral conditions were compared with a one-tailed
 537 paired samples t-test. Mean size ratings, both average and broken down by the four body
 538 sizes, are shown below alongside difference scores (prime - neutral) showing the distribution
 539 around zero (see Figure 11.).



540

541 *Figure 11.* (A) Participants' mean ratings for each condition and aggregated mean scores.

542 Error bars show 95% CIs. Dashed lines indicate the average of prime and neutral. (B)

543 Participants' difference scores, showing distribution around zero (null).

544 A paired samples t-test revealed a difference in the same direction as Experiment 2

545 and the effect size was of a very similar magnitude, $t(105)=-2.20$, $p=.015$, $d=-0.214$ [-∞, -

546 0.05]. Mean difference = -0.969 [-∞, -0.24]. Like Experiment 2, the average effect across the

547 group is small and in the expected direction (1 point on the VAS, Cohen's $d = -0.21$). Many

548 individual participants show an effect on or above zero, which demonstrates considerable
549 variability across participants.

550 *4.3.4 Exploratory Analyses*

551 Pearson's correlations between the difference scores for each dependent variable and each
552 sub-facet of the are reported in Supplementary Table 8 and visualised in Supplementary
553 Figures 6-9. No clearly meaningful patterns of data emerged from these exploratory
554 correlations. Two sets of Cronbach's Alphas were calculated per dependent measure to test
555 both inter-item consistency and inter-rater agreement. These show mixed inter-item
556 consistency and high inter-rater agreement (see Supplementary Table 9). The variability in
557 inter-item consistency appears to be driven by differences in the scale values used to reflect
558 participants' lowest and highest responses, which sometimes drive negative correlations
559 between scores for the smallest and largest body sizes. Additionally, a series of 2x4 factorial
560 ANOVAs were carried out to evaluate potential interactions between our priming effects and
561 target body sizes for Experiments 2 and 3. These analyses did not support the presence of an
562 interaction between prime condition and body size (see Supplementary Analyses) All data are
563 made available for the pursuit of alternate exploratory hypotheses (<https://osf.io/z9ds8/>).

564 *4.3.5 Meta-analysis across experiments*

565 A meta-analysis of the effect sizes measured in Experiments 2 and 3 was performed to
566 calculate a pooled effect size. This was conducted in ESCI using unbiased estimates of
567 population effect sizes (Cumming, 2013) (see Figure 12.). Exact values for all statistics
568 presented in the article can be found in Supplementary Tables 2-6.



569

570 *Figure 12.* Summary of effect sizes and pooled effect size estimates

571 **4.4 Discussion**

572 The findings from Experiment 3, as well as the meta-analysis, confirm our prior findings.

573 First, the extraversion and health judgments showed a clear and consistent increase between
 574 neutral and prime trials, with the impact on extraversion judgments being approximately
 575 twice as large as the impact on health judgments. As such, the effect on extraversion
 576 judgments served as a useful ‘positive control’ and manipulation check by showing that the
 577 extraversion prime was operating on person judgments in a manner that we intended. By
 578 contrast, the effect of extraversion-diagnostic primes on health judgments demonstrates the
 579 generalisability of this trait inference to person inferences that extend beyond the initial
 580 personality construct.

581 A second finding that Experiment 3 replicates, but with greater precision in the
 582 estimated effect size, is that there is a small negative effect of trait knowledge on body size
 583 judgments. The impact on body size judgments operates in a predictable direction on average
 584 across participants. The effect also varies between individuals with some not showing the
 585 effect (i.e., some participants show an effect close to zero or a small positive effect).

586 Therefore, the effect of trait knowledge on social perception may manifest as an individual

587 difference, whereby only a subset of the population shows the effect. Alternatively, the lack
588 of consistent effect across participants may reflect limits to the sensitivity of the perceptual
589 measure, which future research would have to establish by developing different measures that
590 exhibit greater sensitivity.

591 **5. General Discussion**

592 We show that making a trait inference about a person generalises sufficiently to influence
593 other similar person inferences (health), as well as distinctly different judgments that rely
594 more heavily on visual person representations (body size). These results deepen our
595 understanding of the relationship between ‘trait space’ and ‘body space’ when forming
596 impressions of other people by providing a behavioural characterisation of the function of the
597 interplay between distinct pieces of person knowledge. In contrast to much prior work, which
598 focussed on person inferences prompted by face or body images, here we show that a brief
599 trait-inference can bias judgements that are based more on perceptual representations of body
600 shape. Therefore, a relatively transient person inference can provide a small change in the
601 way one “sees” other people. We suggest that the primary value of this work is that it
602 underscores why it is important to link neuroscience research with behavioural research
603 (Krakauer et al., 2017). Indeed, by providing a relevant functional description of the links
604 between trait knowledge and perceptual processes, we aid the interpretation of prior
605 neuroimaging studies, which used functional connectivity measures and showed links
606 between body-part processing and theory of mind networks (Ramsey, 2018).

607 *5.1 Implications*

608 Our findings deepen understanding of the mapping between ‘trait space’ and ‘face/body
609 space’ when forming impressions of other people (Over & Cook, 2018). We show that
610 reconfiguring trait space via a person inference, subsequently alters links between other
611 person inferences, as well as judgments that rely on a distinct system that is sensitive to body

612 size judgments. As such, we show that trait-based knowledge does not just influence
613 mappings towards similar types of person judgments, such as health judgments. Rather, re-
614 configuring trait-space alters mappings towards non-trait judgments, which are based on body
615 size and shape. The strength of re-mapping is not the same in all cases, however. Modifying
616 trait space has a much stronger influence on similar rather than dissimilar judgment types.
617 This suggests that the mapping of within trait space is stricter than between trait space and
618 body space, as one may intuitively expect. Taken together with prior work, which showed
619 that facial or body features can prompt trait inferences (Greven et al., 2019; Todorov et al.,
620 2015), we suggest that judgments of body size and person inferences are reciprocally linked
621 and mutually reinforce each other.

622 The results complement prior neuroimaging findings that showed functional
623 interactions between the body-selective brain regions in the ventral visual stream and the
624 theory of mind network when forming impressions of others (Ramsey, 2018). During
625 impression formation, distinct information processing units do not operate in isolation;
626 instead, they exchange signals to integrate information and bias the overall judgment space.
627 We feel that the general approach taken here, as well as in previous papers (Greven et al.,
628 2016; Over & Cook, 2018; Ramsey, 2018), underscores the value of considering the
629 integration of different signals when forming an overall impression, rather than the modal
630 approach in social cognition that studies perceptual and inferential processes separately.
631 Furthermore, we believe that the use of behavioural research aids in characterising the
632 functional qualities of integration between these neural networks, where prior neuroscience
633 alone has focussed more on establishing the presence of such links. Our findings, therefore,
634 add to recent proposals that highlight how considering behavioural and neural data sets
635 together can help adjudicate between competing mechanistic models and place useful
636 constraints on mechanism discovery in the human brain (Kaplan & Hewitson, 2020;

637 Krakauer et al., 2017; Niv, 2020). We hope that links between sub-disciplines of social
638 cognition and neuroscience will continue to emerge, because a piecemeal approach to
639 understanding any aspect of cognitive and brain function is limited (Churchland, 2013).
640 Whether one typically focusses on inferences common in theory of mind research (e.g. Frith
641 & Frith, 1999; Saxe & Kanwisher, 2003; van Overwalle, 2009), or the sensitivity within the
642 visual system to features of another person (e.g. Kanwisher, 2010), we feel that both
643 endeavours work better when they are considered together, and not only separately. This
644 suggestion appears especially relevant when one considers a typical social exchange, which
645 requires one to fuse together physical features of a person with knowledge about their trait-
646 based character.

647 *5.2 Strengths and limitations*

648 One possible limitation of the results concerns the general difficulties that are associated with
649 interpreting small effect sizes. The effects of trait inferences on body-size judgments were
650 small (approximately Cohen's $d = 0.2$) and many participants did not show an effect in the
651 predicted direction. One could argue, therefore, that it is difficult to interpret such findings
652 because they are more likely to reflect sampling error and chance variation. We point to
653 several factors within our approach that make sampling error an unlikely explanation of our
654 findings. First, all of our predicted effects, which comprised three separate dependent
655 variables per priming experiment, were in the expected direction and consistent across both
656 priming experiments, including the high-power replication experiment. Second, given that the
657 effects on dependent variables were not all in the same direction, it is unlikely that the body-
658 size effect can be accounted for by an artefact of the experimental paradigm or a simple
659 response rule (i.e. always responding higher on prime trials). Indeed, any explanation of our
660 findings needs to account for why the same prime systematically biases different judgments
661 in different ways. Moreover, it is one reason why we included a 'positive control' condition

662 to serve as a manipulation check – a condition where we have good reason to expect a
663 particular effect, which can guide the interpretation of other results. Finally, as expected,
664 within-modality priming effects were considerably larger than cross-modal priming effects,
665 which should also be expected from prior priming and adaptation studies (Burton et al., 1990;
666 Hills et al., 2010; Watson et al., 2014). As such, although small effects, we feel that they have
667 been precisely estimated and a cautious interpretation is therefore justified.

668 Other factors also provide relevant context when interpreting small effects. First, the
669 aims of the present research matter. We were concerned with performing basic science
670 research that tested a model system of the structure of social cognition and person perception.
671 We were not aiming to provide results that served an immediate practical benefit. As such,
672 we feel that small but relatively precise estimates of effect size license a judgment about the
673 target systems of interest. A second aspect of relevant context is the potential for effects to
674 aggregate over time (Funder & Ozer, 2019). That is, in a one-off trial or over the course of an
675 experiment, any given small effect may be inconsequential in practical terms. But, in real life,
676 if that effect – say making a trait-inference about a colleague at work – happens 20 times a
677 day, five days a week, then the effects may become cumulative and be stronger than the
678 current experiment can demonstrate. Of course, this is an empirical question, which would
679 need demonstrating using a different research design, but we nonetheless feel that it provides
680 an important consideration when interpreting effect sizes.

681 Earlier we noted the possibility of our trait-neutral statements leading to judgements
682 of high introversion rather than being truly trait-neutral. Indeed, it is likely that some trait-
683 diagnostic information can be extracted from an ostensibly neutral statement, particularly in
684 the context of a task that demands some form of social evaluation. This is an important
685 consideration for the interpretation of our effect sizes because, assuming a wholly linear
686 relationship between body size and the introverted-extraverted axis, one would expect the

687 true difference between extraverted and neutral judgements to be approximately half the size
688 of the true difference between extraverted and introverted judgments. We address this
689 possibility in the service of informing future work using similar paradigms, and in the
690 interests of accurately characterising our effect size estimates: Each dataset that involved a
691 judgement of extraversion (both priming experiments and the survey validating our trait
692 statements), reflects a task in which participants judged the extent to which the person in
693 question was extraverted, so it is difficult to interpret whether responses in the lower half of
694 the scale reflected a judgement of ‘neutral’ or ‘introverted’. However, in the ‘positive
695 control’ condition of each priming experiment, the average extraversion rating was close to or
696 above the centre of the response scale, making it unlikely that participants were judging the
697 target to be highly introverted. Furthermore, when judging extraversion, variability in
698 participants’ responses was far better explained by priming condition than the size of the
699 associated body, further supporting that this rating reflected their interpretation of the prime
700 more so than the body. Therefore, we argue that it is unlikely that we’ve greatly
701 overestimated the difference between extraverted and trait-neutral character in influencing
702 judgements, however acknowledge and highlight that all ‘neutral’ statements are likely to
703 possess some trait-diagnostic information which may influence judgements in these types of
704 experiments.

705 Finally, it is important to address the extent to which our design can support specific
706 claims about cross-modal influences on perceptual processes. We recognise that our findings
707 could reflect a general “halo effect”, where trait characteristics generally deemed positive
708 lead people to judge other aspects of a person in a way that is culturally and/or subjectively
709 favoured (i.e., thin-ideal). This is difficult to fully disentangle from perceptual processes, as
710 we would expect judgements of body size to be biased whether individuals are forming a
711 body size judgement in real-time, from memory, or even about an imagined body. This is

712 because generating a judgement of someone's size is likely to require body shape to be
713 internally represented in some way, and trait inferences would be expected to influence
714 judgements which are then based off this body shape representation. As such, it is possible
715 that the effect arises from the perceptual component during encoding, the memory component
716 during recall, or a combination of the two processes. We note that the designs used in the
717 current experiments are unable to clearly separate the role of perceptual versus memory
718 processes, and we suggest that a valuable future direction would be to probe this question.
719 What we can conclude from this series of experiments, however, is that when participants
720 formed a single judgement about a target identity, whether based on extraversion, health or
721 body size, this judgement reflected the influence of both the visual percept and imbued trait
722 character of that target identity. That is, when averaging across prime condition, all types of
723 judgements vary as a function of body size, and when averaging across body size, all types of
724 judgement vary as a function of prime condition (see Supplementary Analyses).

725 *5.3 Constraints on Generality*

726 In terms of our theoretical interpretation of findings, we acknowledge that the present
727 work says nothing about the accuracy of links between trait inferences and body shape
728 representations (that is, the extent to which they reflect true correlations between traits and
729 body shapes in the real world). We therefore remain largely agnostic to the possible
730 functional benefits of these inferences to guide social interactions or predict how someone is
731 likely to behave, as the ways in which character judgements are linked to physical appearance
732 are often found to reflect idiosyncratic and culturally-acquired stereotypes. Whether these
733 stereotypes serve an adaptive function despite being largely inaccurate (e.g., heuristics for
734 anticipating the maximal bounds of probable behaviour), or reflect a once functional system
735 now biased by a heavily skewed 'perceptual diet', is a separate empirical question which
736 remains untested by the current study.

737 Our findings were demonstrated using computer-generated female bodies in a sample
738 of students, where extraversion-diagnostic information was delivered through behavioural
739 statements. Given our use of computer-generated bodies we do not expect the experimental
740 task to have fully tapped body perception processes, nor do we expect the effects to translate
741 1:1 to an analogous real-world context given the constrained presentation of bodies without
742 wider context such as the face. Rather, we argue that the presence of such an effect in a
743 tightly controlled lab environment is indicative of the manner in which separate systems
744 integrate information. While we would expect this integration to have real-world
745 consequences, the precise nature and outcomes of this is likely to vary based on numerous
746 factors including the context of other morphological characteristics of the target body, and
747 individual differences in the structure of conceptual trait space (e.g. Stolier et al., 2018). It is
748 also important to highlight that the current set of experiments explicitly required participants
749 to form judgements about the stimuli, so it is unclear whether the integration demonstrated
750 here occurs spontaneously or only in the context of explicitly forming judgements. Lastly, the
751 specific dimensions selected for the current study, extraversion, health and body fat, may
752 represent a special case for such an effect to occur given strong evidence for their alignment
753 in judgements of bodies (Greven et al., 2019; Hu et al., 2018). Broader investigation would
754 be required to establish evidence of a general pattern of integration where various dimensions
755 of social evaluation influence various dimensions of size and shape.

756 Although the current work represents basic research that aimed to understand a model
757 system of cognitive function, in the longer term, understanding the complex underpinnings of
758 impression formation may have applied relevance. For instance, such work may provide
759 insight into the mechanisms that support body-size-based stigma. If simply reading
760 statements about other individuals under sanitised and socially impoverished laboratory
761 conditions can bias estimates of observed body size, it may be no surprise that social media,

762 advertising and healthy lifestyle messaging can be a powerful reinforcer of such stigma. A
763 further future consideration for applied research is the relationship between perceptual and
764 inferential processes when understanding distortions in judgments of one's own body. For
765 example, body size distortion is a key feature of Anorexia Nervosa (Zopf et al., 2016), and
766 young people who self-harm also have an altered body representation (Hielscher et al., 2019).
767 Therefore, it is not difficult to see how a deeper understanding of the complex and multi-
768 faceted bases of body image representations may ultimately have applied relevance.

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