

1 **The effect of the thin body ideal in a media-naïve population**

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3

4 **The thin ideal is the western concept of an ideally slim or underweight female body<sup>1</sup>,**  
5 **and its omnipresence in the mass media has a negative impact on women's health<sup>2-5</sup>.**  
6 **Media consumption is associated with a drive for thinness, body dissatisfaction, low**  
7 **self-esteem, and disordered eating in women of western and/or industrialised**  
8 **societies<sup>4</sup>. Furthermore, cross-cultural research suggests that the media have similar**  
9 **effects when they are introduced into non-western or non-industrialised societies<sup>2,6,7</sup>.**  
10 **No study, however, has attempted to induce a change in female body size ideals in a**  
11 **population that is not exposed to the thin ideal and that has currently no access to the**  
12 **media. Here we show experimentally that a short exposure to the thin ideal can**  
13 **change body size ideals in a media-naïve population. 80 rural Nicaraguan men and**  
14 **women with very low to non-existent media access created their ideal female body**  
15 **before and after seeing photographs of either thin or plus size fashion models.**  
16 **Analyses revealed a significant interaction between time and group, meaning that**  
17 **exposure to media images shifted the subjects' ideal female body size. We discuss**  
18 **problems posed by the pervasiveness of the thin body ideal in the context of the**  
19 **global obesity pandemic.**

20 Up to 30-50% of girls and women from western or industrialised countries have  
21 negative body image<sup>8,9</sup>, which contributes to widespread psychopathologies such as low  
22 self-esteem, depression, and disordered eating<sup>10,11</sup>. One key sociocultural contributor to  
23 body dissatisfaction is the thin body ideal and its omnipresence in the mass media<sup>1,3,5,12-14</sup>.  
24 For example, across 77 correlational and experimental studies, media exposure was  
25 associated with a stronger internalisation of the thin body ideal, higher body dissatisfaction,  
26 and higher eating disorder symptomatology<sup>4</sup>. Furthermore, cross-cultural research has  
27 shown that populations with limited access to the media have a higher female body size  
28 ideal<sup>7,15-17</sup>, and that the introduction of television in previously media-naïve populations is  
29 accompanied by an increase in body dissatisfaction and pathological eating attitudes<sup>2,6,7,14</sup>.

30 Although past research suggests that the media impact female body size ideals and  
31 so have a negative effect on women's health, it suffers from two important limitations. First,  
32 experimental research has never shown that the thin ideal and the media can induce a  
33 change in body size ideals in a non-WEIRD (western, educated, industrialised, rich, and  
34 democratic)<sup>18</sup>, media-naïve population. Instead researchers have used western,  
35 industrialised subjects in countries where the thin body ideal is already omnipresent in the  
36 media and where poor body image is already widespread<sup>19-21</sup>. Second, all cross-cultural  
37 research using non-western or non-industrialised subjects has been correlational, cross-  
38 sectional, or pseudo-longitudinal, and has therefore failed to establish causation between  
39 exposure to the thin ideal and a decrease in female body size ideals.

40 Here we describe the first study to experimentally induce a shift in female body size  
41 preferences using thin ideal stimuli in a non-western media-naïve population. To do so, 80

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42 male and female subjects were drawn from two Nicaraguan villages with no access to grid  
43 electricity and thus very low to non-existent access to visual media (see Table 1 for sample  
44 characteristics). They were tested on their ideal female body size (hereafter ‘ideal body  
45 task’), before and after seeing photographs of either thin or plus size fashion models  
46 (hereafter ‘manipulation’). In the ideal body task, subjects used computer-generated female  
47 bodies to create their ideal female body based on multiple different exemplars or ‘starter  
48 bodies’ (Figure 1). They could do so by increasing or decreasing the size of these starter  
49 bodies within a range equivalent to BMI 15-40. The subjects created 4 bodies at pre-test,  
50 and 4 bodies (using different starter bodies) at post-test, with the order of starter bodies (pre  
51 vs post-test) counterbalanced across subjects.

52 In the manipulation phase, subjects were exposed to a series of photographs of  
53 either thin or plus size fashion models (Figure 2). The photographs were taken from western  
54 retailer’s catalogues or popular women’s magazine, and depicted models wearing clothes  
55 ranging from UK size 4-6 (thin models) to 16-28 (plus size models). The models varied in  
56 age, ethnic background, and clothing, with these characteristics being represented equally in  
57 both experimental groups. To ensure visual engagement with manipulation stimuli, the  
58 photographs were presented in pairs and the subjects were instructed to choose their  
59 favourite model out of each pair.

60 Preliminary analyses showed that the two experimental groups were matched on all  
61 variables measured in this study, including age, BMI, dieting, earnings, education, ethnicity,  
62 television access and television consumption, time since last meal, sex, and travel ( $F_s <$   
63  $1.955$ ,  $p_s > .167$ ). To determine whether time and group interacted, a random intercept  
64 model was constructed with subject as the higher level and body/trial as the lower level unit.  
65 Initial variance partitioning (Model I; Table 2) indicated that 52.8% of variance operated at  
66 the level of the body identity/trial, while the remainder operated at the level of the subject.  
67 Time (pre-test vs. post-test) was entered as a body-level covariate in Model II, and group  
68 was added as a subject-level covariate in Model III. Neither of these variables improved the  
69 model, however introduction of the interaction term between group and time significantly  
70 improved the model ( $LR = 15.88$ ,  $p < .001$ ) and yielded a significant main effect of time, and  
71 a significant effect of the group and time interaction (Model IV). As shown in Figure 3,  
72 subjects in the thin size condition showed a shift towards preferring thinner bodies from pre-  
73 to post-test, while subjects in the plus size condition showed the opposite pattern. Body size  
74 ideals in the plus size condition were significantly larger at post-test than those in the thin  
75 size condition (Figure 3). The model was further improved by adding sex (Model V:  $LR =$   
76  $7.06$ ,  $df = 2$ ,  $p < .05$ ) and location (Model VI:  $LR$  against Model V =  $18.04$ ,  $df = 2$ ,  $p < .001$ ) of  
77 subjects as both main effects and interaction terms with group and time, and showed a  
78 significant effect of location, such that subjects in the first village preferred thinner bodies in  
79 general than those in the second village. Addition of further potential confounding variables  
80 (age, BMI, dieting, education, time since last meal, and travel), did not improve the model  
81 any further ( $p_s$  for likelihood ratios against Model V all  $> .1$ ), and yielded no other main  
82 effects. Furthermore, none of the three-way interaction terms were significant (see full  
83 results in Extended data). As such, the interaction between time and group remained  
84 unmoderated by any of the potential confounders measured.

85 This study is the first to demonstrate experimentally that a short exposure to media  
86 images can change female body size ideals in a non-WEIRD population with very low to

87 non-existent access to the media. Overall, just seeing a small selection of western media  
88 images of either thin or plus size female models induced change in subjects' perceptions of  
89 ideal female body size in the direction of the images seen. These data are concordant with  
90 similar results in western samples<sup>19-21</sup> and more importantly suggest that the capacity of  
91 visual experience to shape body ideals is not limited to subjects with a media-saturated  
92 environment. Furthermore, we have provided experimental evidence to support the  
93 assumption that the association between media access and both thinner body ideals<sup>2</sup> and  
94 elevated body dissatisfaction<sup>2,6</sup> in cross-cultural data, may be mediated in part by direct  
95 impacts of said media on internalised body ideals. The fact that none of our potential  
96 confounding variables moderated the experimental interaction, suggests that the impact of  
97 visual media on short term body ideals is not reliant on, for instance, recent prior media  
98 exposure or interest in weight loss.

99         It should be noted that, as per much visual media, we presented 'aspirational'<sup>19</sup>  
100 stimuli (i.e., healthy, attractive models in high status clothes) in the weight manipulations,  
101 and encouraged subjects to focus on their attractiveness. Thus we cannot determine  
102 whether our results were driven by the positive weight associations presented, or merely the  
103 visual experience itself. Furthermore, we used only one type of media images and future  
104 research should certainly consider the experimental impact of viewing other types such as  
105 magazines or real televisual stimuli on subjects, and should also consider both male stimuli  
106 and additional impacts on body satisfaction. Finally, although our subjects had very low to  
107 non-existent access to media in their villages, and despite the fact that the average  
108 participant tested had not left their village for 234 days, most have experienced some  
109 television when visiting towns or cities in the past. In other words, although body ideals in  
110 low media villages in this location are considerably larger than in the west<sup>7</sup>, it is possible that  
111 even modest prior experience may modulate the impacts seen here. Thus replication with a  
112 completely media-naïve population (not only in terms of TV access at home, but without any  
113 access to the visual media at all, even when travelling) would be ideal, albeit extremely  
114 difficult.

115         Nevertheless, we have shown that introducing western media images in a non-  
116 WEIRD population with very low prior media exposure can have an impact on their female  
117 body size ideals in a matter of a single 15-minute exposure. These results are important if  
118 we consider that grid electricity is gradually being introduced in our study site, that the local  
119 populations will soon have full, daily satellite TV access, and that TV consumption is  
120 associated with body dissatisfaction, low self-esteem, and disordered eating<sup>4</sup>. The  
121 globalization of the thin ideal in populations that are in the process of westernisation and/or  
122 modernisation<sup>1</sup> is all the more worrying given that it usually coincides with rising levels of  
123 obesity, and therefore renders the dominant ideal of a slim or underweight female body even  
124 more difficult to attain. We thus strongly recommend further research on this pressing global  
125 challenge.

126

## 127 **METHODS**

128 All study procedures and protocols were approved by Durham University's Psychology  
129 Department Ethics Subcommittee (ref 10/09), and conformed to Durham University's Data  
130 Protection Policy 2008 as well as to the ethical guidelines of the British Psychological  
131 Society.

132 **Study site.** We selected two villages with no access to grid electricity and very low to non-  
133 existent media access on the remote Mosquito Coast of Nicaragua. The first village, San  
134 Vicente, was located in the Pearl Lagoon Basin and had no more than 40 adult inhabitants.  
135 The second village, Pedregal, was located on the nearby Patch River and had a maximum of  
136 600 inhabitants. In San Vicente, one household had a solar panel that was used for  
137 lighting, but there was no functional TV or access to other visual media in the village at the  
138 time of data collection. In Pedregal, a small number of households had recently acquired  
139 solar panels and satellite dishes and were therefore excluded from the study. Overall, the  
140 average hours of TV watched by the subjects in the last 7 days (including any TV watched  
141 while travelling) was 1.55 (mode: 0; median: 0). Further, the average subject had not left  
142 their village for 234 days. Together with participant observation, these statistics confirmed  
143 that the subjects had a very low exposure to visual media. More study site characteristics  
144 are in Table 1.

145 **Subjects.** We tested 80 subjects (40 women) from 16 to 78 years ( $M= 30.4$ ;  $SD=12.9$ ) in  
146 total. Thirty-nine subjects were from San Vicente, where we tested all adults who were  
147 willing to participate and older than 16 years old. The remainder were recruited from  
148 Pedregal, where our rule was to test a similar number than in San Vicente and with an  
149 approximately equal number of men and women. All subjects provided consent and received  
150 \$4 in local currency for their time. Subjects younger than 18 years old or older than 75 years  
151 old were tested with a parent or guardian present. Seven subjects from Pedregal who  
152 reported having access to satellite TV and watching it in the last 7 days, as well as 2  
153 subjects who created the thinnest or fattest ideal body possible at both pre- and post-test  
154 (i.e. showed ceiling/floor effects), were discarded from analyses. Full sample characteristics  
155 are in Table 1.

156 **Materials and measures.** For the ideal body task, we created 8 starter bodies in the  
157 software suite DAZ Studio 4.5. These bodies varied in shape (pear type vs. hourglass type),  
158 skin colour (light vs. dark), and clothing (swimsuit vs. low waist shorts and strapless bra),  
159 with each combination of shape/skin colour/clothing being represented. Importantly, the size  
160 of these starter bodies could be modified by the subjects (using left and right arrow keys  
161 over 20 increments) on a scale ranging from -20 (thinnest body) to +20 (heaviest body) and  
162 corresponding to a BMI range of 15 to 40. Half of the subjects received the first 4 bodies at  
163 pre-test, and the 4 remaining bodies at post-test, with the other half of the subjects receiving  
164 the opposite manipulation. Both at pre-test and post-test, the order of presentation of the  
165 bodies was randomised for each subject. Sizes selected for each body were recorded as the  
166 percentage of the screen width by which the mouse position deviated from the midpoint (-  
167 50% to 50%) and were treated as our dependent variable scores. Inspection of a Q-Q plot  
168 showed that these scores were approximately normally distributed, and multilevel model  
169 analyses were conducted in MLwiN 2.36.

170 For the manipulation, we used 144 photographs of either thin or plus size fashion  
171 models found on mainstream or specialist UK or U.S. retailers' online catalogues or in

172 popular women's magazines. Although it was not always possible to determine which  
173 clothing size the models were wearing, most models in the thin and plus size condition  
174 ranged within UK sizes 4-6 and 16-28, respectively. All images showed women face-on, with  
175 a neutral background and with the full body visible (from head to knees at least), in non-  
176 sexually explicit poses. In each condition, there was an equal number of white and non-white  
177 ethnicity models, with two thirds of the models wearing clothes and one third wearing  
178 underwear or swimwear. The photographs were presented in pairs, giving 36 trials per  
179 condition, and the subjects were instructed to choose which of the two models they found  
180 more attractive. Within each pair, the models used looked similar and were matched for body  
181 shape, type of clothing, and pose. The number of same/different ethnic background pairs  
182 was counterbalanced both within and between experimental conditions. Further, the order of  
183 presentation of the pairs and the side of presentation of each photograph (left or right) were  
184 randomised for each subject.

185 All subjects also reported whether they had access to television (*in my house, in a*  
186 *neighbour's house I visit, in a neighbour's house I don't visit, no TV in village*), and if they  
187 did, which type of television they had access to (*TV set-without satellite-and DVD player,*  
188 *Satellite TV, Satellite TV and DVD player, Other*), and how many hours they had watched it  
189 in the last 7 days. They also reported the last time that they travelled to other communities,  
190 how long they were away, and whether they had watched any TV while away (and how  
191 many hours in the last 7 days if they had). Subjects also reported how many hours ago they  
192 had last eaten and whether they were trying to change weight (*trying to lose weight, trying to*  
193 *increase weight, not trying to change weight*). Finally, we collected anthropometrics to  
194 compute the BMI and WHR of each subject. All sample characteristics are in Table 1.

195 **Procedure.** The subjects were tested individually in a quiet room with a desk. The subjects  
196 already knew the experimenters from previous work in the area, and although they were  
197 aware of our main research interests (the electrification of the Mosquito Coast, and body  
198 ideals in Central America), they did not know the specific aim of the current experiment.

199 Upon providing oral informed consent, the subjects were assigned to condition (thin  
200 vs. plus size models) and presentation order of starter body quasi-randomly to ensure a  
201 similar number of subjects in each group (the experimenter was not blinded to group  
202 allocation). The subjects then completed the ideal body task on a laptop computer. Each  
203 body started at a random size, and the experimenter demonstrated to the subject how the  
204 size of the body could be changed using the left and right arrow keys, and showing the full  
205 possible range. The subjects were then instructed to modify each of the four bodies until  
206 these looked like their 'ideal woman body', meaning by this, 'a woman body that to you is as  
207 attractive, good-looking, and sexy as possible'. They were also reminded several times that  
208 we were interested in their personal opinion and that they were no 'right or wrong' answers  
209 for this task. As most subjects were not used to computers, every effort was made to ensure  
210 that they knew how to use the left and right arrow keys and how this affected the size of the  
211 bodies. When the subject had finished a body, the experimenter asked again whether this  
212 represented their ideal female body before letting the subject proceed to the next body.  
213 When all 4 bodies were finished, the subject was told that 'we will do something else now',  
214 and received the manipulation. For each pair of photos, the experimenter asked the subject  
215 to choose their 'favourite body' between the two, or which one of the two bodies 'looks  
216 better, or is a more attractive woman body in your opinion'. When the subject had chosen

217 one body by tapping on it on the screen, the experimenter would display the next pair of  
218 photos by clicking the mouse, until all pairs had been displayed. This exposure to the  
219 thin/plus size models lasted approximately 15 minutes for each participant. The subjects  
220 then completed the ideal body task again, with exactly the same instructions as at pre-test  
221 (but with the 4 other starter bodies).

222 The session continued with an interview where subjects provided demographics and  
223 answered questions about media access, travel, etc. Finally, subjects' height, weight, chest,  
224 waist, and hips were measured using an electronic scale and tape measure. These  
225 measurements were taken with the subjects dressed but without shoes. The subjects were  
226 given the opportunity to take their measurements themselves (with guidance), and  
227 anthropometrics for females were collected by a female experimenter or a female field  
228 assistant. A typical session lasted 40-45 minutes, and all subjects were interviewed in their  
229 native language (Creole English or Spanish).

230

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234

235 **Author contributions.** Designed the study: JLJ with participation of all authors. Prepared  
236 the materials: MJT, JLJ, and LGB. Collected the data: JLJ and TT. Analysed the data: LGB  
237 and JLJ. Wrote the paper: JLJ and LGB with participation of MJT and TT.

238

239 **Competing financial interests.** The authors declare that they have no competing financial  
240 interests.

241

242 **Materials & Correspondence.** Correspondence and material requests should be addressed  
243 to [jean-luc.jucker@durham.ac.uk](mailto:jean-luc.jucker@durham.ac.uk).

244

245 **Data availability.** The datasets generated during and/or analysed during the current study  
246 are available from the corresponding author on reasonable request.

247

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301 **Table 1: Sample Characteristics**

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Valid N	71
% Female	49.29
Age (years)	30.42 (12.95)
Body mass index	24.63 (4.98)
<b>Dieting</b>	
% Not dieting	69.01
% Decrease weight	18.30
% Increase weight	12.67
Earnings (\$/year)	1,230.06 (2,356.20)
Education (years)	5.35 (4.80)
<b>Ethnicity</b>	
% Garifuna	29.57
% Mestizo	56.33
% Mixed or other	14.08
<b>TV access</b>	
% In own house	8.45
% In neighbour's house	16.90
% No access	74.64
<b>TV consumption</b>	
TV consumption in last 7 days (hours)	1.55 (3.14)
<b>TV type</b>	
% TV set + DVD player only	15.49
% Satellite TV	12.67
% No TV	71.83
Time since last meal (hours)	3.57 (1.84)
<b>Travel</b>	
Last trip to other village (days)	234.94 (859.03)
Duration of stay (days)	4.25 (12.01)
Daily TV consumption (hours)	0.77 (1.25)

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304 *Note.* 'TV access' refers to access to any type of television, not necessarily satellite  
305 television; 'TV type' specifies which type of television the subjects had access to. Further,  
306 'TV consumption in last 7 days (hours)' includes any TV watched (and any type of TV  
307 watched) while travelling in the last 7 days.

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**Table 2: Multilevel modelling analysis of predictors of ideal body size selected for each starter body: Models I-VI**

	I		II		III		IV		V		VI	
	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE
Constant	-9.03	1.59	-8.83	1.68	-10.76	2.32	-9.19	2.39	-11.62	2.86	-7.58	3.15
<b>Time</b>			-0.41	1.11	-0.41	1.11	<b>-3.56</b>	<b>1.56</b>	<b>-3.56</b>	<b>1.56</b>	<b>-3.56</b>	<b>1.56</b>
Group					3.76	3.15	0.66	3.33	0.52	3.31	0.57	3.14
<b>Time*Group</b>							<b>6.21</b>	<b>2.19</b>	<b>8.49</b>	<b>2.70</b>	<b>10.21</b>	<b>3.12</b>
Sex									4.87	3.21	4.00	3.06
Sex*Time*Group									-4.32	2.99	-4.62	2.99
<b>Location</b>											<b>-7.69</b>	<b>3.06</b>
Location*Time*Group											-3.31	2.99
Log-likelihood:	4688.25		4688.11		4686.69		4678.75		4675.22		4666.20	
Likelihood ratio vs previous model			0.28		2.84		<b>15.88</b>		<b>7.06</b>		<b>18.04</b>	

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312 *Note.* Figures in bold indicate  $p < .05$ . Models VII to XII are in Extended data.

313 **Figure 1. Sample starter bodies (minimum and maximum size)**

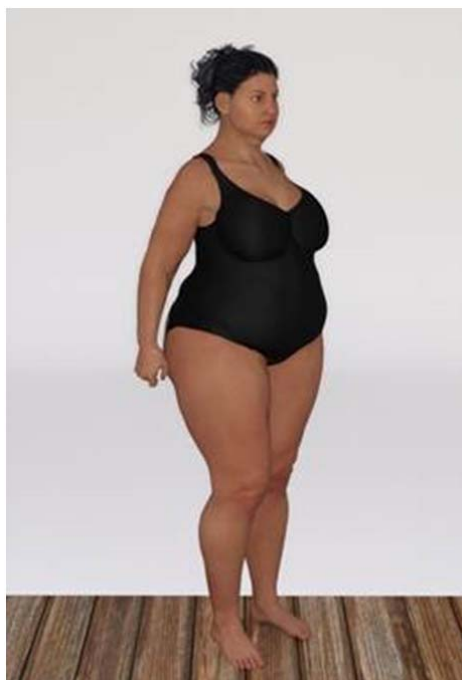
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328 **Figure 2. Sample thin size and plus size models**

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330 Thin size:

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354 Plus size:

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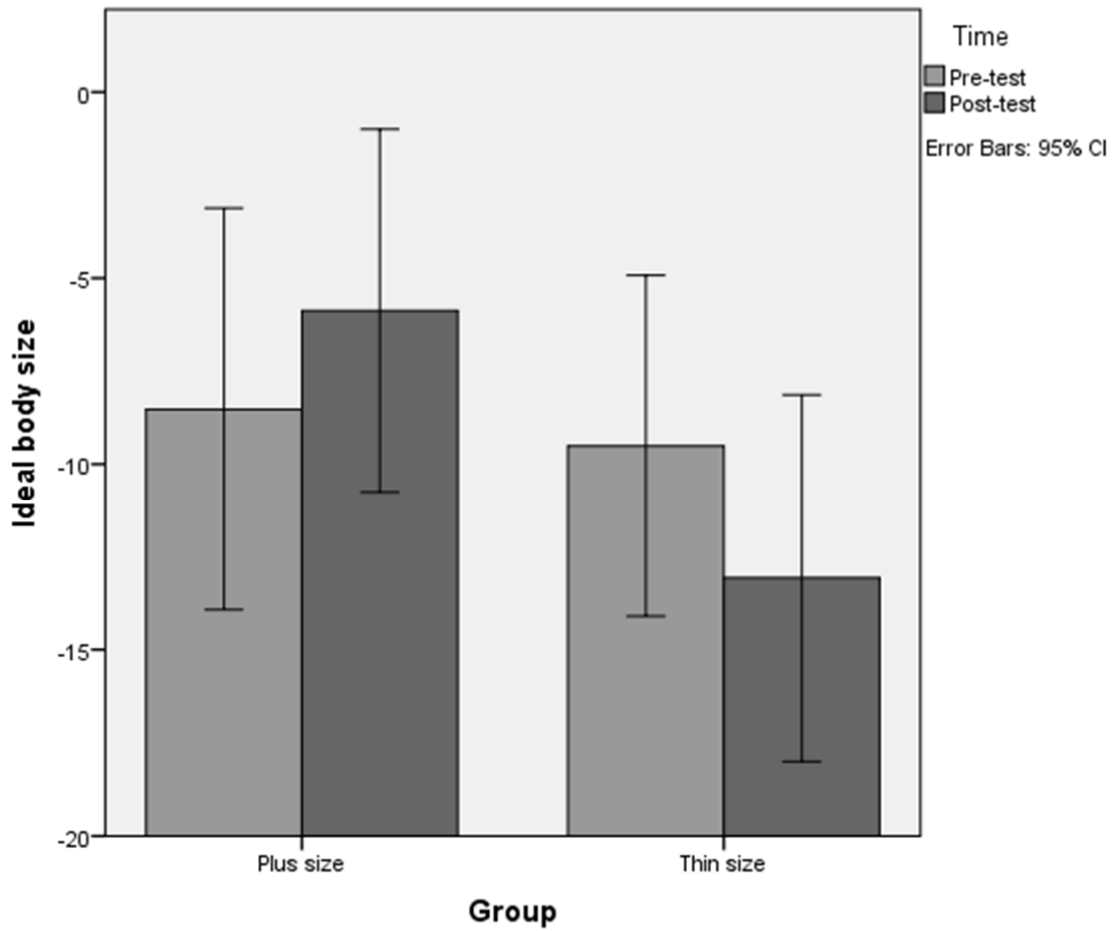
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388 **Figure 3. Pre-test to post-test difference in ideal body size between groups**  
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393 *Note.*  $N = 71$ ; mean difference: 7.19, 95% CI 0.38 to 14.00,  $t(69) = 2.107$ ,  $p < .05$  (two-  
394 sided),  $d = .49$ . Levene's test for equality of variances:  $p = .623$ .  
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405 **Extended data. Multilevel modelling analysis of predictors of ideal body size selected for each starter body: Models VII-XII**

	VII		VIII		IX		X		XI		XII	
	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE
Constant	-6.93	3.34	-10.10	4.50	-9.63	5.32	-9.44	5.34	-9.52	5.36	-8.77	5.51
<b>Time</b>	<b>-3.56</b>	<b>1.56</b>	<b>-3.56</b>	<b>1.56</b>	<b>-3.56</b>	<b>1.56</b>	<b>-3.56</b>	<b>1.56</b>	<b>-3.56</b>	<b>1.55</b>	<b>-3.56</b>	<b>1.55</b>
Group	0.52	3.13	0.03	3.15	0.03	3.15	0.10	3.15	0.32	3.19	0.50	3.20
<b>Time*Group</b>	<b>10.90</b>	<b>3.29</b>	<b>14.38</b>	<b>4.57</b>	<b>14.10</b>	<b>5.37</b>	<b>14.17</b>	<b>5.38</b>	<b>13.95</b>	<b>5.39</b>	<b>14.54</b>	<b>5.64</b>
Sex	4.16	3.06	3.98	3.05	3.93	3.06	3.84	3.07	3.63	3.11	2.94	3.33
Sex*Time*Group	-4.11	3.07	-3.94	3.07	-3.88	3.17	-3.80	3.17	-3.36	3.22	-4.18	3.76
<b>Location</b>	<b>-6.77</b>	<b>3.45</b>	<b>-7.34</b>	<b>3.48</b>	<b>-7.45</b>	<b>3.54</b>	<b>-7.59</b>	<b>3.56</b>	<b>-7.88</b>	<b>3.62</b>	<b>-7.67</b>	<b>3.63</b>
Location*Time*Group	-2.37	3.33	-2.33	3.33	-2.27	3.37	-2.70	3.44	-1.77	3.63	-1.82	3.64
Travel	-1.83	3.21	-1.13	3.26	-0.98	3.39	-1.07	3.39	-0.91	3.42	-1.06	3.41
Travel*Time*Group	-2.31	3.41	-1.57	3.58	-1.67	3.74	-1.70	3.74	-2.37	3.84	-2.18	3.85
Age			0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.11
Age*Time*Group			-0.12	0.12	-0.13	0.12	-0.13	0.12	-0.11	0.12	-0.11	0.12
Last meal					-0.14	0.85	-0.10	0.86	0.01	0.89	0.03	0.89
Last meal*Time*Group					0.09	0.90	0.27	0.95	-0.08	1.05	-0.02	1.06
BMI							0.00	0.01	0.00	0.01	0.00	0.01
BMI*Time*Group							-0.01	0.01	0.00	0.01	0.00	0.01
Education									-0.01	0.02	-0.01	0.02
Education*Time*Group									0.01	0.02	0.01	0.02
Dieting											-2.48	4.43
Dieting*Time*Group											-1.70	4.66
Log-likelihood:		4665.18		4663.39		4663.36		4662.86		4662.13		4661.56
Likelihood ratio vs previous model		2.04		3.58		0.06		1		1.46		1.14

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407 *Note.* Dieting and Travel were used as binary variables (i.e., is the subject trying to change their weight? *yes* or *no*; has the subject travelled in  
 408 the last 7 days? *yes* or *no*). Ethnicity and earnings were not included because we considered that these were redundant with location and  
 409 education, respectively. Further, separate analyses including ethnicity and earnings did not significantly change the results reported here.