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Women's attractiveness is linked to expected age at menopause

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Abstract

A great number of studies have shown that features linked to immediate fertility explain a large part of the variance in female attractiveness. This is consistent with an evolutionary perspective, as men are expected to prefer females at the age at which fertility peaks (at least for short-term relationships) in order to increase their reproductive success. However, for long-term relationships, a high residual reproductive value (the expected future reproductive output, linked to age at menopause) becomes relevant as well. In that case, young age and late menopause are expected to be preferred by men. However, the extent to which facial features provide cues to the likely age at menopause has never been investigated so far. Here, we show that expected age at menopause is linked to facial attractiveness of young women. As age at menopause is heritable, we used the mother's age at menopause as a proxy for her daughter's expected age of menopause. We found that men judged faces of women with a later expected age at menopause as more attractive than those of women with an earlier expected age at menopause. This result holds when age, cues of immediate fertility and facial ageing were controlled for. Additionally, we found that the expected age at menopause was not correlated with any of the other variables considered (including immediate fertility cues and facial ageing). Our results show the existence of a new correlate of women's facial attractiveness, expected age at menopause, which is independent of immediate fertility cues and facial ageing.

Introduction

Why some women are more attractive than others has been the focus of many studies, and it has been repeatedly shown that features linked to immediate fertility (i.e. fertility at a given time) explain a large part of the variance in attractiveness (see Rhodes, 2006 for a review). Cues of immediate fertility can be found in body shape, voice pitch or facial features; in fact, all traits linked to sexual maturity, age and parity or substantially influenced by sex hormones (which are factors influencing immediate fertility) have the potential to influence physical attractiveness (see, e.g. Symons, 1995; Henss, 2000; Singh, 2002; Jasienska *et al.*, 2004; Feinberg *et al.*, 2005; Law Smith *et al.*, 2006; Pipitone & Gallup, 2008; Singh *et al.*, 2010; Little *et al.*, 2011; Puts *et al.*, 2012, 2013; Pfluger *et al.*, 2012; Jones, 2014; Mondragón-Ceballos *et al.*, 2015; Sugiyama, 2015; Butovskaya *et al.*, 2017 but see Marcinkowska *et al.*, 2014, 2015 for some modulations of these preferences). To increase their reproductive success, males should prefer females of the age at which age-specific fertility peaks, at least for short-term mates (Maestripieri *et al.*, 2014). For long-term relationships such as marriage, however, residual reproductive value —the expected future reproductive output—becomes pertinent too. In humans, this trend is strengthened by the existence of reproductive senescence or menopause (i.e. the permanent cessation of menstruation), associated with the ultimate cessation of child-bearing potential, long before the somatic senescence. Consequently, for long-term relationships, the number of offspring produced by the couple will depend in part on the number of years before the woman reaches menopause, particularly in natural fertility populations

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where reproduction could theoretically extend until menopause.

Thus, men can increase their reproductive success by choosing a long-term mate with a longer reproductive window (i.e. higher residual reproductive value). The first criterion of a long reproductive window is of course age. And indeed, youth is one of the most important factors of women's attractiveness (Buunk *et al.*, 2001). Then, for a given age, the temporal reproductive window will vary according to the age at menopause, which is highly variable both across and within populations (Avis *et al.*, 2001; Thomas *et al.*, 2001; Velde *et al.*, 2002; Dratva *et al.*, 2009; Morris *et al.*, 2011; Stepaniak *et al.*, 2013). If the future age at menopause is somehow detectable in young adults, it could contribute substantially to mate choice and thus influence female attractiveness. It is possible that previously identified components of immediate fertility are also informative of female residual reproductive value: reproductive value at a young age and later in life could be positively correlated due to some common underlying factors, or negatively correlated as a result of a biological trade-off (Hamilton, 1966; Wood *et al.*, 2001; Carter & Nguyen, 2011). Alternatively, future age at menopause could be independent of immediate fertility cues, and thus a correlate of attractiveness that has not yet been identified.

In this study, we investigated whether expected age at menopause is related to the attractiveness of young women's faces. As age at menopause is heritable (heritability between 0.42 and 0.72 depending on the study: Snieder *et al.*, 1998; de Bruin *et al.*, 2001; van Asselt *et al.*, 2004; Murabito *et al.*, 2005; Morris *et al.*, 2011), mother's age at menopause was used as a proxy for the daughter's expected age of menopause. To better understand how the residual reproductive value could be facially detectable, immediate fertility cues were included in the model as possible explanatory variables. It could also be speculated that women who reach menopause later have an overall slower life-history trajectory, with a slower general physical ageing, and may look younger, at the same age, than women who will experience menopause at an earlier age (in line with this idea, a later age at menopause is associated with a longer life expectancy, for a review see Gold, 2011). To see whether general physical ageing could mediate the relationship between facial attractiveness and expected age at menopause, we included facial ageing (measured as the difference between actual age and perceived age) as another explanatory variable.

Materials and methods

Ethics statement

The protocol used to recruit participants and collect data was approved (#1226659) by the French National Committee of Information and Liberty (CNIL). For each participant, the general purpose of the study was explained ('a study on the determinants of mate choice' and a written voluntary agreement was requested for a statistical use of data (private information and photographs). Data were analysed anonymously.

Stimuli

A total of 97 women between 25 and 35 years of age were recruited by social networks and advertising in Montpellier, France. Sixty-eight Caucasian women whose mother had a natural and known age at menopause constituted our final stimuli sample (mean age = 28.4, age range: 25–35, see Table S1). Volunteers were instructed to come to the laboratory after collecting information about their mother's and (when possible) grandmothers' menopause (menopause was defined as the first full year without any menstruation) and without wearing any make-up. For each woman, the following information was collected: date and place of birth for themselves, their parents and grandparents; monthly income (divided into 10 classes from <760€ to more than 4705€) for themselves and their parents; education level; and age at menopause for their mother and grandmothers. A facial photograph was taken with the same digital still camera (Canon EOS 20D) at a distance of 1 m using the same general settings. Each woman was asked to have a neutral facial expression, to remove any glasses or earrings and to wear a hairband (to make sure that all the faces were visible). All photographs were electronically processed using Adobe Photoshop CS3 to normalize size (photographs were aligned on eyes position, with a fixed distance between eyes and chin), colour balance, contrast and luminosity (using the Photoshop autocorrections tools). Hairstyle was cropped, and the background was replaced by a uniform grey colour (see Fig. 1). A compensation of 20€ was provided for the subjects' participation.

Procedure

A Delphi-based computer program was generated to present randomly drawn pairs of photographs of the 68 women (see Fig. 1). For each pair, the rater was instructed to click on the photograph depicting the woman he found the most attractive (the outcome measure of our study). The position of the photograph on the screen (left or right) was randomly ascribed. Each rater had 30 distinct pairs of photographs to assess, corresponding to 60 different women. If the rater knew one of the women he had to judge, the trial was removed. Also, the first pair seen by each participant was not used for the analyses, because the task could require some habituation. Three pairs, randomly chosen from among those previously viewed, were presented again at the end to estimate judgement reliability.

Fig. 1 Example of screenshot during the evaluation of women's facial attractiveness by the raters. For each pair of women, which was randomly chosen, the rater was instructed to click on the photograph of the woman that he found the most attractive. Photographs reproduced with permission. Faces were anonymized for publication.

Raters

A total of 156 male raters assessed the relative attractiveness of these women. Volunteer raters were recruited in public places in Montpellier (France) and were unaware of the purpose of the study when assessing the pairs of pictures. For each rater, the following information was collected: date and place of birth, grandparents' origins, monthly income, occupation, house ownership, taxability, education level and sexual orientation. Only data from Caucasian and heterosexual raters were used for the analyses. Assessments of unreliable raters (i.e. with more than one incorrect answer during the test of judgement reliability) were removed. A total of 119 raters were retained in the final sample, with a mean age of 36.2 (age range: 17–72, see Table S1). Each woman was observed, on average, by 101.1 raters (range: 93–108).

Immediate fertility cues

We collected three physical features hypothesized to be linked to women's immediate fertility: the waist-to-hip ratio (the ratio between body circumference at the waist and the hips or WHR, Singh, 1993; Jasienska *et al.*, 2004; Singh & Randall, 2007; Lassek & Gaulin, 2007; Mondragón-Ceballos *et al.*, 2015; Butovskaya *et al.*, 2017; but see Nenko & Jasienska, 2009), the fundamental frequency of the voice (F0, Harries *et al.*, 1998; Abitbol *et al.*, 1999; Feinberg, 2008; Evans *et al.*, 2008; Abend *et al.*, 2014) and the facial femininity (Farkas, 1987; Johnston & Franklin, 1993; Perrett *et al.*, 1998; Fink & Neave, 2005; Law Smith *et al.*, 2006; Little *et al.*, 2011; Pfluger *et al.*, 2012; Jones, 2014). The WHR was measured in the laboratory by the investigator. To measure the F0, women were recorded reading the French version of a standard text ('La bise et le soleil') using a Tascam DR-07 MKII digital recorder. Across each recording, the fundamental frequency (F0, the acoustic correlate of pitch) was measured using Praat software (Boersma & Weenink, 2013). To generate morphological facial femininity scores, a geometric morphometric analysis of the faces was used following methods described in Scott *et al.*, 2010; Lee *et al.*, 2014; Dixson *et al.*, 2017: first, the coordinates of 142 landmarks (anatomical points present in all individuals, e.g. the corners of the lips) and semi-landmarks (sliding points positioned along some anatomical curves, such as the bow of the eyebrow) were delineated for each female face, as well as for 26 male facial photographs retrieved from another database. These 26 additional men were recruited according to the same criteria as for the women's recruitment: heterosexuality, Caucasian origin, 25–35 years old. The delineation of the landmarks and semi-landmarks was performed using Psychomorph (Tiddeman *et al.*, 2005). The R package Geomorph (version 3.0.3) was used to carry out a Procrustes superimposition of the landmark and semi-landmark data, which removes nonshape information such as translation, size and rotational effects (Zelditch *et al.*, 2012, 2013). A principal component analysis (PCA) was conducted on the Procrustes-registered landmark and semi-landmark data of the 26 male faces and 26 female faces randomly drawn from this study data set, matching the age distribution of the 26 men. This PCA produced shape variables which are a decomposition of the landmark coordinates of the male and female faces (see Figure S1). The values on the factors of the PCA were computed for the remaining 42 female faces (not used to create the PCA). Then, a linear discriminant analysis (LDA) incorporating the two-first components of the PCA was used to discriminate between male and female faces. The resulting analysis provided correct sex classification for 92.6% of faces. Discriminant function scores were therefore used as an index of facial femininity, with high scores indicating a more feminine facial morphology scores (Scott *et al.*, 2010; Lee *et al.*, 2014; Dixson *et al.*, 2017). All analyses were performed using R software, version 3.4.2.

Estimation of facial ageing

It could be speculated that women who reach menopause later have an overall slower life-history trajectory, with a slower general physical ageing, and may look younger, at the same age, than women who will experience menopause at an earlier age. To control for this possibility, a second Delphi-based computer program was generated to present the facial photographs of the 68 women to 136 raters. For each photograph, the rater was instructed to estimate the age of the woman (see Figure S2). Each rater had 20 distinct photographs to assess, randomly drawn among the 68 pictures. Three photographs, randomly chosen among those previously viewed, were presented again at the end to estimate judgement reliability. For each rater, information about sex and age was collected. The reliability of raters was assessed by computing the sum of absolute differences between the three-first estimations and the corresponding repetitions. Raters with values higher than 15 years were removed (a more stringent threshold of 9 years, or no threshold, did not change qualitatively the results). A total of 107 facial ageing raters (including 61 women) were retained in the final sample, with a mean age of 35.1 (age range: 16–65). Each woman was observed, on average, by 31.2 raters (range: 24–43). For each woman, the difference between their real age and the mean age given by the raters was calculated. This variable represents the facial ageing of the women, a critical explanatory variable for the analysis of attractiveness.

Statistical analyses

Logistical regressions were used to analyse raters' attractiveness preferences. The binary response variable corresponded to being chosen or not for the focal woman (arbitrarily the woman presented at the left position) during the presentation of each pair. Women and attractiveness raters were considered random samples from a larger population of interest and were thus random-effect variables. Therefore, generalized linear mixed models with a binomial error structure were used. For each choice made by a rater, the difference between the ages at menopause of the focal and the nonfocal woman's mothers was calculated. The value of this difference was integrated into the model as the main variable of interest. To control for potential confounding effects, the differences between the focal and the nonfocal woman's ages and socio-economic status (SES, a PCA combination of education level and the woman's and her parents' monthly incomes) were introduced into the model. Because the subjects displayed a perceptible smile in some photographs, a qualitative variable describing this aspect was also introduced (this binary variable was coded by three independent raters, blind to the other characteristics of the women). Variables concerning the raters' characteristics were also included in the model as potential confounding effects. These variables were the rater's age and SES (a PCA combination of the variables 'monthly income', 'occupation', 'house ownership', 'taxability' and 'education level'). All variables were standardized for the analysis. In a second model, the difference between the two women for cues of immediate fertility (facial femininity, WHR and F0), and facial ageing were included as explanatory variables. Indeed, these variables, which may be linked to expected age at menopause, could potentially mediate the relationship between expected age at menopause and facial attractiveness.

Linear regression was used to analyse the mother's age at menopause according to the maternal grandmother's age at menopause. The 'one-parent-one-child' regression coefficient represents half the heritability (h^2) of the trait (Lynch & Walsh, 1998). Pearson correlations were used to analyse relationships between each woman's measured traits: expected age at menopause, immediate fertility cues, facial ageing, age and SES. All statistical analyses were performed using R software, version 3.4.2.

Results

Attractiveness, age at menopause and immediate fertility

The variable expected age at menopause (estimated by mother's age at menopause) had a significant positive effect on the probability of a woman being chosen as the most attractive: men tend to prefer women who are likely to reach menopause later ($\beta = 0.22$, SE = 0.053, $P < 0.001$ see model 1 in Table 2). This result holds when immediate fertility cues and facial ageing are controlled for ($\beta = 0.24$, SE = 0.053, $P < 0.001$, see model 2 in Table 1 and Fig. 2), showing that the effect of expected age at menopause on attractiveness is not due to know cues of immediate fertility cues or facial ageing. Additionally, the three cues of immediate fertility had a significant effect on the probability of being chosen: men tend to prefer more feminine faces ($\beta = 0.4$, SE = 0.057, $P < 0.001$, see model 2 in Table 1) and the faces of women who have a higher (i.e. more feminine) F0 ($\beta = 0.2$, SE = 0.058, $P = 0.001$). In contradiction with our prediction, men also tend to prefer the faces of women who had a higher (i.e. more masculine) WHR ($\beta = 0.13$, SE = 0.057, $P = 0.02$). Facial ageing had a negative effect on the probability to be chosen ($\beta = -0.56$,

Table 1 Effects of the different variables on the probability to be chosen during the test of attractiveness (male raters had to choose the woman found to be the most attractive between two facial photographs). N = 3439 observations (119 male raters and 68 female faces). Model 1 only includes the variable of interest (mother's age at menopause) and the control variables. Model 2 also includes cues of immediate fertility and facial ageing as explanatory variables.

	Model 1				Model 2			
	Estimate	SE	z value	Pr(>|z|)	Estimate	SE	z value	Pr(>|z|)
(Intercept)	0.092	0.121	0.762	0.446	0.096	0.112	0.861	0.389
Mother's age at menopause†	0.217	0.053	4.129	<0.001***	0.240	0.053	4.516	<0.001***
WHR†	–	–	–	–	0.132	0.057	2.321	0.020*
Facial femininity†	–	–	–	–	0.404	0.057	7.148	<0.001***
F0†	–	–	–	–	0.200	0.058	3.469	0.001**
Age†	−0.204	0.053	−3.883	<0.001***	−0.271	0.058	−4.683	<0.001***
Facial ageing †	–	–	–	–	−0.563	0.060	−9.350	<0.001***
Smile†	0.335	0.053	6.364	<0.001***	0.271	0.058	4.662	<0.001***
Socio-economic status†	−0.067	0.052	−1.302	0.193	−0.170	0.057	−3.009	0.003**
Raters' characteristics								
Age	−0.033	0.061	−0.548	0.584	−0.041	0.063	−0.642	0.521
Socio-economic status	−0.015	0.061	−0.252	0.801	−0.012	0.063	−0.187	0.852

†For each of these variables, the difference between the two women presented was integrated into the model.
Significance codes: ***P < 0.001; **P < 0.01; *P < 0.05.

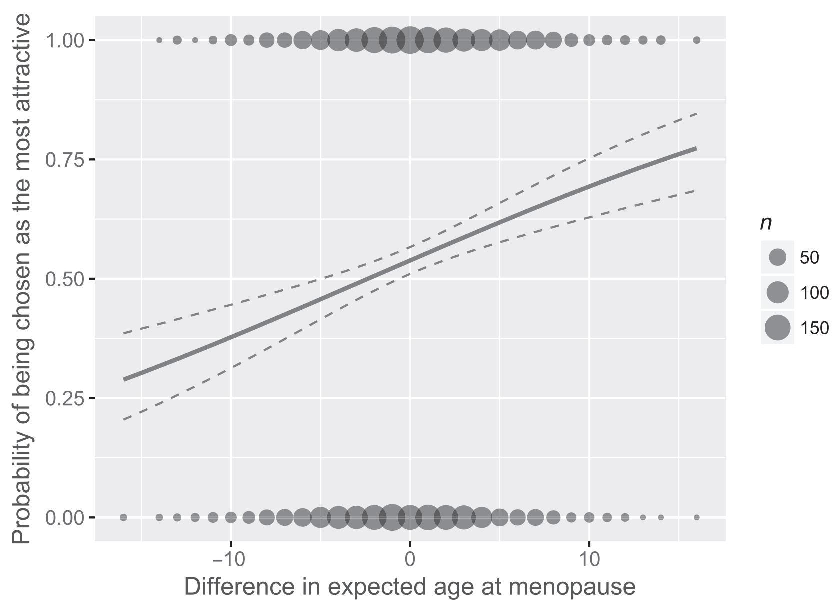

Fig. 2 Predicted probability to be chosen during the test of attractiveness, according to the difference in expected age at menopause (unstandardized values) between the focal and the nonfocal women, controlling for all the other variables of model 2. Circled areas are proportional to the number of choices made by the raters: chosen (1) or not (0) as the most attractive woman. 95% confidence interval is represented by the dotted lines.

SE = 0.06, $P < 0.001$): independently of their actual age, women who look younger than their actual age were preferred by men. Women's age and smile demonstrated a significant effect on the probability of being chosen: men preferred women who were younger ($\beta < -0.2$, $P < 0.001$, see models 1 and 2 in Table 1) and smiled more ($\beta > 0.27$, $P < 0.001$, see models 1 and 2 in Table 1). The socio-economic status of the woman had a negative effect on the probability to be chosen as the more attractive, but this result was significant only in model 2 ($\beta = -0.17$, SE = 0.057, $P = 0.003$). The raters' age and socio-economic level had no significant effect on their choices (all $P > 0.5$, see models 1 and 2 in Table 1).

Menopause and other women's features

There was no significant correlation between expected age at menopause and immediate fertility cues (facial femininity, F0 and WHR), facial ageing, woman's age or socio-economic status (all $P > 0.1$, see Table 2), showing that expected age at menopause is capturing a distinct correlate of facial attractiveness. There was no significant correlation between the other variables,

Table 2 Pearson's correlations between measures in the female sample (N = 68 women).

	Age	Mother's age at menopause	F0	WHR	Facial femininity	Facial ageing
Mother's age at menopause	0.07					
F0	−0.10	0.07				
WHR	0.22	−0.04	0.01			
Facial femininity	−0.20	−0.13	0.03	−0.01		
Facial ageing	−0.23	−0.08	−0.13	−0.03	0.24	
Socio-economic status	0.05	0.13	0.08	0.20	−0.18	−0.29*

Significance codes: ***P < 0.001; **P < 0.01; *P < 0.05.

except a negative correlation between facial ageing and SES (r = −0.29, P = 0.021, see Table 2).

Heritability of age at menopause

To help establish the validity of our sample, we measured the heritability of age at menopause, for comparison with previous studies performed with various samples and methods (Snieder *et al.*, 1998; de Bruin *et al.*, 2001; van Asselt *et al.*, 2004; Murabito *et al.*, 2005; Morris *et al.*, 2011). Here, we used the regression between grandmother and mother, without controlling for possible shared environments (this is not crucial for this study, as the main purpose here is to establish the validity of the mothers' age at menopause as a proxy for the daughters' expected age at menopause). Among the 97 women, 42 completed information about both their mother's and maternal grandmother's menopause. The mean age at menopause was 51.0 (range: 42–58) for the mothers and 50.3 (range: 39–60) for the grandmothers. The maternal grandmother's age at menopause had a significant effect on the mother's age at menopause (β = 0.275, SE = 0.11, P = 0.016, see Fig. 3). This implies a heritability of age at menopause from the maternal side of 27.5% and thus an overall heritability h^2 ~ 55% (SE = 0.22).

Discussion

Here, we show that expected age at menopause is significantly related to the facial attractiveness of young women. This result holds when variables potentially linked to immediate fertility (age, facial femininity, voice pitch and WHR), facial ageing and socio-economic status are controlled for. Additionally, immediate fertility cues and facial ageing were not correlated with

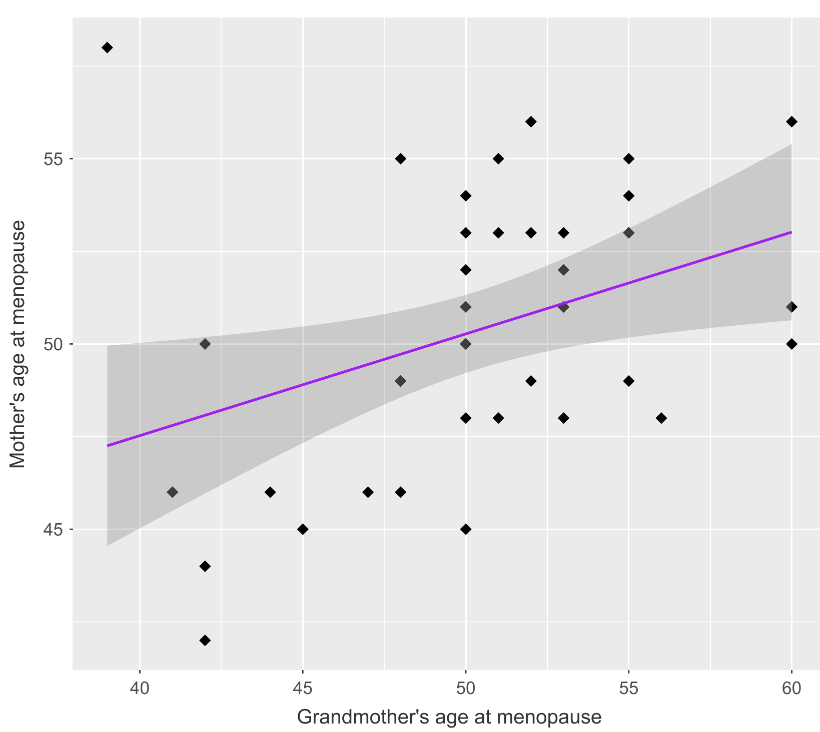

Fig. 3 Relationship between age at menopause of mothers and maternal grandmothers. Plain line represents the linear regression (β = 0.275, SE = 0.11, P = 0.016, corresponding to a heritability of age at menopause h^2 = 0.55). 95% confidence interval are in grey.

the expected age at menopause. Thus, the expected age at menopause seems to be linked to independent facial information, which is not deducible from previously documented components of facial attractiveness linked to immediate fertility or facial ageing.

Results classically found in the literature were replicated in this study, suggesting that this sample of young females is not different from those described elsewhere. First, our sample provided an heritability estimate for age at menopause of 0.55, consistent with previous values ranging from 0.42 to 0.72 (Snieder *et al.*, 1998; de Bruin *et al.*, 2001; van Asselt *et al.*, 2004; Murabito *et al.*, 2005; Morris *et al.*, 2011). Moreover, immediate fertility cues were positively correlated with facial attractiveness, as in previous studies: men in our sample preferred more feminine faces as in Cunningham *et al.*, 1995; Perrett *et al.*, 1998; Rhodes *et al.*, 2003; Koehler *et al.*, 2004; Little *et al.*, 2011; and facial attractiveness was positively correlated with pitch voice (F0), consistent with Collins & Missing, 2003; Feinberg *et al.*, 2005; Wheatley *et al.*, 2014; Smith *et al.*, 2016. Also, attractive faces were rated younger than their true age, as in the study of Kwart *et al.* (2012). However, two variables had significant effects on attractiveness, but in the opposite direction than expected. First, men in our sample had a preference for faces of women who have a higher (i.e. more masculine) WHR, which is in contradiction with the idea that face and body would signal one same quality. However, our results go in the same direction than results of Thornhill & Grammer (1999), who found a positive but insignificant correlation between facial attractiveness and WHR. Further studies are needed to investigate whether face and WHR are signalling different aspects of female mate quality. Secondly, we found that socio-economic status of the women had a negative effect on facial attractiveness. We were expecting a positive correlation, as a higher socio-economic status is related to less stress during development, better nutrition, less unhealthy behaviour, etc. (Adler *et al.*, 1994; Kalick *et al.*, 1998). But here again, even if counterintuitive, our results are in the same direction than a previous study showing a negative correlation between facial attractiveness and SES for female (Hume & Montgomerie, 2001). We cannot speculate on this result, as the variance of SES in our female sample is very narrow (women were all students at the university). However, we can suggest that it deserves more study (more research focused on the effect of attractiveness on SES, but less on the reverse relationship).

Spurious significant results may sometimes arise following model simplification (Whittingham *et al.*, 2006). This statistical bias is unlikely in this study, as all terms were kept and no model simplification was performed. However, it is still possible that a confounding variable, which remains to be identified, explains the link between expected age at menopause and facial attractiveness. Moreover, further study is needed to specify the facial cues used by men to detect residual reproductive value in young women (in this respect, Figure S3 shows the differences in face shape between women of high and low expected age at menopause). Here, we investigated the mediating role of immediate fertility cues and facial ageing, as residual reproductive value could potentially be linked to these two traits (Wood *et al.*, 2001; Gold, 2011). The next step would be to consider a large range of facial features such as facial symmetry, averageness, adiposity, skin colour, skin homogeneity and hair in an exploratory attempt to detect the facial cues linked to expected age at menopause. Also, age at menopause could additionally be assessed with more objective methods then self-report, for example using the serum antimüllerian hormone concentration (van Disseldorp *et al.*, 2008), or through genetic analysis (He *et al.*, 2009, 2010). Assuming that preferences reflect actual mate choice (which remains to be established for this trait), men's preference for women signalling a late age at menopause—and thus a longer temporal reproductive window—could suggest a current selection towards a later menopause, at least in Western societies. Interestingly, a secular trend of increased menopausal age has recently been observed (vanNoord *et al.*, 1997; Rodstrom *et al.*, 2003; Dratva *et al.*, 2009). This suggests that the social, familial and cultural conditions found today in Western societies are promoting current selection towards a later menopause in women. As a consequence, studies carried out in these societies are probably not adequate to empirically test evolutionary hypotheses on the ancestral selection on the emergence or maintenance of an extensive post-reproductive lifespan in the human lineage (Thouzeau & Raymond, 2017). Our results also suggest that sexual selection should be included in studies investigating the evolution of menopause in humans.

Somatic senescence, or ageing, is readily detectable in a face through wrinkles, skin texture and coloration, etc. (for a review, see Rhodes, 2009). Those traits are specifically targeted by cosmetic changes when a younger appearance is desirable. Facial traits correlated with reproductive senescence have yet to be identified, and it remains to be determined whether they can be, or are already, manipulated to increase attractiveness by signalling a later menopause.

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Supporting information

Additional Supporting Information may be found online in the supporting information tab for this article:

Figure S1 Results of the Principal Component Analysis (PCA) conducted on the Procrustes-registered landmarks and semi-landmarks data.

Figure S2 Example of screenshot during the evaluation of women's age by the raters.

Figure S3 *Top*: Shape differences of a low expected reproductive value face (average face of the 7 women with the earlier expected age at menopause in our sample) relative to the average face (average of all the women's face in our study), on a thin-plate spline (TPS) grid. *Bottom*: shape differences of a high expected reproductive value face (average face of the seven women with the later expected age at menopause) relative to the average face.

Table S1 Descriptive statistics.

Data deposited at Dryad: https://doi.org/10.5061/dryad.jb7m1

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