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Age differences in preferences for body physique

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A R T I C L E I N F O

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A B S T R A C T

Studies have demonstrated the importance of body weight in physical attractiveness, where thinness in women and leanness and muscularity in men are judged to be attractive. However, most research has focused on young adults, while less has investigated whether attractiveness judgments of body weight change with age. Here, we compared young and older adults' preferences for body physique in a Chinese population using 3D human body models. We found that the attractiveness judgments of body physique vary with age, where older adults have weaker preference for thinness in both male and female bodies than did young adults. These results present novel evidence that preferences for body size alters with age. We propose that the variation in preference for thinness is likely due to the difference in resource availability between generations.

1. Introduction

Within the field of physical attractiveness, one cue that has received substantial attention is Body Mass Index (BMI, weight divided by squared height kg/m^2). Much evidence has suggested that BMI is a very important predictor of the judgment of female attractiveness (Crossley et al., 2012; Wang et al., 2015). From an evolutionary perspective, attraction functions to identify mates who are most likely to increase one's reproductive success (Buss & Schmitt, 1993; Symons, 1979), which evolved and inherited from our ancestors. Consequently, cues that indicate reproductive success are seen as attractive (Andrews et al., 2017).

A large number of studies have demonstrated the importance of weight in fertility and reproductive health. In men, obesity is negatively related to sperm mobility and normality (Fejes et al., 2006; Hofny et al., 2010; Jensen et al., 2004). Note that underweight men also have lower sperm concentration and total sperm count compared to normal weight men, although semen volume and percentage of motile sperm were not related to low BMI (Jensen et al., 2004). The impact of obesity on female fertility is also well documented. Obesity is positively associated with the rate of miscarriage regardless of the mode of conception. A meta-analysis revealed that obese women have higher odds of miscarriage when conceived naturally or following oocyte donation (Metwally et al., 2008). The deleterious effect of obesity is not limited to conception. Obesity is positively linked to birth defects also. One meta-analysis revealed increased risks of anencephaly, spina bifida, cardiac septal anomalies l, hydrocephaly in babies of obese women (Stothard et al., 2009). Furthermore, obesity was found to be linked to the polycystic ovarian syndrome, which could lead to irregular periods, excess androgen levels, and polycystic ovaries, consequently causing fertility problems (Barber et al., 2006; Lim et al., 2013; Vrbikova & Hainer, 2009).

Nonetheless, it should be kept in mind that excessive thinness is harmful to fertility as well. Underweight, excessive weight loss and excessive exercise are common causes of menstrual dysfunctions like amenorrhoea (Frisch, 2004; Stokić et al., 2005; Støving et al., 1999). Women who have low BMI (e.g., BMI <18) like athletes and those having eating disorders are more likely to develop amenorrhoea, which is due to endocrine alterations, such as lowered estrogen levels (Ackerman & Misra, 2018; Hamilton-Fairley & Taylor, 2003; Ledger & Skull, 2004). When weight is put back on, resumption of menstrual cycling is observed (Ackerman & Misra, 2018; Arends et al., 2012).

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Apart from the adverse effects on reproductive health, obesity is detrimental to general health, especially cardiovascular, which influences reproduction indirectly. Many studies have shown that overweight people are at a higher risk for many cardiovascular diseases, including heart attacks, stroke, Type 2 diabetes, hypertension (Aune et al., 2016; GBD 2015 Obesity Collaborators, 2017; Khan et al., 2018), and some cancers like endometrial, breast, and colon cancer (Bhaskaran et al., 2014). Mortality was found to be lowest in the normal BMI range (20–25 kg/m^2), below or above the range was positively associated with overall mortality (Di Angelantonio et al., 2016). In a systematic review, both obesity and underweight were associated with shorter life expectancy (Bhaskaran et al., 2018).

Consistent with the healthy BMI range, studies investigating female physical attractiveness found that BMI of around 18–20 kg/m^2 is judged to be most attractive in Western countries (Swami, Neto, et al., 2007; Tovée et al., 2012), but the associated BMI of most attractive female bodies is lower in Asians. For example, this figure is 18.43 kg/m^2 among Japanese participants (Swami et al., 2006) and 17.28 kg/m^2 among Malaysian Chinese participants (Stephen & Perera, 2014a). In contrast to a relatively lower BMI being attractive in females, the most attractive male body is associated with a higher BMI. Swami, Smith, et al. (2007) reported that a male body representing a BMI of 21.34 kg/m^2 is perceived to be most attractive in Greek and 23.07 kg/m^2 in British. Notably, the preferred BMIs found in previous studies are within the healthy BMI range, except in the Chinese population, which might reflect the drive for finding healthy and fertile mates.

Given that preferences for thin female bodies and lean male bodies might function to identify fertile mates, one may expect conspecifics who are in the infertile phase, like pre-pubescents and post-menopause women, might have weaker preferences for traits that signal one's fertility. For example, the waist-to-hip ratio that is seen as most attractive by adults is not preferred by young children but is preferred by teenagers (Connolly et al., 2004). On the other hand, some studies have shown that post-menopausal women show weaker preferences for masculine male faces, which are argued to signal men's mate values (Jones et al., 2011; Little et al., 2010; Marcinkowska et al., 2017). In contrast, one study has found that preferences for BMI do not vary with the observer's age (George et al., 2008). The authors explained that the constant preferences might be beneficial as observers of different ages are able to consciously compensate for the lack of mate values by targeting potential mates with appropriate levels of attractiveness. Both explanations seem plausible. However, studies of the age effect on BMI preferences are limited. Hence, more evidence is required to test the two hypotheses.

In the current study, we used 3D human body images to examine possible age differences in the preferences for BMI and body fat in the Chinese population. Recent studies have demonstrated the importance of body fat in preferences for body physique as the body shape of individuals with various body fat appear different given the same BMI (Brierley et al., 2016; Lei et al., 2018). Therefore, we employed both measures in the current study. Since both hypotheses are plausible, we do not have specific predictions.

2. Method

All work was approved by the Ethics Committee of the affiliated University. All participants gave informed consent.

2.1. Participants

A total of 178 participants were recruited from the affiliated University and local retirement home. Individuals who had psychiatric or neurological disorders or were taking psychotropic medications were not eligible to participate. All participants had a normal or corrected-to-normal vision. None of the female participants were pregnant or using hormonal contraception. All participants were Chinese and lived in China. Data from one older adult participant was excluded due to missing age information. Thus, the final data set consisted of 43 older men ($M_{age} \pm SD = 65.93 \pm 4.26$, range 55–82 years, who were born between 1937 and 1964), 48 older women ($M_{age} \pm SD = 67.44 \pm 5.61$, range 60–87 years, who were born between 1932 and 1959), 43 young men ($M_{age} \pm SD = 23.88 \pm 3.30$, range 19–36 years, who were born between 1983 and 2000), and 43 young women ($M_{age} \pm SD = 24.00 \pm 3.86$, range 18–32 years, who were born between 1987 and 2001). A power analysis indicated that a sample size of 39 participants in each group would be sufficient to obtain the power of 80% for a medium to large effect size ($d = 0.65$). Participants were paid at a rate of 40 Chinese currency per hour.

2.2. Stimuli

The stimuli consisted of male and female body models obtained from the app “BMI 3D PRO”, which have been used in a previous study (Lei & Perrett, 2021). One male and one female human body model (front view) were adjusted, covering a wide range of BMI in 1 unit intervals (16–28 kg/m^2 for female and 18–30 kg/m^2 for male). At each BMI level, the body models were then adjusted to represent different levels of body fat percentage (fat mass/total body mass; hereafter referred to as BF). For the male stimuli, the body was adjusted to represent BF from 12% to 28% in 2 units intervals. The female body was adjusted to cover BF from 20% to 32% in 2 units intervals. Since it was impossible to adjust the bodies to represent a high BF for bodies with a low BMI level, bodies at low BMI levels did not cover the full BF range (see Tables S1 & S2 in supplementary materials). This resulted in 81 male stimuli and 48 female stimuli in total. The head was cropped to remove confounding information (see Fig. 1). All images were resized to 540 × 680 pixels.

2.3. Procedure

The body preference task was conducted on a computer in a quiet room. Participants were first asked to complete a demographic questionnaire about age, sex, sexual orientation, ethnicity, and residence. Participants were then asked to rate the attractiveness of each stimulus on a nine-point Likert scale from 1 (very unattractive) to 9 (very attractive). There was no time limit to make judgments. To minimize fatigue, each participant was randomly shown half of the stimuli for each sex. Male and female stimuli were presented in separate blocks. The order of the two blocks was counterbalanced. Each body stimulus within the block was also presented in random order.

2.4. Statistical analysis

Prior to the main analysis, we carried out a correlation test to check the association between average male rating and average female rating of attractiveness judgments on BMI and BF. Consistent with previous studies (George et al., 2008; Tovée & Cornelissen, 2001), the attractiveness ratings made by male and female participants were highly correlated (BMI: $r = 0.88$, $p < .001$; BF: $r = 0.94$, $p < .001$). Therefore, following previous studies, we pooled male and female responses together in subsequent analysis. Nonetheless, data were analyzed separately for ratings of male and female bodies.

Firstly, line charts were used to explore the potential relationships between BMI and attractiveness ratings and also between BF and attractiveness ratings by body image gender and age group, respectively (Fig. S1). Consistent with previous research (George et al., 2008; Tovée & Cornelissen, 2001), the pattern of the line charts (Fig. S1a & b) indicated that the relationship between BMI and attractiveness judgment was likely to be quadratic. To confirm whether including a quadratic BMI term significantly improved the fit of the model, we performed a model comparison between the quadratic model and the linear model. Specifically, in the quadratic model, the dependent variable was the attractiveness ratings (1–9), and the independent variables

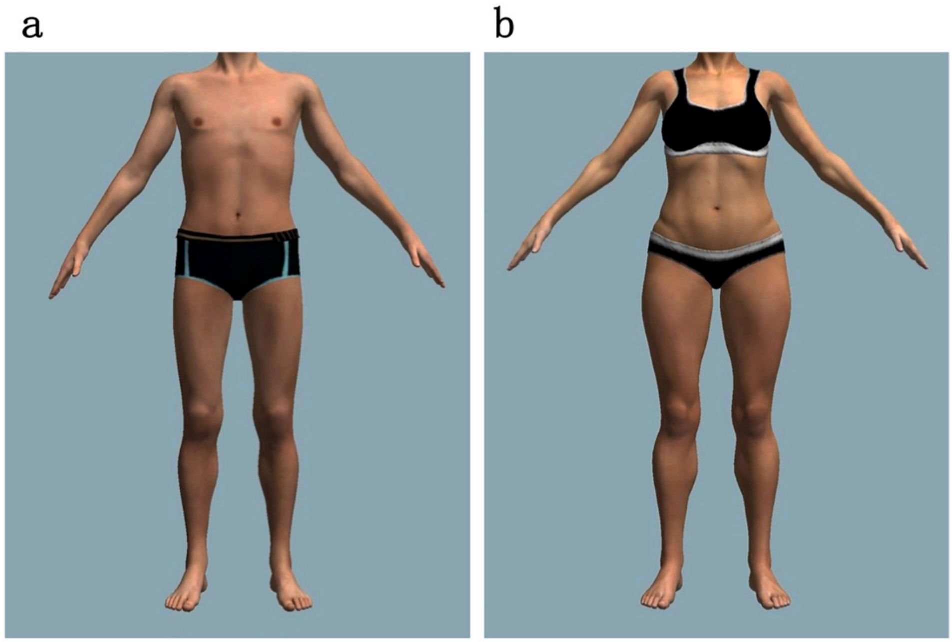

Fig. 1. Examples of a male (a) and female (b) body image stimuli.

were linear BMI term, quadratic BMI term, age groups of raters, the interaction between linear BMI term and age groups, and the interaction between quadratic BMI term and age groups. The linear model was the same as the quadratic model, except the linear model excluded the quadratic BMI term and its interaction with age groups. Additionally, BF was added into both the quadratic model and the linear model as a control variable. Data were analyzed using the linear mixed model in R version 3.6.0 (R Core Team, 2019), with lmerTest version 3.1.0 (Kuznetsova et al., 2017). The independent variable age group was effect coded as young participant: −0.5 and older participant: +0.5. These models specified random intercepts for participants. Random slopes were specified maximally, following Barr (2013) and Barr et al. (2013).

In addition, if the relationship between attractiveness ratings and BMI was curvilinear (i.e., the quadratic BMI term significantly predicted attractiveness ratings), then the estimated peak BMI preferences (i.e., the BMI value predicted by the apex in the quadratic function) and the quadratic gradients of BMI preference (i.e., the absolute value of second derivation of quadratic function, which equals to the absolute beta value of quadratic BMI term multiplying two, see details in code document in supplementary materials) were calculated for each age group based on the fitted models. The larger value of the quadratic gradient of BMI preference, the sharper changes of attractiveness ratings with BMI changes, which indicated the higher sensitivity of attractiveness judgment to BMI changes. The same analysis procedure was conducted for BF as for BMI. For more analysis details, please see the supplementary material.

3. Results

3.1. Male BMI and attractiveness

Model comparison showed that the quadratic model was a significantly better fit than the mixed linear model (linear model vs. quadratic model: AIC 23422 vs. 22,238, $\chi^2 = 1191$, $p < .001$). Therefore, we selected the quadratic model and reported its results. There were main effects of linear BMI term (*beta* = 1.76, *SE* = 0.06, $t(6600) = 30.33$, $p < .001$) and quadratic BMI term (*beta* = −0.03, *SE* = 0.01, $t(3879) = -27.72$, $p < .001$), indicating that male BMI was related to ratings of attractiveness in a curvilinear fashion. Very low and very high BMI was rated as relatively unattractive. Additionally, there were significant interactions between linear BMI term and age group (*beta* = −0.45, *SE* = 0.11, $t(6555) = -3.94$, $p < .001$) and between quadratic BMI term and age group (*beta* = 0.01, *SE* = 0.00, $t(3778) = 4.09$, $p < .001$), indicating that young participants and older participants differed significantly in their attractiveness judgments for male BMI.

These interactions were interpreted by examining the associations between attractiveness ratings and linear BMI term as well as quadratic BMI term in each age group. The attractiveness ratings were significantly associated with linear BMI term (young: *beta* = 2.07, *SE* = 0.08, $t(2828) = 25.03$, $p < .001$; older: *beta* = 1.46, *SE* = 0.08, $t(3390) = 17.89$, $p < .001$) and quadratic BMI term (young: *beta* = −0.04, *SE* = 0.01, $t(1082) = -22.72$, $p < .001$; older: *beta* = −0.03, *SE* = 0.01, $t(2023) = -16.10$, $p < .001$) in both age groups. The estimated peak BMI preference was significantly lower in young participants (BMI = 25.75) than in older participants (BMI = 26.47). In addition, the quadratic gradient was significantly larger in young participants (0.08) than older participants (0.06).

In sum, the lower estimated peak BMI preferences indicated that young participants preferred thinner male bodies, and the higher gradient of BMI preferences indicated that young participants were more sensitive to BMI changes on male body attractiveness compared with older adult participants (see Fig. 2a).

3.2. Female BMI and attractiveness

Model comparison showed that the quadratic model had significantly better fit than the linear model (linear model vs. quadratic model: AIC 13868 vs. 13,298, $\chi^2 = 577.03$, $p < .001$). Therefore, we selected quadratic model and reported its results. There were main effects of linear BMI term (*beta* = 1.38, *SE* = 0.07, $t(3285) = 18.87$, $p < .001$) and quadratic BMI term (*beta* = −0.03, *SE* = 0.01, $t(1461) = -18.16$, $p < .001$), indicating that female BMI was related to ratings of attractiveness in a curvilinear fashion. Additionally, there was a significant interaction between linear BMI term and age group (*beta* = 0.35, *SE* = 0.14, $t(3198) = 2.48$, $p = .013$), but the interaction between quadratic BMI term and age group was not significant (*beta* = −0.01, *SE* = 0.01, $t(1400) = -1.44$, $p = .149$). The significant interaction between BMI and age group indicated that young adults and older adults differed significantly in their attractiveness judgments for female BMI.

These interactions were interpreted by examining the associations

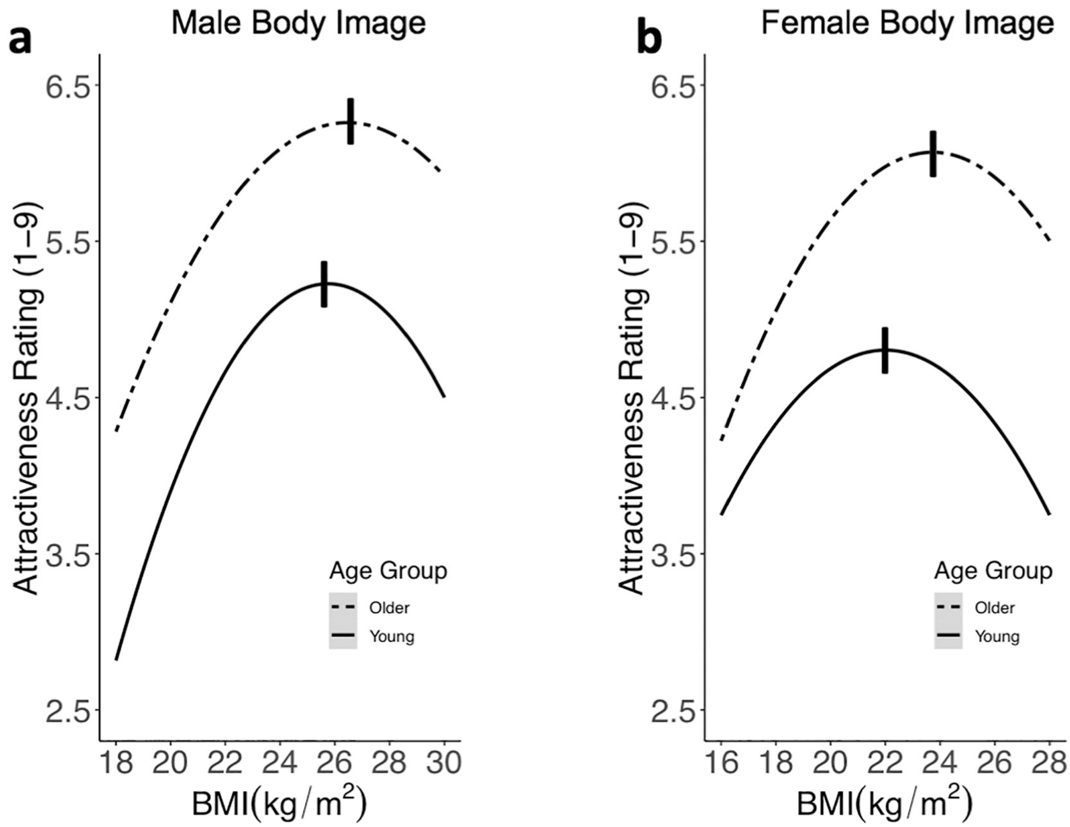

Fig. 2. The relationship between BMI (kg/m^2) and attractiveness ratings. The short black vertical line marks the estimated peak BMI preferences (i.e., turning point). (a) The quadratic relationship between *male* BMI and attractiveness ratings on each age group. (b) The quadratic relationship between *female* BMI and attractiveness ratings on each age group.

between attractiveness ratings and linear BMI term as well as quadratic BMI term in each age group. The attractiveness ratings were significantly associated with linear BMI term (young: *beta* = 1.29, *SE* = 0.10, *t*(5682) = 12.66, $p < .001$; older: *beta* = 1.46, *SE* = 0.08, *t*(3390) = 17.89, $p < .001$) and quadratic BMI term (young: *beta* = −0.03, *SE* = 0.01, *t*(1449) = −12.41, $p < .001$; older: *beta* = −0.03, *SE* = 0.01, *t*(2023) = −16.10, $p < .001$) in both age groups. The estimated peak BMI preference was significantly lower in young participants (BMI = 22.00) than in older participants (BMI = 23.72). However, the quadratic gradient was not significantly different between young participants (0.06) and older participants (0.06).

In sum, the lower estimated peak BMI preferences indicated that young participants preferred thinner female bodies, but the non-significant difference of the gradient of BMI preferences indicated that young participants showed similar sensitivity to BMI changes on female body attractiveness as older adult participants (see Fig. 2b).

3.3. Male BF and attractiveness

Model comparison showed that the quadratic model had significantly better fitness than the mixed linear model (linear model vs. quadratic model: AIC 23433 vs. 23,163, χ^2 = 278.19, $p < .001$). Therefore, we selected the quadratic model and reported its results. There were main effects of linear BF term (*beta* = 0.23, *SE* = 0.02, *t*(6943) = 10.09, $p < .001$) and quadratic BF term (*beta* = −0.01, *SE* = 0.01, *t*(6518) = −13.96, $p < .001$). Additionally, there was a significant interaction between linear BF term and age group (*beta* = 0.09, *SE* = 0.05, *t*(6944) = 1.98, $p = .048$), but the interaction between quadratic BF term and age group was not significant (*beta* = −0.01, *SE* = 0.01, *t*(6517) = −1.06, $p < .292$). The significant interaction between BF and age group indicated that young participants and older participants differed significantly in their attractiveness judgments for male BF.

These interactions were interpreted by examining the associations between attractiveness ratings and linear BF term as well as quadratic BF term in each age group. The attractiveness ratings were significantly associated with linear BF term (young: *beta* = 0.19, *SE* = 0.05, *t*(1877) = 3.56, $p < .001$; older: *beta* = 0.27, *SE* = 0.03, *t*(3389) = 8.81, $p < .001$) and quadratic BF term (young: *beta* = −0.01, *SE* = 0.01, *t*(5935) = −4.88, $p < .001$; older: *beta* = −0.01, *SE* = 0.01, *t*(8776) = −10.90, $p < .001$) in both age groups. The estimated peak BF preference was significantly lower in young participants (BF = 12.23) than in older participants (BF = 15.02). However, the quadratic gradient was not significantly different between young participants (0.02) than older participants (0.02).

In sum, the lower estimated peak BF preferences indicated that young participants preferred leaner male bodies, but the non-significant difference of gradient of BF preferences indicated that young participants showed similar sensitivity to BF changes on male body attractiveness as older adults participants (see Fig. 3a).

3.4. Female BF and attractiveness

Model comparison showed that the quadratic model had significantly better fitness than the mixed linear model (linear model vs. quadratic model: AIC 13909 vs. 13,578, χ^2 = 338.93, $p < .001$). Therefore, we selected the quadratic model and reported its results. There were main effects of linear BF term (*beta* = 0.89, *SE* = 0.09, *t*(3956) = 10.28, $p < .001$) and quadratic BF term (*beta* = −0.02, *SE* = 0.01, *t*(3966) = −11.90, $p < .001$). Additionally, there were significant interactions between linear BF term and age group (*beta* = 1.12, *SE* = 0.17, *t*(3959) = 6.74, $p < .001$) and between quadratic BF term and age group (*beta* = −0.02, *SE* = 0.01, *t*(3952) = −6.07, $p < .001$), indicating

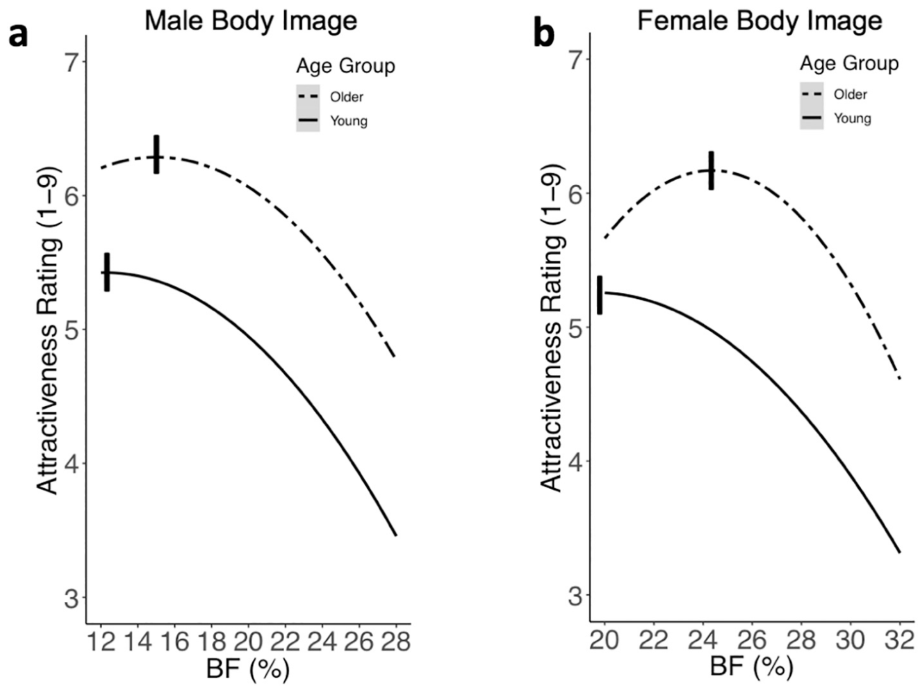

Fig. 3. The relationship between BF (body fat percentage) and attractiveness ratings. The short black vertical line marks the estimated peak BF preferences (i.e., turning point). (a) The quadratic relationship between *male* BF and attractiveness ratings on each age group. (b) The quadratic relationship between *female* BF and attractiveness ratings on each age group.

that young participants and older participants differed significantly in their attractiveness judgments for female BF.

These interactions were interpreted by examining the associations between attractiveness ratings and linear BF term as well as quadratic BF term in each age group. The attractiveness ratings were significantly associated with linear BF term (young: $beta = 0.50$, $SE = 0.12$, $t(1738) = 4.02$, $p < .001$; older: $beta = 1.30$, $SE = 0.12$, $t(1936) = 10.68$, $p < .001$) and quadratic BF term (young: $beta = -0.01$, $SE = 0.01$, $t(1177) = -5.16$, $p < .001$; older: $beta = -0.03$, $SE = 0.01$, $t(1958) = -11.67$, $p < .001$) in both age groups. The estimated peak BF preference was significantly lower in young participants (BF = 19.61) than in older participants (BF = 24.36). The estimated peak BF preference in the young participants was out of the BF range of the stimuli (i.e., between 20 and 32), which indicated that the relationship between BF and attractiveness rating from young participants were not quadratic in the current BF range (i.e., between 20 and 32). Therefore, to compare the sensitivity to BF changes on female body attractiveness between young and older participants, we re-analyzed female BF and attractiveness data, using a linear model, within the BF range from 25 to 32. The reason why we analyzed BF range between 25 and 32 is that the association direction (i.e., positive vs. negative) between BF and attractiveness judgment was not the same between young and older participants, until the BF range large than 24.36 (i.e., the estimated peak BF preference of young participants). The results of the linear model in the new BF range showed that the interaction between BF and age group was not significant ($beta = 0.01$, $SE = 0.02$, $t(1568) = 0.26$, $p = .792$). It indicated that young participants showed no significant difference to older adult participants on the sensitivity of BF changes on female body attractiveness for the BF range between 25 and 32.

In sum, the lower estimated peak BF preferences indicated that young participants preferred leaner female bodies (see Fig. 3b), but young participants showed similar sensitivity to BF changes on female body attractiveness as older adult participants.

Additionally, following one of the reviewer's suggestions, we conducted a further analysis that included participant sex in each main model. However, the interaction between participant sex and BMI or BF was not significant (for detailed results, please see supplementary materials). Moreover, the rest of the results were the same as the results reported above (i.e., when including participant sex in the analysis, the interactions between age group and BMI and BF were still significant).

4. Discussion

This study aimed to investigate whether different age groups show different preferences for body physique. Peak BMI preferences and preference gradients were compared across young and older adult groups in both men and women. We found that young participants showed greater preferences for low BMI and BF in both female and male bodies in comparison to older participants. These findings suggest that attractiveness judgments of body physique are not constant but vary with age.

The finding that preference for body size changes with age suggests that different age groups might have different mating strategies. Indeed, it has been demonstrated in previous studies that preferences for sexual dimorphism in faces are reduced in older adults (Little et al., 2010; Marcinkowska et al., 2017). Specifically, older or post-menopausal women showed weaker preferences for masculine male faces, and older men also showed weaker preferences for feminine female faces. These findings have been explained with respect to life history theory (Bribiescas, 2006; Hawkes et al., 1998). It asserts that older men and women would shift away from mating-oriented psychology to family-oriented psychology due to the decrease in fertility. As a result, older adults are less sensitive to attractive physical cues, including body size.

In contrast to these findings and our own, one study found that the judgment of the most attractive female body figure did not vary with age in a Western population (George et al., 2008). The authors explained that it might be advantageous for observers to have consistent criteria for attractiveness judgments because it would enable one to effectively target the potential mates with similar levels of mate values as one's mate value changes. If so, one would expect no individual differences in mate preferences. However, many studies have revealed multiple individual differences in attractiveness judgments. For example, self-rated attractiveness, financial worries, pathogen disgust sensitivity, self-reported status, and relationship status were all found to influence women's preference for men's facial masculinity (see Holzleitner & Perrett, 2017). Likewise, several studies found assortative mating for body size with thinner individuals find thinner opposite-sex bodies attractive, and vice versa (Stephen & Perera, 2014b; Tovée et al., 2000). These findings imply that mate preferences are very likely to depend on one's own condition. Therefore, the consistent preference for body size between different ages found by George et al. (2008) may not be due to the so-called advantages that the authors proposed. In fact, evidence is mounting that preferred body size is largely influenced by media and resource availability.

A considerable amount of research has revealed the effect of media exposure on body ideals in both women and men, adults, adolescents, and children (Fardouly & Vartanian, 2016; Grabe et al., 2008; Harrison & Hefner, 2006; Tiggemann & Zaccardo, 2015). To be specific, the female body ideal is characterized by thinness (Fouts & Burggraf, 2000; Grabe et al., 2008), and the male body ideal is defined as lean muscular (Boyd & Murnen, 2017; Pope et al., 2000). Therefore, the preference for lower BMI by young Chinese might reflect the media impact on the ideal body in young populations. In a large cross-cultural study, general Western media exposure (including television, movies, magazines, and music) was found to predict preference for thin female bodies in men and thin ideal body size in women (Swami et al., 2010). Recently, Boothroyd et al. (2016) found that people from areas with low TV access selected a larger female body as their most preferred, and they were more tolerant of heavier female bodies than their counterparts from areas with high TV access. In line with this finding, one study showed that Fiji (a traditional society) adolescent girls developed disordered eating attitudes and behaviors after the introduction of TV for three years (Becker et al., 2002). Further interviews of this study suggest that eating disorders were indeed due to the desire for looking like the Western characters they saw on TV. Similar to Western populations, young Chinese also feel great pressure from comparisons with and preferences for the physical appearance of celebrities from media (Jackson et al., 2016). Therefore, the preference for a lower BMI in young Chinese found in the present study might reflect an impact from media. Although older adults have more time to watch TV, they are less influenced by media and put less importance on appearance (Pruis & Janowsky, 2010; Tiggemann, 2004). Consequently, a discrepancy of preference for body size between young and old groups is observed.

On the other hand, young adults are generally more physically attractive and have higher mate values than older adults. Given that young adults are in a better position in the mating market, they would/could be choosier and have a stricter preference for BMI and BF (i.e., low BMI and low BF that are frequently exposed on social media as ideal body image), compared to older adults. As individuals grow older and generally be less physically attractive, older adults would become less choosy and have weaker preferences for low BMI/BF to avoid intense intra-sexual competition in the mating market. Consequently, older adults may give averagely higher ratings in body attractiveness judgment tasks than young adults, which were shown in the current results. However, our data only included young and older adults but not the full age range of adults. Future studies may assess age-related changes in body preferences.

If the media impact could account for the discrepant body size preference between young and old adults, one would expect a similar discrepancy in other populations. As aforementioned, George et al. (2008) did not find such a discrepancy. Hence, we propose an alternative explanation, which focuses on the influence of resource availability on body size preference. Zulu people who moved to the UK showed substantially lower preferences for BMI compared to local Zulu observers (Tovée et al., 2006). Instead, they showed a preference more similar to British Caucasians, although Zulu migrants preferred female bodies are still larger than native British. The authors explained this preference difference between local Zulu and Zulu migrants as a result of adaptation to the local environment. As fertility and general health are associated with a lower weight in the UK but a higher weight in South Africa, Zulu migrants should change their preference for better survival and reproductive success. Indeed, plumpness is valued in many traditional or rural areas (Swami, 2015). A well-known explanation is the preference for heaviness is an adaptation to increase one's reproductive success as thinness indicates low fertility (Frisch, 2004; Tovée & Cornelissen, 2001). Furthermore, researchers found that men who were hungry rated heavier female bodies as more attractive in comparison to men who were satiated (Swami & Tovée, 2006). Similarly, men reported an increased preference for female facial adiposity after ten days in an army training camp (Batres & Perrett, 2017). In light of these findings, the high peak preference for BMI we observed in older Chinese might reflect their adaptation to harsh environments in the old days. The older Chinese tested in this study experienced a long period of harsh environment (or poverty), including famine due to the under development in China in the last mid-century. As a result, they might have developed a preference for large body size because thinness indicated poor fertility in women (Frisch, 2004) and poor strength in men (Holzleitner & Perrett, 2016). In sharp contrast, the UK was more developed than China in the 20th century, which means the older and younger populations in George et al. (2008) study may have experienced similar levels of economic development. Hence, no discrepancy of preference for body size was observed in that sample. However, we notice that the explanation above is based on the assumption that compares to the impact from one's adulthood resource access, childhood resource access has a larger impact on their body preference. Hence, the explanation remains speculative. Future studies may set out to further explore the relationship between childhood/adulthood resource access and body preferences (e.g., SES, Griskevicius et al., 2011).

Consistent with previous findings (Swami, Neto, et al., 2007; Tovée et al., 1999; Tovée et al., 2012), thinness was found to be most attractive in female bodies in young Chinese. However, it should be noted that a curvilinear relationship between BMI and physical attractiveness was found in Western participants, with both an extremely low and extremely high BMI were seen as least attractive, while slightly thinness was seen as most attractive in women. In comparison, although the curvilinear term was found to be significant in this study, the peak preference for women's BMI was found to be around 22 kg/m^2 by young Chinese in this study, whereas this figure is 23 kg/m^2 in British using the same stimuli (Lei & Perrett, 2021). The peak BMI predicted by the model suggests that Chinese have a stronger preference for thinness than their Western counterparts. Indeed, it has been demonstrated that Asians prefer substantially lower BMI in female bodies compared to Whites. For example, Japanese judged a significantly lower BMI in female bodies (18.97 kg/m^2) as most attractive compared to British (20.97 kg/m^2) (Swami et al., 2006). Similarly, the most attractive female body has a BMI of around 17 kg/m^2 among Malaysian Chinese (Stephen & Perera, 2014a). The cultural difference in preferred body size has been explained as a psychological adaptation to local environments (Stephen & Perera, 2014a; Swami et al., 2006). From an evolutionary psychology point of view, perception of attractiveness reflects psychological adaptations for identifying healthy potential mates. Since the optimal BMI for health is lower for Chinese compared to White Europeans (WHO, 2004), Chinese should prefer thinner partners in comparison to their Western counterparts.

This study also extends previous research by demonstrating that young Chinese have a preference for lean muscular men like their Western counterparts. Research in the field of male physical attractiveness revealed that lean muscular male bodies are judged as most attractive (Boyd & Murnen, 2017; Pope et al., 2000). However, this finding is limited in Western populations. Less is known about whether this male ideal is valued in a different culture. Results from the current study showed that male bodies with medium BMI (~25 kg/m^2) and low body fat (~12%) are judged as most attractive in young Chinese populations. The similarity in attraction to lean muscular male bodies might be the result of media influence. A growing number of studies have shown a positive relationship between drive for muscularity in men and media exposure as well as media internalization (Daniel & Bridges, 2010; Pritchard & Cramblitt, 2014). As the body ideals of young Chinese are similarly influenced by the media (Jackson et al., 2016), they should show a preference for the male ideal characterized by the media, which is the lean muscular body.

In summary, the current study found that preferences for body size change with age, with older adults preferring heavier bodies compared to young adults. We suggest that this age difference might reflect the different experiences of resource availability.

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Data statement

The Experiment reported in this article was not formally preregistered. The requests for the data or code can be sent via email to leixue@zufe.edu.cn.

CRediT authorship contribution statement

XL and CH developed the study concept. CH and XL designed the study. PY and XL collected the data. CH and XL analyzed the data. CH and XL wrote the first version of the paper. EM, PY and XL provided critical revisions. All authors approved the final version for submission.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2021.111033.

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