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Preferences for sexually dimorphic body characteristics revealed in a large sample of speed daters

Abstract

While hundreds of studies have investigated the indices that make up attractive body shapes, these studies were based on preferences measured in the lab using pictorial stimuli. Whether these preferences translate into real-time, face-to-face evaluations of potential partners is unclear. Here 539 (275 female) participants in 75 lab-based sessions had their body dimensions measured before engaging in round-robin speed dates. After each date they rated each other's body, face, personality, and overall attractiveness, and noted whether they would go on a date with the partner. Women with smaller waists and lower waist-to-hip ratios were found most attractive, and men with broader shoulders and higher shoulder-to-waist (or hips) ratios were found most attractive. Taller individuals were preferred by both sexes. Our results show that body dimensions associated with greater health, fertility, and (in men) formidability influence face-to-face evaluations of attractiveness, consistent with a role of intersexual selection in shaping human bodies.

Keywords: Body shape; intersexual selection; mate preferences; speed-dating; physical attractiveness

Preferences for sexually dimorphic body characteristics revealed in a large sample of speed daters

Bodies are centrally important to sexual attractiveness. A fundamental tenet in theories of human mate choice is that romantic preferences have evolved to attend to traits that were important in ancestral environments. The clearest examples of these traits are those that reflect large sex differences in stature, muscularity, and body fat composition. For example, in women, a lower waist-to-hip ratio and lower body mass index are associated with greater reproductive value, i.e. youth (Lassek & Gaulin, 2018); in men, height and shoulder width have been associated with greater physical strength (Archer & Thanzami, 2009) and perceptions of both physical and social dominance (Dijkstra & Buunk, 2001; Stulp, Buunk, Verhulst, & Pollet, 2015).

Previous studies investigating the association of a body's shape with its appeal to a viewer have shared one common feature: the models have always been inert stimuli presented on screens or on paper. This raises several questions. To what extent do these preferences translate into real-time, face-to-face evaluations of opposite-sex partners? Are there preferences that are not captured by on-screen judgements? And, how much do bodily features actually affect our attraction to real people, who have faces and personalities as well as bodies?

What makes a body attractive?

Singh's (1993) landmark study reported that men rated female stimuli of average body weight with the lowest WHR (.70) as youngest, healthiest, and most attractive. These findings were replicated in several Western populations (Koscinski, 2014; Thornhill & Grammer, 1999), small-scale societies (Dixson, Dixson, Bishop, & Parish, 2010; Singh, Dixson, Jessop, Morgan, & Dixson, 2010; but also see: Douglas & Shepard Jr, 1998; Marlowe & Wetsman, 2001), and in research measuring men's visual attention and neural

reward responses (Dixson, Grimshaw, Linklater, & Dixson, 2011; Platek & Singh, 2010). In men, height, shoulder width, and muscularity are positively associated with physical strength and health (Archer & Thanzami, 2009; Lassek & Gaulin, 2009). Women also judge muscular and v-shaped physiques as more attractive than over-lean or corpulent body types (Dixson, Grimshaw, Ormsby, & Dixson, 2014; Frederick & Haselton, 2007; Mautz, Wong, Peters, & Jennions, 2013). High body mass index (BMI) is associated with low attractiveness in both sexes, but the association is complicated by the covariance of BMI with more specific body measures such as muscle mass and waist circumference (Chinedu et al., 2013).

Artificial stimuli may be problematic

Though there is much research into the determinants of body attractiveness, the studies to date have many limitations. The stimuli in the studies described above have ranged from line drawings (e.g. Singh, 1993, 1995), to photographs (e.g. Koscinski, 2014), 3D rotations of body scans (e.g. Brooks et al., 2010), videos of inert figures (e.g. Rilling, Kaufman, Smith, Patel, & Worthman, 2009), and popular cartoon characters (Lassek & Gaulin, 2016). The use of artificial stimuli in the studies investigating body attractiveness has been criticised for conflating WHR and BMI (Tovee, Maisey, Emery, & Cornelissen, 1999), and obscuring abdominal depth (Rilling et al., 2009). Importantly, the nature of the stimuli has been shown to affect the manifestation of preferences (Koscinski, 2014), reinforcing the importance of the match between stimuli and the mating situations of interest.

Of course, until recent times human mate evaluation did not rely on stimuli on a computer screen but on face-to-face interactions. There are several reasons why in-person evaluations might differ from ratings of stimuli on a computer screen. First, overall body size (i.e. height) is impossible to properly appreciate from a small image on a screen; this is especially relevant given the importance of body size in mate choice in animals (Bercovitch,

1989; Serrano-Meneses, Córdoba-Aguilar, Méndez, Layen, & Székely, 2007; Shine et al., 2000) and apparently in humans too (Stulp & Barrett, 2016). Second, models used as stimuli in previous studies investigating body attractiveness have worn form-fitting attire (e.g. Koscinski, 2014) or been completely naked (Thornhill & Grammer, 1999), and in all cases their faces were obscured. These procedures were designed to isolate the effects of body variation, but in doing so they departed far from reality and made it impossible to determine the importance of body variables to overall attractiveness when other relevant factors (e.g. face, personality, clothing) are varying too, as is the case in real life mate evaluation (Lee, Dubbs, Von Hippel, Brooks, & Zietsch, 2014). Third, real life interactions involve moving bodies, which could be perceived quite differently from inert bodies (even if it is a 3D image rotating so it can be seen from all angles). Natural movement can change the perception of physical features – indeed several studies have shown modest or absent correlations between attractiveness ratings of the same faces in static and dynamic conditions (Lander, 2008; Penton-Voak & Chang, 2008; Rubenstein, 2005; but see Kościński, 2013). Fourth, attraction-related cognitive processes elicited by in-person interactions are thought to be different from those elicited by stated preferences (Todd, Penke, Fasolo, & Lenton, 2007). This difference may relate to the cold-to-hot empathy gap (Eastwick & Finkel, 2008), which refers to the idea that individuals who are not currently in a state of arousal (such as strong attraction) have limited insight into the effect this arousal will have over their behaviour when it arises (Loewenstein, 2005). Participants observing a picture or video of an inert body are unlikely to experience the same arousal levels as when interacting in the physical presence of the person they are evaluating, so the same principles may apply to these contexts. However, recently the same pattern of results has been shown in friendship formation, which is less likely to involve hot affect than relationship formation, suggesting that the problem may be more complex (Huang, Ledgerwood, & Eastwick, in press).

Speed-dating paradigms offer a way to test the importance of specific traits in mate choice during ecologically valid face-to-face mating contexts (Finkel, Eastwick, & Matthews, 2007; Kurzban & Weeden, 2005, 2007; Lenton, Fasolo, & Todd, 2009; Lenton & Francesconi, 2011). In speed-dating scenarios, people engage in brief interactions (3-5 minutes) with previously unknown people during which romantic interests can be gauged. Despite their advantages, speed-dating paradigms have rarely been used to examine the influence of objectively measured facial/bodily traits. In one study, male speed-daters with wider faces, a cue to social dominance and aggressiveness (Geniole, Denson, Dixson, Carré, & McCormick, 2015) were preferred as short-term mates (Valentine, Li, Penke, & Perrett, 2014). In other speed-dating studies, height was found attractive in men only (Asendorpf, Penke, & Back, 2011), in both sexes (Stulp, Buunk, Kurzban, & Verhulst, 2013), or in neither sex (Luo & Zhang, 2009). Additionally, there is some evidence that lower weight (Luo & Zhang, 2009) and lower BMI (Asendorpf et al., 2011) are attractive in women only. These results suggest that speed-dating is a valuable paradigm for physical attractiveness research; however, selection for physical traits is undoubtedly multivariate, which places high value on studies that include multiple objective measures of physical traits. Studies measuring shoulders, waist, and hips are particularly valuable as they allow for analysis of body shape rather than body size.

The present study

Existing research leaves the following questions unanswered: 1) How do body dimensions influence judgements of body attractiveness in face-to-face interactions? 2) How important is body attractiveness relative to face and personality attractiveness? 3) Do these implicit preferences shape the explicit choices made by speed-daters? Answering these questions is crucial to understanding how variation in bodies, and in particular body

dimensions, might affect mate selection in natural scenarios like those that have shaped our evolution.

To address these questions we used a speed-dating paradigm in which opposite-sex participants rated each other's body, face, personality, and overall attractiveness. The participants' body dimensions were also measured, and using linear mixed effects modelling we investigated the association of each body dimension, as well as several sexually dimorphic ratios, with body attractiveness ratings. Similarly, we investigated the relative importance of body, face, and personality attractiveness to overall attractiveness. We also investigated the importance of these features in deciding whether to go on a date with their partner. Lastly, to investigate whether these preferences are sex-differentiated, we tested for moderation by sex in all analyses.

Material and methods

Participants

Participants were 539 (275 female) first year psychology students with ages ranging from 16.67 to 46.08 (females: M = 19.14, SD = 2.68; males: M = 19.83, SD = 3.11). Participants were recruited from the University of Queensland's first year research participation scheme and were offered one credit for their participation in a study titled 'Speed-meeting study'. Requested volunteers were 1) heterosexual, 2) not in a committed relationship, and 3) open to answering personal questions regarding their sexual history (for questions not relating to the current study). Participants were assured of confidentiality as well as being told at regular intervals that they may discontinue/omit answers without forgoing credit. The participants included in this study are a subset (collected during 2012, 2013, 2014, and 2015) of an ongoing 'attraction study' (2010-present). The subset was selected based on availability of all measures necessary for the present study. Sample size

was determined each year by how many participants could be tested in the available time frame. All relevant data available at the start of preparing the paper were included. Statistical power in a sample of this size (2161 interactions) is strong, but specific calculations are difficult because of the complex multi-level, cross-classified design. From this subset, participants who were classed as outliers (+/- 3.29 SD) on one or more body dimensions were removed (8 males, 7 females).

Materials

Participants completed three questionnaires: *pre-questionnaire*, *speed-date questionnaire,* and *post-questionnaire*. The *pre-questionnaire* contained self-report items including participant height. The *speed-date questionnaire* contained ratings of partners' body attractiveness, facial attractiveness, personality attractiveness, and overall attractiveness. Each of the partner attractiveness (face, body, personality, overall) items were asked in the format of 'I would rate their ____ attractiveness as…' These ratings were made on a 7-point response scale ranging from 1 = Not at All Attractive to 7 = Extremely Attractive. Additionally, participants were asked whether they would hypothetically go on a date with the partner in the format of 'Would you go on a date with this person? (Y/N)'. The *post-questionnaire* contained items unrelated to this study. We also collected body weight, but it (and BMI) were not included in the main analyses because they are largely captured by the girth variables and height – indeed, when included weight did not predict body attractiveness above and beyond height, waist, hips, and shoulders (see supplementary material, S1).

Procedure

Depending on attendance, speed-dating sessions consisted of two to five males and two to five females. Prior to the speed-dates, participants were separated by sex and

completed the *pre-questionnaire*. Once finished, the group was brought together and participants were assembled at five 'stations' within the laboratory. Each station had two opposite-facing chairs for the partners. Participants were then told they would be given three minutes to interact with an opposite sex partner. Participants spoke about any topic until they heard a bell which indicated the date had ended. After hearing the bell, participants were then instructed to begin completing the *speed-date questionnaire*. All participants were reminded to hold their clipboards up to avoid their partner seeing their ratings. Experimenters supervised the room to determine when all participants had finished completing ratings. The process outlined above was then repeated until all opposite-sex dyads had interacted. If there was an uneven ratio of males and females, the extra participant(s) were instructed to sit quietly for three minutes during one or more rounds. Once all speed-dates and ratings had been completed, participants began completing the *post-questionnaire*. During this time, participants were taken aside one at a time by a female experimenter and their body dimensions (shoulders, waist, hips) were measured using a tape measure. Waist and hips were defined as the narrowest and widest points of the lower torso (including buttocks), respectively. Shoulders were measured at the widest point of the shoulder area. All three dimensions were measured as circumferences.

Analysis

The nature of the design (i.e. participants rating multiple partners) creates dependencies in the data. The rating from each interaction between two people (Level 1) is cross-classified within both the participant receiving the rating (Level 2), and the partner who gave the rating (Level 2), all of which is nested within the session they both attended (Level 3). Therefore, it is necessary to use multilevel modeling (MLM) to account for the hierarchical structure of the data. To check that MLM was appropriate, intraclass correlations were examined at each level for both body and overall attractiveness (see Table 1).

As all intraclass correlations were significant, indicating clustering at each level, we proceeded with MLM analyses. We used the statistical software 'R', along with packages 'lme4' (Bates, Mächler, Bolker, & Walker, 2014) and 'lmerTest' (Kuznetsova, Brockhoff, & Christensen, 2017), for these analyses.

Table 1

Intra-class correlations for Bodily Attractiveness and Overall Attractiveness each level: Participant (Level-1), Partner (Level-2), and Session (Level-3).

Levels	**Women Rating Men**		**Men Rating Women**	
	Estimate (CI)	N	Estimate (CI)	N
Bodily Attractiveness				
Participant (Target)	.35 (.28-.41)	275	.30 (.24-.37)	290
Partner (Perceiver)	.31 (.25-.38)	287	.25 (.19-.32)	275
Session	.17 (.11-.24)	75	.11 (.07-.17)	75
Overall Attractiveness				
Participant (Target)	.28 (.21-.34)	275	.25 (.19-.32)	290
Partner (Perceiver)	.33 (.26-.39)	287	.22 (.16-.28)	275
Session	.13 (.09-.20)	75	.06 (.03-.11)	75

Note: The intra-class correlation represents the extent to which scores on the dependent variables 'cluster' within each level of aggregation. The intra-class correlation for *participant* represents the extent to which ratings received by a particular participant are more similar to each other than to ratings received by other participants. *Partner* indicates the extent to which ratings given by a particular partner are more similar to each other than ratings given by other participants. *Session* indicates the extent to which ratings received by participants in a particular session are more similar to each other than ratings received by participants in other sessions.

Results

Figure 1 shows scatterplots of the associations of height, and hip, shoulder, and waist circumference with bodily attractiveness. MLM analyses with partner ratings of attractiveness (body, facial, personality, overall) at Level-1, participant dimensions (shoulders, waist, hips, height) at Level-2, and session group at Level-3 were used to evaluate main effects and interactions. Unless otherwise specified, all models reported are maximal models (Barr, Levy, Scheepers, & Tily, 2013). Prior to analysis, variables that were used as denominators in ratios were converted to proportions for conceptual clarity (Kronmal, 1993).

Figure 1. Scatterplots depicting the relationship between body dimensions in centimetres (X) and average bodily attractiveness rating provided by speed-dating partners (Y) for each body dimension.

All variables were then mean centred using their sex-specific mean. The means and standard deviations (prior to mean centring) for all Level-1 and Level-2 variables are reported in Table 2.

Table 2

Means and standard deviations for male and female targets on all Level-1 and Level-2 variables.

Variables	**Male Targets**		**Female Targets**	
	Mean	SD	Mean	SD
Level-1 (Partner Ratings)				
Bodily Attractiveness	4.31	1.01	4.66	0.92
Facial Attractiveness	4.18	0.98	4.50	0.88
Personality Attractiveness	5.09	0.76	5.28	0.68
Overall Attractiveness	4.58	0.79	4.77	0.76
Level-2 (Participant)				
Shoulders	114.97	7.90	100.47	6.29
Waist	80.66	8.36	71.55	6.29
Hips	97.47	8.55	93.79	7.19
Height	180.18	7.27	165.82	7.06

Note: All attractiveness ratings were made on a 7-point Likert scale ranging from 1-7 (midpoint: 4). All body dimensions were measured in centimetres.

What makes a male body attractive?

Previous research investigating male body attractiveness has emphasised the importance of the shoulder-to-hip and shoulder-to-waist ratios. Interaction terms were favoured over ratios because ratios can cause spurious relationships and produce unacceptable collinearity with their constituent variables (Kronmal, 1993). These interaction terms conceptually correspond to ratios, but with more appropriate statistical properties, and will hereupon be referred to as ratios to simplify wording. All variables were standardised to a mean of 0 and a standard deviation of 1 before being entered into equations, to ease

comparison of coefficients across body dimensions. The γ coefficients for both male models are reported in Table 3.

Table 3

Male MLM Models for Rated Bodily Attractiveness: Models are named for the variables they include. The first row contains univariate models estimating main effects for each body measurement. The second row contains multivariate models with interaction terms representing well-known ratios as well as main effects for their constituent variables. Multivariate models including all main effects can be found in supplementary materials (S2).

Main Effect Only Models											
	Shoulders			Waist			Hips			Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.12	0.05	.007	-	-	-	-	-	-	-	-	-
Waist	-	-	-	.00	0.05	.992	-	-	-	-	-	-
Hips	-	-	-	-	-	-	-0.02	0.04	.615	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.16	0.04	<.001
Interaction Models												
	Shoulders by Hips			Shoulders by Waist			Waist by Hips			Waist by Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.21	0.05	<.001	0.38	0.06	<.001	-	-	-	-	-	-
Waist	-	-	-	0.28	0.06	<.001	-0.01	0.06	.913	0.07	0.04	.100
Hips	0.07	0.05	.144	-	-	-	-0.07	0.06	.238	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.2	0.04	<.001
Interaction	0.27	0.04	<.001	0.27	0.03	<.001	-0.25	0.04	<.001	0.09	0.05	.070

Note: Waist is inverted, with positive coefficients indicating that smaller values are preferred.

We found that taller men with broader shoulders were rated as having more attractive bodies. Interaction terms in the shoulder-to-waist and shoulder-to-hips models were significant, suggesting that a higher shoulder-to-waist or shoulder-to-hip ratio has a positive effect on attractiveness beyond the individual effects of having broad shoulders or narrow waist/hips. Additionally, the interaction term in the waist-by-hips model was significant,

suggesting that a lower waist-to-hips ratio has a positive effect on attractiveness beyond the individual effect of having a narrow waist.

What makes a female body attractive?

Previous research investigating female body attractiveness has emphasised the importance of the waist-to-hip and waist-to-height ratios. The γ coefficients for both female models are reported in Table 4.

Table 4.

Female MLM Models for Rated Bodily Attractiveness: Models are named for the variables they include. The first row contains univariate models estimating main effects for each body measurement. The second row contains multivariate models with interaction terms representing well-known ratios as well as main effects for their constituent variables. Multivariate models including all main effects can be found in supplementary materials (S2).

Rated Bodily Attractiveness											
Main Effect Only Models											
	Shoulders			Waist			Hips			Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	-0.11	0.05	.015	-	-	-	-	-	-	-	-	-
Waist	-	-	-	0.19	0.05	<.001	-	-	-	-	-	-
Hips	-	-	-	-	-	-	-0.15	0.05	.002	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.11	0.04	.011
Interaction Models												
	Shoulders by Hips			Shoulders by Waist			Waist by Hips*			Waist by Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	-0.05	0.05	.341	0.13	0.06	.033	-	-	-	-	-	-
Waist	-	-	-	0.33	0.06	<.001	0.21	0.05	<.001	0.25	0.04	<.001
Hips	-0.13	0.05	.009	-	-	-	0.00	0.05	.924	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.14	0.04	<.001
Interaction	-0.01	0.04	.872	0.12	0.04	.005	0.10	0.03	.003	0.04	0.05	.453

Note: Waist and Hips are inverted, with positive coefficients indicating that smaller values are preferred.

* Maximal model did not converge, random intercept only model used.

We found that taller women with narrower waists, hips, and shoulders were rated as having more attractive bodies. The interaction term in the Waist-to-hip model was significant, suggesting a lower waist-to-hip ratio has a positive effect on attractiveness beyond the individual effect of having a narrow waist. Additionally, the interaction term in the shoulders-to-waist model was significant, suggesting that having a higher shoulder-to-waist ratio has a positive effect on attractiveness beyond the individual effect of having a narrow waist. Though the shoulders coefficient is negative in the univariate model, it is positive in the shoulder-to-waist model where both waist and shoulder-to-waist ratio are controlled; this may suggest that the negative coefficient observed in the univariate model is driven by collinearity between shoulders and waist. Additional multivariate models for both women and men can be seen in supplementary materials (S2).

Are there truly sex differences in body preferences?

As the pattern of results appeared to differ by sex, we combined the male and female samples and tested for moderation of the effects by sex (see Table 5). Several sex differences emerged: the attractiveness of broader shoulders and broader hips was greater in men, whereas the attractiveness of narrower waists was greater in women. Unexpectedly, men and women preferred taller partners to a similar degree. Additionally, the positive influence of higher shoulder-to-waist or shoulder-to-hips ratios on attractiveness was greater in men. Unexpectedly, the positive influence of lower waist-to-hip ratios was also greater in men.

Table 5.

Unisex MLM Models for Rated Bodily Attractiveness: Models are named for the variables they include. The first row contains univariate models estimating main effects for each body measurement. The second row contains multivariate models with interaction terms representing well-known ratios as well as main effects for their constituent variables. Multivariate models including all main effects can be found in supplementary materials (S2).

Main Effect Only Models												
	Shoulders			Waist			Hips			Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.00	0.03	.885	-	-	-	-	-	-	-	-	-
Waist	-	-	-	0.10	0.03	.003	-	-	-	-	-	-
Hips	-	-	-	-	-	-	-0.07	0.03	.023	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.13	0.03	<.001
Sex	0.13	0.03	<.001	0.13	0.03	<.001	0.14	0.03	<.001	0.14	0.03	<.001
Sex Interaction	-0.11	0.03	<.001	0.09	0.03	0.001	-0.08	0.03	.008	-0.03	0.03	.337
Interaction Models												
	Shoulders by Hips			Shoulders by Waist			Waist by Hips			Waist by Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.07	0.03	.044	0.26	0.04	<.001	-	-	-	-	-	-
Waist	-	-	-	0.31	0.04	<.001	0.11	0.04	.002	0.15	0.03	<.001
Hips	-0.09	0.03	.007	-	-	-	0.06	0.04	.140	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.15	0.03	<.001
Sex	0.06	0.04	.087	0.05	0.04	.138	0.07	0.04	.048	0.13	0.03	<.001
Shoulders*Sex	-0.11	0.03	.001	-0.11	0.04	.013	-	-	-	-	-	-
Waist*Sex	-	-	-	0.01	0.04	.898	0.09	0.04	.017	0.08	0.03	.005
Hips*Sex	-0.04	0.03	.217	-	-	-	-0.05	0.04	.225	-	-	-
Height*Sex	-	-	-	-	-	-	-	-	-	-0.02	0.03	.430
Focal Interaction	-0.12	0.03	<.001	0.18	0.03	<.001	0.17	0.03	<.001	0.04	0.03	.140
Focal Interaction*Sex	0.11	0.03	<.001	-0.07	0.02	.008	-0.07	0.03	.012	-0.01	0.03	.607

How important is body attractiveness?

Table 6 shows that individuals' bodies were important to their overall attractiveness in dynamic interactions with real people – something that had not been directly demonstrated before. A model including a sex interaction term for each individual predictor (e.g. *Bodily Attractiveness*Sex*) showed that body attractiveness ($p = .010$) and facial attractiveness ($p = .015$) were more important to female attractiveness than to male attractiveness. On the other hand, personality attractiveness was more important to male attractiveness than to female attractiveness ($p < .001$). Full results of this analysis can be found in the supplementary materials (S3).

Table 6.

MLM γ coefficients for associations between body attractiveness and overall attractiveness.

	Rated Overall Attractiveness (1-7)	
Predictors	*γ* (SE)	
	Male Targets	**Female Targets**
Bodily Attractiveness	0.26 (0.02)***	0.32 (0.02)***
Facial Attractiveness	0.32 (0.02)***	0.40 (0.02)***
Personality Attractiveness	0.44 (0.02)***	0.32 (0.02)***

Note: ***p < .001; **p < .01; *p < .05.

Do these preferences shape speed-date choices?

To determine whether the pattern of results identified for the bodily attractiveness and overall attractiveness variables was consistent with their speed-dating choices, the same analyses were repeated with the Date variable. For male targets, all associations were consistent with previous analyses (see Table 7).

Table 7.

Male MLM Models for Date (Y/N): Models are named for the variables they include. The first row contains univariate models estimating main effects for each body measurement. The second row contains multivariate models with interaction terms representing well-known ratios as well as main effects for their constituent variables.

Main Effect Only Models											
	Shoulders			Waist			Hips			Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.24	0.10	.022	-	-	-	-	-	-	-	-	-
Waist	-	-	-	0.00	0.11	.968	-	-	-	-	-	-
Hips	-	-	-	-	-	-	0.05	0.11	.630	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.38	0.10	<.001
Interaction Models												
	Shoulders by Hips			Shoulders by Waist			Waist by Hips			Waist by Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.40	0.12	.001	0.75	0.17	<.001	-	-	-	-	-	-
Waist	-	-	-	0.55	0.17	.001	-0.04	0.15	.783	0.10	0.11	.353
Hips	0.20	0.12	.104	-	-	-	0.01	0.15	.930	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.42	0.11	<.001
Interaction	0.42	0.13	.002	0.54	0.15	<.001	-0.38	0.13	.003	-0.12	0.1	.226

Note: Waist is inverted, with positive coefficients indicating that smaller values are preferred.

For female targets, main effects were consistent with the exception of the positive effect for narrower hips, which was no longer significant. Additionally, the positive influence of lower waist-to-hip ratios and higher shoulder-to-hips ratios were no longer significant (see Table 8).

Table 8

Female MLM Models for Date (Y/N): Models are named for the variables they include. The first row contains univariate models estimating main effects for each body measurement. The second row contains multivariate models with interaction terms representing well-known ratios as well as main effects for their constituent variables.

Date Yes/No												
Main Effect Only Models												
	Shoulders			Waist			Hips			Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	-0.17	0.12	.148	-	-	-	-	-	-	-	-	-
Waist	-	-	-	0.29	0.12	.018	-	-	-	-	-	-
Hips	-	-	-	-	-	-	-0.17	0.13	.208	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.22	0.11	.041
Interaction Models												
	Shoulders by Hips			Shoulders by Waist			Waist by Hips			Waist by Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	-0.17	0.14	.207	0.07	0.17	.679	-	-	-	-	-	-
Waist	-	-	-	0.41	0.16	.013	0.37	0.15	.011	0.39	0.12	.001
Hips	-0.09	0.13	.498	-	-	-	0.12	0.14	.413	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.29	0.12	.013
Interaction	0.18	0.12	.125	0.05	0.13	.688	0.15	0.12	.197	0.14	0.11	.210

Note: Waist and Hips are inverted, with positive coefficients indicating that smaller values are preferred.

* Maximal model did not converge, random intercept only model used.

In terms of sex differences, the effect of broader shoulders was still greater in men; however, there was no longer a sex difference for narrower waists. Additionally, the positive influence of higher shoulder-to-waist or shoulder-to-hips ratios was still greater in men; however, there was no longer a sex difference for lower waist-to-hip ratios (see Table 9).

Table 9

Unisex MLM Models for Date (Y/N): Models are named for the variables they include. The first row contains univariate models estimating main effects for each body measurement. The second row contains multivariate models with interaction terms representing well-known ratios as well as main effects for their constituent variables.

Main Effect Only Models												
	Shoulders			Waist			Hips			Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.01	0.08	.904	-	-	-	-	-	-	-	-	-
Waist	-	-	-	0.16	0.08	0.046	-	-	-	-	-	-
Hips	-	-	-	-	-	-	-0.10	0.08	.203	-	-	-
Height	-	-	-	-	-	-	-	-	-	0.30	0.09	<.001
Sex	0.36	0.09	<.001	0.37	0.09	<.001	0.37	0.09	<.001	0.38	0.09	<.001
Sex Interaction	-0.20	0.08	.010	0.13	0.08	.089	-0.05	0.08	.476	-0.08	0.07	.246
Interaction Models												
	Shoulders by Hips			Shoulders by Waist			Waist by Hips			Waist by Height		
Predictors	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*	γ	SE	*p*
Shoulders	0.10	0.09	.307	0.41	0.12	.001	-	-	-	-	-	-
Waist	-	-	-	0.49	0.12	<.001	0.16	0.10	.111	0.24	0.08	.002
Hips	-0.15	0.09	.094	-	-	-	0.07	0.10	.478	-	-	-
Height	-	-	-	-	-	-	-	-	-	-	-	-
Sex	0.23	0.10	.018	0.19	0.10	.056	0.29	0.10	.005	0.40	0.09	<.001
Shoulders*Sex	-0.28	0.09	.002	-0.31	0.12	.010	-	-	-	-	-	-
Waist*Sex	-	-	-	-0.11	0.12	.329	0.19	0.10	.067	0.12	0.08	.113
Hips*Sex	0.05	0.09	.586	-	-	-	0.05	0.10	.629	-	-	-
Height*Sex	-	-	-	-	-	-	-	-	-	-0.08	0.08	.300
Focal Interaction	-0.07	0.09	.418	0.26	0.09	.004	0.25	0.08	.001	0.01	0.07	.892
Focal Interaction*Sex	0.29	0.09	.002	-0.22	0.09	.009	-0.09	0.08	.251	0.13	0.07	.083

Note: Waist is inverted, with positive coefficients indicating that smaller values are preferred.

Individuals' bodies were still predictive of their likelihood of receiving a date, as were their faces and personalities; however, there were no longer any sex differences (*p*s > .16), see Table 10.

Table 10.

MLM γ coefficients for associations between body attractiveness and date (Y/N).

	Date (Y/N)	
Predictors	*γ* (SE)	
	Male Targets	**Female Targets**
Bodily Attractiveness	0.13 (0.04)**	0.17 (0.04)***
Facial Attractiveness	0.32 (0.04)***	0.36 (0.04)***
Personality Attractiveness	0.25 (0.03)***	0.19 (0.03)***

Note: ***p < .001; **p < .01; *p < .05.

Discussion

Previous research into the visual determinants of bodily attractiveness has used images of inert, faceless bodies on a computer screen or sheet of paper. Here, using 75 lab-based speed-dating sessions, we estimated attractiveness of various body dimensions based on ratings in 2161 live, face-to-face interactions. In line with previous findings, our more ecologically valid study showed that women with smaller waists and lower WHRs were found more attractive, and taller men with broader shoulders and lower shoulder-to-hips (or waist) ratios were found more attractive. Contrary to recent studies that suggested WHR does not contribute to attractiveness above and beyond a narrow waist (Brooks, Shelly, Jordan, & Dixson, 2015; Lassek & Gaulin, 2016), our results indicate that WHR does make a significant unique contribution to female attractiveness, though its effect is much smaller than absolute waist circumference. By contrast, the male shoulder-to-waist (or shoulder-to-hip) ratio has a strong influence on male attractiveness, with an interaction term much larger than the female WHR.

We found that broad shoulders and a high shoulder-to-waist or shoulder-to-hips ratio were more attractive in men than in women, consistent with intersexual selection contributing to the large sex difference in these features. We also found a sex difference in the degree to which men and women prefer low WHRs; however, this was in the opposite direction to what we would have expected a priori, with women preferring lower WHRs to a stronger degree. Importantly, this does not indicate that women prefer waist-to-hip ratios more extreme in men than men prefer in women, but rather that women prefer a lower waist-to-hip ratio relative to the male specific norm than men do relative to the female specific norm. Though previous research in this area has placed greater emphasis on the theoretical reasons for preferring low WHRs in women, higher WHRs have been associated with erectile dysfunction in men (Giugliano et al., 2004; Heidler et al., 2007; Zambon et al., 2010). We also did not find the predicted sex difference in height preferences. Women's height has generally not been associated with attractiveness in previous studies using on-screen models (but see Brooks et al., 2015; Rilling et al., 2009), and sex differences in height preference have been found in many other self-reported preference studies, which generally find that women prefer above-average to tall men while men prefer average-height women (reviewed by Courtiol, Raymond, Godelle, & Ferdy, 2010). Further, women self-report valuing height more than do men (Buss & Barnes, 1986). However, because body height cannot be properly appreciated on a screen or sheet of paper, previous findings may have reflected participants' stereotypes about what is attractive in men and women more than their actual preferences (Ledgerwood, Eastwick, & Smith, 2018). Also, awareness of preferences could be limited if it is a correlate of height – such as long legs (Brooks et al., 2015) – that is attractive in women rather than height *per se*. As well as indicating formidability, which is thought to be beneficial mainly to men (Puts, 2010), tallness might be preferred as an indicator of general condition (Perkins, Subramanian, Davey Smith, & Özaltin, 2016), which is beneficial to both sexes.

For the first time, we demonstrated the importance of body attractiveness when judging potential partners in real-time. We showed that body attractiveness is important to the overall attractiveness of both sexes, even when other cues such as facial and personality attractiveness vary. Also, our results demonstrated that body and facial attractiveness are more important to men than to women, whereas personality attractiveness is more important to women than to men. These findings are consistent with Sexual Strategies Theory (Buss & Schmitt, 1993) and cross-cultural self-report findings (Buss, 1989) that physical features rank higher in men's preferences than in women's. Nonetheless, our study has several limitations. First, participants were university students who opted into a speed-dating study. It is therefore possible that our sample contained men and women who were more confident in dating scenarios and thus potentially more physically attractive than the general population. However, both sexes used the full body attractiveness scale, suggesting that – in the eyes of participants – their partners spanned the full range of body attractiveness. Second, participants' evaluations were based on three minute interactions with opposite sex partners. It is possible that personality ratings, relative to body and facial ratings, would have been more influential if participants had greater knowledge of participants' personalities. In this way, our estimate regarding proportion of overall attractiveness attributed to body attractiveness may be specific to short interactions. Additionally, as our attractiveness ratings were general (i.e. not specified as short- or long-term contexts) it is not possible to determine the context participants had in mind when rating partners. Third, our sample contained only young, Western undergraduate students, and so we do not make claims about the universality of these results. Fourth, this study used linear modeling. While it is highly likely that these relationships are non-linear when extreme values are included (e.g. malnourished and obese individuals), they did not significantly depart from linearity within the range of body types of participants in our study. Correlation tables for all included variables can also been seen in

Supplementary material S4. Fifth, the speed-dating paradigm necessitates that one sex is seated while the other sex 'rotates' from partner to partner. When seated, it is difficult to appreciate height. To test whether this influenced our results, we counterbalanced the rotating sex and ran *height by rotating sex* interactions (see supplementary material S5). No interaction term was significant, thereby suggesting that the time participants spent unseated (e.g. milling outside and walking into the room) was sufficient, or that height can be adequately perceived in the sitting position. Last, though using interaction terms in place of ratios is statistically more sound, this prevented us from using known comparison points that are specific to ratios (e.g. WHR .70). To address this, we have provided supplementary figures (S6) that show body attractiveness as a function of all of the included ratios. For WHR, we also include comparison points for the ideal ratios for both men (.90) and women (.70)

Future research examining body attractiveness should evaluate both sexes regardless of whether their hypotheses are sex-specific. Although examining the attractiveness of women's dimensions and men's dimensions in separate studies can be informative, the numerous differences in study design and sampling make between-sex comparisons difficult. Without between-sex comparisons, it is not possible to conclude that a trait is preferred by one sex in particular; as illustrated with our height example, the case may be that it is preferred by both sexes similarly. Evolutionary explanations are often shaped by ideas about traits being preferred more strongly (or exclusively) by one or the other sex, so it is important to routinely include both sexes in studies testing evolutionary hypotheses. Furthermore, though our findings largely support findings from studies using inert stimuli, we encourage more mate-preference research involving face-to-face human interactions to ensure that conclusions from computer-based studies apply in more ecologically valid situations.

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