Preferences for younger individuals in facial-attractiveness judgments and online dating profiles

by

Jingheng Li

Supervisors

Professor Benedict Jones

&

Dr Victor Shiramizu

Department of Psychological Sciences & Health

University of Strathclyde

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Declaration

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Jingheng Li

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Publication statement

The empirical work reported in this thesis is adapted from the following publications published in (or in the case of Chapter 4, submitted for publication in) peer-reviewed journals, on which I am first author:

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I confirm that I led the study design and conception, data analyses, and writing for these papers, with additional input from my co-authors.

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Abstract

Age plays an important role in mate preferences and mate selection. However, to date, age is a relatively neglected variable in mate preference research. Age preferences are frequently explained by evolutionary theories suggesting that youth signals reproductive potential, although this hypothesis has not received broad empirical support. Consequently, the current work attempted to investigate the underlying factors behind age preferences, transitioning from facial-attractiveness evaluation paradigms to online dating data analyses. The results found no evidence that age preferences were influenced by the imprinting effect of parental age at participant's birth (Chapter 2), nor that the desire to have children strengthened preferences for younger faces (Chapter 3). Furthermore, by using an automated facial-landmark placement technique to derive face shapes from an age-diverse face database, the results also demonstrated that younger adult women did not possess significantly more feminine face shapes compared to older women, challenging the assumption that facial femininity is preferred because it serves as a cue for youth and, consequently, female reproductive potential (Chapter 4). Although the facial evaluation studies challenged evolutionary hypotheses of age preferences, the subsequent online dating data analyses (Chapter 5) revealed that men who desired children showed stronger preferences for younger partners than did men who did not desire children and the strength of this effect increased with participant age, whereas women's preferences remained stable. Together, these findings expose the profound complexity of human mating psychology. The discrepancies between findings from facial-attractiveness evaluation paradigms and online dating data analyses may highlight methodological limitations in the field. To build an accurate understanding of romantic attraction, future research should move beyond isolated visual stimuli and study participants across broad age ranges in realistic dating environments, capturing the dynamic and mutual nature of actual mate selection.

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Chapter 1

General introduction

The selection of a romantic partner is one of the most important decisions a person makes in their lifetime, lying at the centre of human evolutionary history (Buss, 2016, 2022; Darwin, 1871; Trivers, 1972). According to the evolutionary perspective, mate selection is not random, but a strategic process driven by the need to maximise reproductive success (Buss, 2016, 2022; Darwin, 1871; Trivers, 1972). Because human reproduction and child-rearing require substantial physiological, emotional, and time investments, selecting a good mate is critical for the survival and genetic fitness of offspring (Buss, 2016, 2022; Trivers, 1972). Beyond these biological pressures, mate selection also shapes a person's marital satisfaction, financial security, and long-term well-being (Ju et al., 2026; T. Li & Fung, 2011; Mu & Xie, 2014; Schwartz, 2013). Consequently, to maximise the potential mating benefits and avoid the serious costs of a poor mate choice, humans have evolved complex psychological mechanisms called mate preferences (Buss, 2016; Symons, 1979). These preferences act like internal algorithms that unconsciously guide individuals toward partners who show signs of underlying mate value, such as health, fertility, genetic quality, and the capacity for parental investment (Buss, 2016, 2022; Buss & Schmitt, 2019; Symons, 1995). Thus, mate preferences function as essential psychological filters, and understanding how they work is key to explaining human social judgment and interpersonal attraction.

When evaluating those observable cues of mate value, the most immediate and accessible source of information is physical appearance. Human faces serve as a primary portal for social interaction, providing a wealth of information about sex, age, ethnicity, emotion, personality traits, and mental states, thereby playing a fundamental role in navigating the complexities of human social interaction (for reviews, see Hadley et al., 2022; Haxby et al., 2000; Hu & O’Toole, 2023; Jack & Schyns, 2015; Todorov et al., 2008). We see many faces every day, and few sights are as pleasurable as encountering a beautiful one. Because attractive faces activate the brain's reward systems similarly to how it responds to money or addictive drugs, individuals are motivated to expend more effort for the opportunity to view them (Aharon et al., 2001; B. Levy et al., 2008). The influence of facial attractiveness is not confined to basic reward processing. It also operates at a complex social level. For example, it biases the personality attribution process and leads to the attractiveness halo effect, referring to people often see physically attractive individuals as having socially desirable personality traits. (i.e., “what is beautiful is good” stereotype, Batres & Shiramizu, 2023; Dion et al., 1972; Eagly et al., 1991; Langlois et al., 2000). These attractiveness advantages manifest across the entire lifespan. It emerges in infancy, where caregivers may exhibit preferential treatment toward more attractive infants (Golle et al., 2015; Langlois et al., 1995), continues into educational contexts, where the expectations of teachers can be biased by a student's physical appearance (Ritts et al., 1992; Talamas et al., 2016), and even extends to patient-provider interactions within healthcare settings (Bagnis et al., 2020; Thirsk et al., 2022). Moreover, people with more attractive faces tend to be preferred in voting (Olivola & Todorov, 2010; Verhulst et al., 2010), hiring (Maestripieri et al., 2017; Marlowe et al., 1996; Paustian-Underdahl & Walker, 2016), court decisions (Waterbury, 2024; Zebrowitz & McDonald, 1991), and especially in mate choice (Buss & Schmitt, 2019; Johnston, 2006; Rhodes, Simmons, et al., 2005; Zhang et al., 2019). This pervasive bias highlight that facial attractiveness is not simply a matter of personal aesthetic preference, but a powerful social force that shapes life outcomes from early development through late adulthood.

The effect of facial attractiveness on mate choice has been widely researched, with preferences for specific facial characteristics potentially reflecting evolved psychological adaptations to enhance reproductive success (for reviews, see Little et al., 2011; Rhodes, 2006). For example, facial averageness may be positively correlated with individual health status (Foo, Simmons, et al., 2017; Rhodes et al., 2001), and feminine traits in female faces provide cues to youth and greater fertility (Johnston, 2000; Law Smith et al., 2005; Perrett et al., 1998; Pflüger et al., 2012). Consequently, average faces or feminine female faces are generally considered more attractive (Kleisner et al., 2024; Langlois & Roggman, 1990; P. Lee et al., 2025; Perrett et al., 1998). However, a growing body of empirical evidence presents more complex and inconsistent results regarding the association between facial cues and actual health conditions and fertility (e.g., Foo, Simmons, et al., 2017; Obrochta et al., 2025; Pound et al., 2014; Van Dongen & Gangestad, 2011). These theoretical controversies raise a fundamental question: if these preferences do not primarily signal health and fertility, what accounts for their existence and robustness? Therefore, revisiting the underlying mechanisms of facial attractiveness is crucial not only for a deeper understanding of human mating strategies but also for evaluating the relative merits of competing evolutionary and other alternative explanations of beauty.

Moreover, these theoretical controversies may reflect methodological limitations of traditional facial attractiveness research. Most of these studies rely on highly controlled experimental settings where faces are evaluated in isolation (e.g., Little et al., 2007, 2014; Perrett et al., 1998), which limits their ecological validity (Dong et al., 2023; A. L. Jones & Jaeger, 2019; B. C. Jones et al., 2023; A. J. Lee et al., 2021; Satchell et al., 2023; Scott et al., 2013). In the real world, mate selection is a complex process that depends not only on visual cues but also on other external and internal traits of potential partners (Buss, 1989, 2016, 2022; N. P. Li et al., 2002; Xu, 2025). Therefore, to understand human mate preferences more accurately, it is necessary to study them in more natural settings. In light of this, researchers have increasingly turned to online dating platforms (e.g., Davis & Fingerman, 2016; Fiore et al., 2008; Lee et al., 2019; Rosenfeld & Thomas, 2012). These platforms constitute a large-scale real-world mating market and provide data that are not constrained by controlled experimental environments (Finkel et al., 2012). They provide a useful and convenient way to collect and analyse various mate preferences expressed in real-world mating markets, addressing the ecological validity limitation of facial attractiveness research to some extent.

Overall, this chapter will first review the theoretical origins of facial preferences from socio-cultural, evolutionary and cognitive perspectives. Following this, facial characteristics that contribute to attractiveness will be introduced, as well as the environmental and individual differences in attractiveness judgements. Subsequently, this chapter will discuss the methodological issues in existing facial attractiveness research. Finally, given these methodological limitations, the chapter will then turn to the literature on mate preferences in the online dating context as a complementary and more ecologically valid approach.

1.1 Origin of facial preferences

1.1.1 Socio-cultural perspective

For a long time, aesthetic preferences for faces were widely seen as social constructs specific to cultural contexts, shaped by the internalisation of culturally transmitted norms from family, peers, and media (Berry, 2000; Berscheid & Walster, 1974; Jackson, 1992). From this perspective, beauty standards are subject to the same historical fluctuations as the societies and cultures from which they emerge. For example, Ancient Egyptian women are typically depicted with slim, high-waisted figures, narrow hips, dark hair, and golden skin; during the Renaissance, beauty was associated with high foreheads, fair hair, and a rounded body shape; the Edwardian era, in turn, was characterised by the hourglass figure, with a cinched waist accentuated by full breasts and hips (Dimitrov & Kroumpouzos, 2023). In the contemporary period, with globalisation and the development of fashion, media, and the movie industry, Western European and North American beauty ideals have become dominant in the beauty standards of many countries (Swami et al., 2010; Yan & Bissell, 2014). For instance, fashion magazines in Asia and Latin America have historically favoured Western beauty ideals and frequently featured White models over local counterparts, while Western societies has recently shown an increasing tendency toward inclusivity with respect to more diverse body shapes, skin types, and ethnicities (Maymone et al., 2020; Yan & Bissell, 2014). Although these globalising trends exist, substantial regional and cultural variation in aesthetic preferences persists. For instance, Ainu women in northern Japan traditionally tattooed moustaches on their faces (Siddle, 2012), while Padaung women in Thailand practised neck elongation using metal rings (Chawanaputorn et al., 2007). Such behaviours may appear unusual to outsiders, but they represent established standards of beauty within their respective cultural contexts.

Socio-cultural view implies that standards of attractiveness are arbitrary, such that a face rated attractive in one era or culture might be perceived as unattractive in another. Although environmental and individual differences exist in judgments of facial attractiveness (see Section 1.3), a growing body of evidence has suggested that this view of beauty is insufficient.

According to the socio-cultural perspective, facial preference is an outcome of social learning. Therefore, it was assumed that children could not develop standards of beauty until the age of three or later (Dion & Berscheid, 1974). However, research by Langlois et al. (1987) on infants' social responses to faces fundamentally challenged this assumption. In their study, adults first rated the attractiveness of a series of female photographs. These images were then presented to infants who were only a few months old. The results revealed that the infants gazed significantly longer at the faces that had been rated as more attractive by adults, suggesting that certain facial preferences may exist early in life, without the need for extensive social learning.

Another study demonstrated that standards of beauty are neither arbitrary nor culturally constrained. Cunningham et al. (1995) examined the consistency of physical attractiveness judgments across different cultural groups. In their research, participants from various racial and cultural backgrounds were asked to rate the facial attractiveness of Asian, Hispanic, Black, and White female photographs. The results revealed a high level of agreement in these attractiveness ratings.

Socio-cultural theories struggle to explain the early emergence of facial preferences and the cross-ethnic and cross-cultural agreement in attractiveness judgment. Therefore, it appears that while socio-cultural factors can modulate these preferences, they are unlikely to be their primary cause. This gap in explanation is being addressed by the emergence of evolutionary psychology, which is providing a more fundamental account of the origins of human's beauty preferences.

1.1.2 Evolutionary perspective

Darwin's (1871) theory of sexual selection is the theoretical framework for much work in mating behaviours. It proposes that competition occurs between same-sex individuals for access to mating opportunities (i.e., intrasexual competition), and opposite-sex individuals will prefer those with greater mate values (i.e., intersexual selection). A hundred years later, the theory of parental investment was proposed by Trivers (1972) as an elaboration of the theory of sexual selection. This theory argues that the sex that invests more in offspring (typically, but not always, the female) has evolved to be more selective in mate choice, while the sex that invests less, by contrast, becomes less selective and competes more intensely with members of the same sex for mating opportunities (Trivers, 1972).

In humans, the most critical stages of parental investment, such as fertilisation and gestation, occur within the female body. Therefore, females themselves represent a valuable reproductive resource (Buss, 2024). For males, a single act of intercourse requires minimal investment, whereas for females, it can lead to the substantial cost of a nine-month gestation. Evolution therefore has favoured females who are more selective about their partners. And consequently, males must compete to demonstrate their mate value in order to secure mating opportunities and pass on their genes (Trivers, 1972). According to that, if cues of a person's mate value (e.g., health, provisioning ability or genetic fitness) were perceptible, individuals who preferred these cues would gain a reproductive advantage, ultimately leaving more offspring.

Then, theoretically, these preferences guide mate choice toward partners who maximise the survival chances of one's genes.

Natural selection acts as a filter in each generation, filtering out the features that do not contribute to survival or reproduction and allowing those that do (Dawkins, 1996). These primary products of evolution by selection are called adaptations (Buss et al., 1998). Thus, standards of facial attractiveness are also considered one of the adaptations that evolved to passing our genes more effectively (Symons, 1995).

Within the framework of sexual selection theory, several hypotheses for mating preferences have emerged, and the central distinction among them lies in whether attractive traits are perceived as signals of mate quality (for reviews, see Andersson, 1994; Andersson & Iwasa, 1996). For example, Fisherian runaway selection (R. A. Fisher, 1915) explains how mating preferences can evolve even if attractive traits do not signal mate quality. This process occurs when attractive individuals have offspring that are also preferred as mates. In principle, this can lead to the evolution of extreme sexual ornaments, such as the peacock's tail. However, it cannot explain how preferences for arbitrary traits first emerge.

Alternatively, the "good genes" theory (Zahavi, 1975) proposes that attractive traits serve as indicators of mate quality (e.g., health, intelligence, fertility, and parental care potential). Preferences for these heritable traits can enhance offspring viability. This idea has driven much of the research on human face preference, leading to the suggestion that these preferences are adaptations for mate choice (for reviews, see Little, Jones, & DeBruine, 2011; Rhodes, 2006). Given that, an attractive face should be marker of health. Indeed, attractive features have historically been associated with perceptions of health (Henderson et al., 2016; B. C. Jones et al., 2001; Rhodes et al., 2007; Thornhill & Gangestad, 1993). However, recent reviews revealed that the overall body of research has not consistently supported this assumption (e.g., Foo, Simmons, et al., 2017; Obrochta et al., 2025; Van Dongen & Gangestad, 2011). Reported effect sizes range from negligible to weak, with only a minority of studies showing moderate effects and some even yielding findings opposite to predictions.

This discrepancy between theoretical predictions and empirical observations may partly reflect evolutionary mismatch, which refers to a situation where adaptations function in environments that significantly differ from the ones they originally evolved in (for a review, see Goetz et al., 2019). Preferences for certain facial cues evolved in ancestral environments where these features reliably signalled pathogen resistance, nutritional status, and developmental stability. In contemporary environments, however, widespread access to healthcare and abundant nutrition has altered the relationship between these evolved cues and actual health outcomes (N. P. Li et al., 2018). For instance, facial adiposity once reliably signalled energy reserves and parasite resistance, but it may now primarily indicate the metabolic consequences of sedentary lifestyles and caloric surplus (N. P. Li et al., 2018; Wells, 2006). Similarly, the link between facial symmetry and developmental stability, which was established in high-pathogen environments, may be weakened in modern contexts where early-life infections are often effectively treated (Graham & Özener, 2016; Pound et al., 2014). Consequently, the weak and inconsistent associations between facial attractiveness and actual health may reflect not a failure of evolutionary theory, but rather a consequence of environmental change outpacing biological adaptation.

1.1.3 Cognitive perspective

Regarding those growing number of mixed results, if the 'good genes' theory provides an insufficient explanation, what alternative account can explain the robust attractiveness of certain facial features? The cognitive perspective offers an answer by locating the origins of beauty not in the face, but in the ease and efficiency with which our perceptual system processes it.

From a cognitive perspective, preferences for attractive faces are explained a by-product of processing fluency, which refers to the ease with which information flows through the cognitive system (Reber et al., 2004; Winkielman et al., 2006). Higher processing fluency triggered stronger activity in the zygomaticus region (the "smiling muscle"), which is a marker of positive affect (Principe & Langlois, 2011; Winkielman & Cacioppo, 2001). These positive affective reactions, in turn, served as a mediator, explaining why more fluent processing results in a more positive aesthetic evaluation (Principe & Langlois, 2011; Winkielman et al., 2003, 2006). Further evidence for the processing fluency theory found that more attractive faces can be judged and processed in a shorter time than less attractive faces and then bias subsequent cognitive processes (Olson & Marshuetz, 2005; Trujillo et al., 2014). These automatic and rapid processing may make facial attractiveness difficult to ignore in social evaluations.

In terms of mental representation, the face-space model (Valentine, 1991; Valentine et al., 2016) proposes that all recognisable faces are encoded within a multidimensional psychological space. The dimensions of the space are defined by certain facial features, such as face shape, cues of age or skin quality. Each face is represented as a unique point within this space, with the average of all faces (i.e., the norm/average/prototypical face) located at the space centre, which is the easiest for the cognitive system to process. Attractiveness of a specific face is determined by the geometric distance between itself and the central point (i.e., the norm/average/prototypical face). Moreover, faces represented by points that are close together are perceived as similar, while those that are far apart are perceived as dissimilar (Leopold et al., 2001; Valentine, 1991; Valentine et al., 2016).

The cognitive perspective suggests that beauty lies not only in the object itself, but also in the perceiver's processing experience, which is jointly shaped by objective features of the stimulus (e.g., symmetry) and the perceiver's subjective experience (e.g., repeated exposure, prototypicality) (for reviews, see Reber et al., 2004). This view integrates early and acquired facial preferences by linking them to the fluency of cognitive processing. It thereby overcomes the limitation of theories focusing solely on objective features, which cannot explain learned preferences. Similarly, it addresses the shortcomings of socialisation theories, which fail to account for the early emergence of face preferences.

Overall, the three perspectives reviewed above are not mutually exclusive. Rather, they operate at different levels of explanation and address different questions about the origin of facial preferences. The evolutionary perspective speaks to ultimate causation: in functional terms, why humans might possess certain preferences in the first place. It identifies the adaptive problems, such as selecting a fertile mate or avoiding pathogens, that these preferences may have evolved to solve. By contrast, the cognitive perspective addresses proximate mechanisms: how these preferences are implemented in the moment, through processes such as perceptual fluency and the rapid automatic evaluation of faces. It explains the immediate psychological process that gives rise to aesthetic judgments. The socio-cultural perspective, in turn, accounts for the variation in how these preferences are expressed across time, regions, and social groups. It explains why evolved preferences can manifest differently depending on local norms, historical context, and individual learning experiences. Taken together, a complete explanation of facial attractiveness requires all three levels of analysis. Evolution provides the foundation by shaping the basic framework of facial preferences; cognitive mechanisms specify how this framework operates in real time; and socio-cultural factors modulate its expression, generating the rich diversity of beauty ideals observed across human societies.

1.2 Elements of beauty

We can easily judge a face as attractive or unattractive, but it is often hard to identify the specific features that lead to this judgment. Initial research on facial attractiveness was met with criticism. Some critics argued that human beauty should not be studied as it was dehumanising and discriminatory, while most questioned whether it could be studied scientifically at all (Perrett, 2012).

As argued at the beginning of this chapter, the justification for this research is clear: facial attractiveness significantly influences various aspects of our daily social interactions, and it is crucial for a deeper understanding of human mating strategies. And next, this section will present how beauty is studied scientifically, what facial characteristics contribute to attractiveness, and the underlying mechanisms involved.

1.2.1 Symmetry

Symmetry refers to the extent to which the left side of the face matches up with the right side. Numerous studies have established facial symmetry as a known predictor of attractiveness (e.g., B. C. Jones et al., 2001, 2007; Perrett et al., 1999; Thornhill & Gangestad, 1993). Two main theories explain this preference. The processing fluency theory argues that it stems from the easier cognitive processing of symmetrical stimuli, while "good genes" theory suggests that symmetry signals higher mate quality.

Process fluency theory suggests that symmetrical patterns are preferred because they have less information and are hence easier to process (Reber, 2002; Reber & Schwarz, 2006), regardless of whether they are recognised from any viewpoints (Enquist & Arak, 1994; Johnstone, 1994). This preference is thus considered a by-product of general cognitive mechanisms. However, Little and Jones (2003) found a robust preference for symmetry in upright faces but not in inverted faces, which implied that the perceptual bias view is insufficient to explain facial symmetry preferences, and that other mechanisms, potentially specific to mate-choice relevance, may be involved (Little & Jones, 2003, 2006).

Humans are largely symmetric, but not perfectly symmetric. For example, the position of our mouths may be slightly off-centre, and as well as noses (Perrett, 2012). These random deviations from perfect symmetry in bilaterally paired traits called fluctuating asymmetry (FA), which is an important indicator for human developmental stability (Graham et al., 2010; Graham & Özener, 2016).

Developmental stability is an organism's ability to develop normally without disturbances when influenced by its genes and environment (for reviews, see Thornhill & Møller, 1997). High levels of FA are often observed in individuals with adverse developmental outcomes, such as inbreeding, premature birth, and specific mental disorders (Livshits & Kobyliansky, 1991). Furthermore, strong FA has also been linked to various health conditions, including respiratory diseases and reduced fecundity (Little, Jones, & DeBruine, 2011). Thus, preferences for symmetry may benefit the perceiver directly by avoiding contagion, and indirectly by passing health genes for offspring (Little, Jones, & DeBruine, 2011).

However, more recent studies on FA as a health marker have shown mixed and inconclusive results (e.g., Foo et al., 2017; Obrochta et al., 2025; Pound et al., 2014). For instance, many report only non-significant or weak associations between FA and major health domains such as cardiovascular, reproductive, and respiratory health (for reviews, see Foo et al., 2017; Obrochta et al., 2025). Consistent with these non-significant or weak associations, Komori et al. (2009) observed that symmetry only slightly affected the attractiveness of male faces and had no effect on female faces. Furthermore, up-to-date studies by Kleisner et al. (2024) and P. Lee et al. (2025) found that facial symmetry did not predict attractiveness for either sex. An alternative explanation for these divergent results is that the preference for facial symmetry may represent an example of evolutionary mismatch: a cue that was once relevant for assessing mate quality, but whose signal value has been substantially weakened in modern environments (N. P. Li et al., 2018). Preferences for symmetry may have evolved in ancestral contexts in which developmental stability was more closely connected with observable facial features. However, in contemporary environments, advances in healthcare and nutrition have weakened this connection, because early-life infections that might once have produced asymmetry are now routinely treated (Graham & Özener, 2016; Pound et al., 2014). Consequently, although the preference for symmetry remains detectable in experimental settings, particularly when stimuli are artificially manipulated to exaggerate symmetric differences, its influence on judgments of unmanipulated faces in real-world contexts may be minimal (A. J. Lee et al., 2021). It underscores the importance of considering ecological validity when designing studies intended to generalise to real-world social perception (A. L. Jones & Jaeger, 2019; A. J. Lee et al., 2021).

1.2.2 Averageness

Averageness (or prototypicality) describes a face that closely resembles the majority within a population, while distinctive faces deviate more from this average. Similar to symmetric faces, average faces are often found more attractive because they may also signal health and developmental stability (Rhodes et al., 2001; Thornhill & Gangestad, 1993).

Thornhill and Gangestad (1993) proposed two evolutionary explanations for this preference for averageness. One suggests that individuals with average faces possess more genetic diversity, which can lead to the production of proteins that are less common and therefore more difficult for pathogens to adapt to. Another explanation states that extreme (non-average) genotypes have a higher likelihood of being homozygous for harmful alleles, making them genetically less advantageous. Both theories ultimately argue that mating with individuals who have average faces could confer evolutionary benefits.

Although some studies have found that facial averageness is unrelated to immune function (Cai et al., 2019; Foo, Simmons, et al., 2017) or is even negatively associated with semen quality (Foo, Simmons, et al., 2017), a broader body of research has robustly and consistently established that average faces are widely perceived as more attractive. The earliest evidence for this comes from two centuries ago. Galton (1879) noted that the composite face created by blending multiple individual faces using photography techniques were more attractive than the individual component faces. However, this finding was not widely studied until nearly a hundred years later. Langlois and Roggman (1990) employed computerised techniques to generate averaged composites of faces. They not only verified Galton’s (1879) finding that averaged faces were generally more attractive than component faces, but also further found that the more faces were added, the more attractive the composites became. These findings have been supported by a large body of more recent evidence (e.g., Baudouin & Tiberghien, 2004; Kleisner et al., 2024; Komori et al., 2009; P. Lee et al., 2025).

From the cognitive perspective, similar to symmetry, the preference for averageness may also be a by-product of processing fluency. Because average faces contain fewer atypical features, they more closely approximate the prototype stored at the centre of the face-space and are therefore easier for the cognitive system to process (for reviews, see Reber et al., 2004). If humans' innate preference for average faces were solely due to their link with mate quality, it would not be necessary to also prefer other prototypical objects. However, studies have shown that people also prefer prototypical birds, fish, and watches (Halberstadt & Rhodes, 2000, 2003). Given this cross-species and cross-category consistency, the robust link between averageness and attractiveness is likely driven by processing fluency. This suggests that our attraction to average faces may reflect a general cognitive tendency to favour prototypical information, rather than a mechanism specifically designed for mate selection.

While average faces are generally more attractive than most, this does not mean that all attractive faces are average or that average faces are optimally attractive (Alley & Cunningham, 1991; DeBruine et al., 2007; Perrett et al., 1994). DeBruine et al. (2007) proposed a separate "attractiveness dimension" in face-space, independent of the effects of averageness. Moving away from the average in a positive direction along this dimension increases attractiveness, while moving in a negative direction decreases it. However, this effect is not limitless. Specifically, across manipulations from 0% to +200%, faces with higher values on this dimension were preferred over more average ones. Beyond +200%, the pattern reversed, and the more natural and average face was again preferred. Therefore, within the tested range, faces manipulated to the +200% level on this dimension may represent a peak in perceived attractiveness.

1.2.3 Sexual dimorphism

Male and female faces differ in their shapes. These sexually dimorphic features reflect the masculinisation or feminisation of secondary sexual characteristics that develop during puberty (Little, Jones, & DeBruine, 2011). According to the theory of parental investment (Trivers, 1972), it is reasonable to expect that feminine female faces would display cues related to fertility, just as masculine male faces would display cues associated with the ability to compete for mates.

1.2.3.1 Femininity

A robust body of research has supported the finding that more feminine female faces are consistently rated as more attractive than more masculine female faces, regardless of whether feminine traits are measured (e.g., Kleisner et al., 2024; P. Lee et al., 2025), rated (e.g., Koehler et al., 2004; Law Smith et al., 2005), or manipulated (Little et al., 2007, 2014; Perrett et al., 1998). One of the explanations for this is that feminine female faces may signal high reproductive potential (Johnston, 2000; Law Smith et al., 2005; Perrett et al., 1998; Pflüger et al., 2012). A feminine face is typically characterised by less prominent brow ridges and jawlines, a smaller chin, thicker lips, higher cheekbones, and larger eyes relative to facial size (Johnston, 2006; Perrett, 2012). Law Smith et al. (2005) demonstrated that these feminine features are associated with female fertility by measuring urinary metabolites. Their study revealed that oestrogen levels, a key predictor of conception success, were positively correlated with facial femininity and attractiveness. In addition, Pflüger et al. (2012) found these feminine features were persistently observed in women of high attractiveness and reproductive success, both in their youth and after menopause. Therefore, a feminine face may serve as a dual signal of both a youthful appearance and higher women's reproductive potential.

An alternative explanation suggests that feminine female faces are considered attractive because femininity preferences reflect psychological adaptations for identifying healthy potential mates and/or healthy competitors for mates (for reviews, see Little et al., 2011; Rhodes, 2006; Rhodes et al., 2007). However, the relationship between facial femininity and health remains debated (for a review, see Foo, Nakagawa, et al., 2017). While some studies reported that more feminine female faces are perceived to be healthier (e.g., Foo, Simmons, et al., 2017; Rhodes et al., 2003, 2007), others have generally found little evidence for significant correlations between facial femininity and measures of women’s actual health (e.g., Cai et al., 2019; Foo, Simmons, et al., 2017; Rhodes et al., 2003). One proposed mechanism is that femininity signals health through its association with female hormones like oestrogen (Foo, Simmons, et al., 2017; Gray & Boothroyd, 2012), while the immunological effects of oestrogen are complex and depend on the immune measure used. For example, while oestrogen exhibits a immunosuppressive effect on cell-mediated immunity, it concurrently shows a immunoenhancing effect against parasite loads (Foo, Nakagawa, et al., 2017). This dual nature helps explain the inconsistent findings regarding facial femininity as a health cue.

1.2.3.2 Masculinity

Men with masculine faces are seen as more dominant (Boothroyd et al., 2007; Perrett et al., 1998), which may help them confer an advantage in intrasexual competition (Fink et al., 2007; Han et al., 2017). And similarly to feminine traits, masculine traits (e.g., thick brows, thin lips, square chins, and small eyes; Keating, 1985; Koehler et al., 2004) indicate individual's testosterone level to some extent (Penton-Voak & Chen, 2004).

Testosterone can suppress the immune system and thereby pose a health cost (for reviews, see Muehlenbein & Bribiescas, 2005; Trigunaite et al., 2015). The immunocompetence handicap principle (Folstad & Karter, 1992) posits that only males who are healthy and vigorous enough to withstand this cost can develop exaggerated sexually dimorphic traits. Further evidence also indicates that facial masculinity is positively associated with physical health (Rhodes, Chan, et al., 2003) and semen quality (Foo, Simmons, et al., 2017) in men.

If health is heritable, women would be expected to prefer men with masculine faces. However, the case for male facial masculinity is more complex. Unlike the stable predictive power of femininity for female attractiveness, research on the attractiveness of male masculinity has yielded conflicting results. Some studies find that masculine men are more attractive (e.g., DeBruine et al., 2006; Docherty et al., 2020; Little & Mannion, 2006), while others find that feminine men are preferred (e.g., DeBruine, Jones, Smith, et al., 2010; Little & Hancock, 2002; Perrett et al., 1998; Rhodes et al., 2000).

These inconsistent findings may be mediated by factors related to social perception. Masculinised faces were generally perceived as colder, less emotional, less honest, less cooperative, and less likely to be good parents, whereas feminised faces were judged as warmer, more emotional, more honest, more cooperative, and more parental (Perrett, 2012; Perrett et al., 1998; Wen et al., 2020). Although these judgements seem stereotypical, there is empirical evidence that men with more masculine facial features are associated with behavioural tendencies such as higher aggression and lower cooperativeness (Carré & McCormick, 2008).

These conflicting findings on the attractiveness of male faces may reflect a fundamental trade-off in women's mating strategies (Buss & Shackelford, 2008; Gangestad & Simpson, 2000). Although masculine features might signal genetic benefits, they can also be perceived as indicating lower potential for paternal investment. Conversely, more feminine male faces are often associated with traits like cooperation and investment in long-term relationships. Therefore, it is reasonable that women show varying preferences for male facial masculinity.

1.2.4 Adiposity

Facial adiposity refers to the perception of weight in the face (Coetzee et al., 2009). As a cue of attractiveness, facial adiposity may simultaneously convey two important evolutionary signals. On one hand, very low levels of facial adiposity can signal poor health resulting from malnutrition, disease, or parasitic infection. On the other hand, in food-scarce environments, higher levels of facial adiposity may be perceived as a positive indicator of the ability to acquire and store resources, thereby signalling survival advantages (Wells, 2006). Consequently, intermediate levels of facial adiposity may represent an optimal balance, suggesting an individual neither burdened by illness nor lacking in resource acquisition capacity. Given that, facial adiposity have evolved as an adaptation for assessing health and mate quality, thereby also predicting facial attractiveness (Coetzee et al., 2009, 2011; Foo, Simmons, et al., 2017). Indeed, Coetzee et al. (2009) have found that the relationship between facial adiposity and attractiveness follows an inverted U-shape. That is, attractiveness is highest at an intermediate level of facial adiposity and decreases toward either extreme.

However, in contemporary contexts characterised by widespread nutritional excess and rising obesity rates, the signal validity of adiposity is facing a serious challenge. Facial adiposity may no longer reliably distinguish healthy plumpness from pathological obesity, because the latter now results primarily from poor modern diets and sedentary lifestyles (N. P. Li et al., 2018; Wells, 2006). Studies indicate that facial adiposity is negatively associated with perceived health in adult faces (Coetzee et al., 2009; C. I. Fisher, Hahn, et al., 2014; Han et al., 2016) but positively associated in infant faces (Volk et al., 2005). Moreover, perceived facial adiposity is linked to actual health conditions (for reviews, see de Jager et al., 2018; Henderson et al., 2016). For instance, individuals perceived as heavier-faced report more frequent and severe colds and exhibit higher blood pressure (Coetzee et al., 2009). Similarly, perceived weight correlates with a composite measure of general health encompassing both physical and psychological well-being (de Jager et al., 2018; Tinlin et al., 2013). Specifically, ratings of facial adiposity not only predict actual weight 36 years later but also adult obesity risk, chronic conditions, and all-cause mortality (Reither et al., 2009). The strong modern preference for relatively low levels of adiposity may therefore reflect a shift in aesthetic standards toward thinner morphologies than those that would have signalled optimal health in ancestral environments (Stephen & Perera, 2014; Swami et al., 2010). This shift may be driven, at least in part, by the desire to avoid the chronic disease risks associated with obesity in contemporary contexts (N. P. Li et al., 2018; Wells, 2006).

1.2.5 Skin quality and colour

The characteristics discussed above primarily relate to the shape of the face. However, skin cues, such as skin quality and colour, are also important factors in facial attractiveness judgment (Fink et al., 2001, 2006; Stephen, Scott, et al., 2012; Sun et al., 2022). Skin cues serve as a dual signal system, conveying information about both an individual's long-term developmental history and current physiological state (Fink et al., 2006; Stephen, Law Smith, et al., 2009; Tan et al., 2018). Static features, such as skin texture, pore size, and permanent blemishes, reflect long-term factors like developmental stability and actual age. In contrast, skin colouration is highly dynamic, changing rapidly in response to short-term conditions and functioning as an indicator of immediate health and recent lifestyle.

1.2.5.1 Skin quality

The skin quality is shaped by a combination of internal biological factors (e.g., ageing and hormones) and external environmental factors (e.g., diet and humidity) (Kammeyer & Luiten, 2015). As the body's outer barrier, the skin serves as a visible indicator of internal physiology. Lesions, acne, and uneven texture are honest cues to potential health problems, serving as evolutionary signals of immune competence. A weakened immune system increases vulnerability to pathogens, whose attacks cause inflammation that disrupts skin homogeneity. Consequently, smooth and even skin indicates a robust immune system and low pathogen load, whereas skin flaws reflect ongoing immunological challenges (Fink et al., 2001, 2006; Tan et al., 2018).

Cross-cultural and cross-ethnic studies have consistently found that smooth, homogeneous skin texture is a strong predictor of facial attractiveness, as it is a honest cue robustly linked to perceptions of health and youth (B. C. Jones et al., 2004; O'Toole et al., 1999; Samson et al., 2010; Sun et al., 2022). In ancestral environments lacking modern medicine and cosmetics, maintaining healthy skin required a robust immune system, adequate nutrition, and the ability to resist pathogens and parasites. Thus, high-quality skin represents a costly external display of overall health capital.

1.2.5.2 Skin colour

Skin colour is mainly influenced by three components: blood perfusion and oxygenation (which increase redness), melanin concentration (which reduce lightness), and carotenoid levels (which increase yellowness) (Tan et al., 2018). These components, in turn, are linked to different aspects of health. For example, blood perfusion and oxygenation reflect cardiorespiratory fitness; melanin provides photoprotection but hinders vitamin D production; and carotenoids are thought to support a healthy immune and reproductive system (for a review, see Perrett, 2012).

Skin redness

Skin redness, which enhances the perceived health of faces, is determined by blood perfusion and oxygen levels (Stephen, Coetzee, et al., 2009; Stephen, Law Smith, et al., 2009; Stephen, Oldham, et al., 2012). Efficient blood flow to the skin requires a strong cardiovascular system, and factors like physical exercise can improve both oxygen saturation and skin perfusion (J. M.

Johnson, 1998). In contrast, conditions such as cardiovascular disease, respiratory illness, smoking, or diabetes reduce blood oxygen levels, leading to paler skin (Stephen, Coetzee, et al., 2009; Stephen, Oldham, et al., 2012). Furthermore, skin blood perfusion can also be regulated by sex hormones. In men, high testosterone levels promote peripheral vasodilation, while in women, high oestrogen levels enhance skin vascularisation. Thus, skin redness can also serve as a cue to an individual's fertility (Perrett, 2012; Stephen, Law Smith, et al., 2009).

Given its role as a valid health indicator, skin redness has been shown to positively correlate with facial attractiveness across diverse populations, including Caucasian, African, and East Asian groups (Coetzee et al., 2014; Han et al., 2018; Pazda et al., 2016; Stephen, Oldham, et al., 2012; Thorstenson et al., 2017), with some evidence of a weaker preference among Chinese participants compared to their UK counterparts (Han et al., 2018).

Skin lightness

Skin lightness is determined by melanin levels, a pigment with both benefits and costs for health. Sunlight contains ultraviolet (UV) radiation, which can damage DNA and folic acid, a vitamin essential for cell production and fetal development (Branda & Eaton, 1978; Off et al., 2005). Producing melanin is one of the ways we have evolved to protect against the damage from UV radiation (Branda & Eaton, 1978; Brenner & Hearing, 2008). Higher melanin levels provide better protection against intense UV radiation and reduce the risk of skin cancer and folic acid deficiency (Brenner & Hearing, 2008). However, excessive melanin reduces the production of vitamin D, which is necessary for calcium absorption (Young et al., 2020). Thus, skin lightness reflects an evolutionary trade-off in melanin's effects.

Skin lightness varies with latitude and is closely correlated with the level of UV radiation reaching the Earth's surface (Branda & Eaton, 1978). Because UV radiation is most intense at the equator and decreases toward the poles, populations with ancestral origins in equatorial regions generally have darker skin than those originating from higher latitudes (Aoki, 2002).

Beyond geographic variation, consistent sex differences in skin lightness are also observed. This may be linked to the higher calcium demands during pregnancy, which is essential for fetal bone development (Hacker et al., 2012). Since vitamin D is required for calcium absorption, insufficient levels can negatively impact both the pregnant woman and the fetus. It is therefore possible that natural selection has preferred lighter skin in women to enhance vitamin D production to meet reproductive need (Perrett, 2012).

Most studies have found that faces with higher skin lightness are rated as more attractive across Caucasian, African, and East Asian populations (Coetzee et al., 2014; Han et al., 2018; Stephen et al., 2011). However, an exception was reported among African raters, who perceived darker African faces as more attractive, supporting the evolutionary trade-off hypothesis regarding melanin's dual roles (Stephen, Scott, et al., 2012). Furthermore, preferences for lighter skin are consistently stronger for female faces than for male faces (Aoki, 2002; Han et al., 2018; Stephen, Law Smith, et al., 2009). This aligns with the view that lighter skin in women may have been favoured evolutionarily due to its role in enhancing vitamin D synthesis, which is particularly important during pregnancy and lactation.

Skin yellowness

Skin yellowness is determined by carotenoids, but carotenoid cannot be synthesised in the body. They are primarily obtained from dietary fruit and vegetables and contribute to human skin yellowness through deposition in the skin (Alaluf et al., 2002).

Carotenoids are known to support immunocompetence and disease resistance in humans (Stephen et al., 2011). Their antioxidant properties help neutralise reactive oxygen species (ROS) generated during immune responses (Dowling

& Simmons, 2009). Accordingly, empirical studies indicate that carotenoid supplementation promotes thymus growth in children and enhances T-lymphocyte activity in adults, whereas lower carotenoid levels are found in individuals with HIV or malaria (Stephen et al., 2011). In addition, carotenoids deposited in the skin provide photoprotection by mitigating damage from natural and artificial UV radiation and raising the threshold for sunburn (Alaluf et al., 2002; Bouilly-Gauthier et al., 2010). Furthermore, carotenoids contribute to men's reproductive system. They are present in semen and help protect sperm from oxidative stress (Alahmar, 2019; Dowling & Simmons, 2009). Supporting this protective role, it has been found that seminal carotenoid levels are lower in infertile men than in fertile men, and supplementation has been shown to improve male fertility (Alahmar, 2019).

Preferences for facial skin yellowness appear to vary across ethnic groups. Several studies have found that both African and Caucasian raters prefer faces with higher levels of skin yellowness (Coetzee et al., 2014; Han et al., 2018; Stephen et al., 2011; Stephen, Scott, et al., 2012), whereas Chinese raters tend to prefer faces with reduced yellowness (Han et al., 2018). This divergence has been hypothesised to result from culture-specific norms or between-group differences in socioeconomic status (Han et al., 2018).

In summary, the skin provides a rich source of information about an individual's health, vitality, and reproductive value through the interplay of its texture and colouration. Attractiveness judgments are not simply isolated preferences for lightness or smoothness. Rather, the skin signals of a highly attractive face tend to work together optimally: it may simultaneously exhibit the uniform texture that signals long-term developmental stability, the moderate redness that reflects immediate cardiovascular vitality, the lightness that is appropriate given the individual's ancestral ecological context, and the healthy yellowness that indicates good nutrition and immune function.

1.2.6 Youth

Among the various cues to facial attractiveness, youth occupy a unique position. From an evolutionary perspective, youth is not an isolated feature but rather a composite indicator that integrates information about health, remaining reproductive value, and genetic vitality (Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992; Maestripieri et al., 2014). Perceived youth thereby function as a meta-cue in attractiveness judgments, encompassing and accounting for preferences for many specific features that are components or correlates of youth. Consequently, numerous studies have demonstrated that younger adult faces are generally rated as more attractive than older ones (e.g., Ebner, 2008; Foos & Clark, 2011; Maestripieri et al., 2014; Palumbo et al., 2017). In addition, since the age-related decline in fertility is more pronounced in women, preferences for youth are assumed to be stronger when men evaluate female mates than the reverse (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992; Walter et al., 2020). Supporting this, empirical evidence shows that male raters judged the decline in attractiveness for post-menopausal women relative to pre-menopausal women as significantly greater than the decline observed in men at similar ages (Maestripieri et al., 2014).

Skin quality is a primary factor in how old a person is perceived (Fink et al., 2006; Gunn et al., 2009; Lai et al., 2013). With increasing age, the skin loses its elasticity, resulting in sagging and the formation of wrinkles (Batisse et al., 2002; Gunn et al., 2009). These signs of skin ageing are influenced by both genetic and environmental factors. Some people inherit genes that are more resistant to wrinkles, but long-term sun exposure can also cause wrinkles (Contet-Audonneau et al., 1999; Kammeyer & Luiten, 2015). Moreover, UV radiation lead the melanin pigment cells to clump unevenly and then produce ‘age spots’ (Hirakawa et al., 2008). Thus, over time, all skin will ultimately show signs of ageing.

Differences in skin quality lead to facial ageing trajectories show significant biological variation across ethnicities, which directly affects age perception across cultures (Alexis & Obioha, 2017; Flament et al., 2018; Vashi et al., 2016; Voegeli et al., 2021). Due to thinner epidermis and less melanin photoprotection, Caucasian individuals experience accelerated photoaging. This leads to early-onset wrinkles and skin laxity, resulting in the largest discrepancy between perceived and chronological age among all ethnic groups(Vashi et al., 2016; Voegeli et al., 2021). In contrast, East Asian individuals, benefiting from a thicker stratum corneum and more even melanin distribution, show structural signs of ageing about a decade later than Caucasians (Alexis & Obioha, 2017). Cross-ethnic studies have again confirmed that wrinkles and sagging are primary cues for age judgment, and the ethnicity of the observer can moderate the accuracy of this assessment (Flament et al., 2021; Voegeli et al., 2021).

Greying and hair loss are probably the most obvious signs of ageing. Hair presents various colours because of different amounts and types of melanin in hair cells (Ortonne & Prota, 1993). With age, the amount of melanin in the hair declines, causing it to turn grey and eventually white. In addition, hair, especially in males, also become less dense due to a decreasing number of hair follicles (Cotsarelis & Millar, 2001; Gokce et al., 2022). Compared with skin, greying hair and hair loss are influenced more strongly by inherited genetic factors. Therefore, if parents experienced early greying or hair loss (mainly in males), their offspring are also likely to develop these traits at a young age (Gokce et al., 2022).

The facial shape is another facial cue of youth. Throughout the lifespan, human faces become increasingly asymmetrical and distinctive (Linden et al., 2018; Skomina et al., 2020). These changes occur at both the structural and surface levels. On a skeletal level, factors such as uneven chewing forces, tooth loss, and the gradual loss of bone density lead to structural asymmetry (Harnádková et al., 2023; Windhager et al., 2019). Simultaneously, the soft tissues of the face are affected by lifestyle, developmental events and sun damage, which then create asymmetric wrinkle patterns and skin sagging (Harnádková et al., 2023; Kammeyer & Luiten, 2015). Furthermore, because the aging process is influenced by an individual's unique genetics and life experiences, facial features tend to diverge from the "average" over time (Deffenbacher et al., 1998). Consequently, facial distinctiveness also increases with age, making each face more unique as it grows older. Moreover, because some feminine traits (e.g., large eyes, full lips, and a small nose) potentially represent a form of neoteny that evokes associations with children's faces (Johnston, 2000), previous studies have reported that feminine faces are typically perceived as younger than masculine faces (Boothroyd et al., 2005, 2007; Perrett et al., 1998; Voelkle et al., 2012). Females therefore tended to look younger than males, even they are at the same age (Bulpitt et al., 2001).

In conclusion, facial attractiveness does not arise from any single feature. Rather, it emerges from the integration of multiple cues. These cues convey diverse types of information. Symmetry and averageness relate primarily to developmental stability and cognitive processing efficiency. Sexual dimorphism signals hormonal levels and personality traits. Facial adiposity and skin condition provide a health monitoring system that operates from immediate states to long-term history. Youth, in turn, functions as a composite signal that integrates multiple facial cues and serves as a visible proxy for remaining reproductive value. Importantly, these cues do not operate independently. How they interact and how their weights shift across different environments and across perceivers constitutes a core issue in facial attractiveness research and underlies the individual and cultural differences in attractiveness judgments.

1.3 Differences in facial attractiveness judgments

Although some cues to facial attractiveness show cross-cultural consistency, a growing body of evidence reveals that these general standards exhibit considerable variation in actual judgments (e.g., Bjornsdottir et al., 2025; DeBruine, Jones, Crawford, et al., 2010; Little et al., 2007; Moore et al., 2009). This variation is not random noise. Rather, it reflects the operation of a dynamic system for attractiveness evaluation. This system flexibly adjusts the weighting of different facial cues in response to the external environment and the internal physiological and psychological states of the perceiver, thereby serving the core goal of maximising adaptive outcomes in specific contexts (Symons, 1995). Thus, understanding this variation means understanding how attractiveness judgments serve as a bridge that connects evolutionary logic with individual experience, immediate states, and life history strategies.

This chapter reviews two categories of variables that shape facial attractiveness judgments. The first concerns the influence of the environment, including social learning, survival pressures, kinship, and visual experiences. These factors suggest that our aesthetic standards are continually shaped by the physical and cultural environments we inhabit, ensuring their alignment with local ecological and social conditions. The second category shifts the focus to the perceiver, examining how factors such as own mate value, hormone levels, mating strategies, and sexual orientation internally modulate preferences. This perspective reveals how an individual's attractiveness judgments can serve as a mirror reflecting their physiological state, life history strategies, and social identity.

1.3.1 Environmental differences

1.3.1.1 Social learning

From an evolutionary perspective, accurately assessing the biological quality of potential mates, such as their fertility or genetic integrity, carries significant survival value (Buss, 2024; Trivers, 1972). However, directly observing these qualities faces considerable challenges due to information asymmetry, particularly when evaluating non-visible traits related to long-term cooperation or parental investment. Individual learning through trial and error is not only time-consuming but also costly. Consequently, humans have evolved heuristic strategies that draw on the wisdom and experiences of others (Little, Jones, DeBruine, et al., 2011). Social learning enables observers to infer the value of a target from their peers' choices, thereby maximising evaluative efficiency, and this mechanism is particularly pronounced under conditions of high uncertainty (Turner et al., 2023).

Mate choice copying represents the most direct manifestation of social learning in attractiveness judgments, which refers to the phenomenon that an individual's mate choice (especially for females) is often influenced by the preferences and behaviours of other same-sex peers. It is well-documented in animals like birds and fish (B. C. Jones & DuVal, 2019; Little, Jones, DeBruine, et al., 2011), but existing evidence suggests this effect also occurs in humans (e.g., Dunn & Doria, 2010; Little et al., 2008, 2015; Waynforth, 2007). For instance, a man surrounded by women was rated as more attractive than when he was alone or with other men (Dunn & Doria, 2010; Waynforth, 2007). Waynforth (2007) noted that mate-copying only emerges when the women surrounding the man are physically attractive. A potential explanation for this is that men with attractive partners are attributed more positive traits (Sigall & Landy, 1973), and a man's attractiveness thereby is inferred from his partners'. Another study (Little, Burriss, et al., 2008) reported that this effect applies to both men and women, only for long-term, not short-term, relationship decisions. This suggests that people use such social cues to infer hidden traits (e.g., status, intelligence) that are crucial for long-term partnerships.

1.3.1.2 Survival pressures

Individuals differ in the environments they inhabit and the experiences they encounter during early development. Consequently, although humans share the same evolved psychological mechanisms, early life conditions guide individuals toward adopting different behavioural strategies (Buss, 2024). Given that, the life history theory was proposed to describe how organisms make adaptive decisions to allocate limited resources among competing biological functions, including growth, somatic maintenance, and reproduction (for reviews, see Kaplan & Gangestad, 2015). Individual life history strategies lie on a fast-slow continuum, where a fast strategy prioritises high reproductive effort and reduced investment in offspring in unpredictable environments or under resource scarcity, while a slow strategy is characterised by delayed development and high parental investment in stable environments (Chisholm, 1996; Dillon et al., 2013; Kaplan & Gangestad, 2015).

If environmental pressures shape behavioural strategies, a key question follows: when survival is threatened, do human's standards for facial attractiveness shift strategically? Indeed, many studies have found that, in harsh environments (e.g., high prevalence of pathogens and poor healthcare), women show stronger preference for facial cues of health. For example, a large-scale study (DeBruine, Jones, Crawford, et al., 2010) has investigated the association between the health condition of a country and women's preference for male facial masculinity across 30 countries. Specifically, the results demonstrated that there was moderately and negatively correlation between the national health index (NHI) and women's preferences for male facial masculinity for each country.

Preferences for facial characteristics may also be affected by resource availability. Little et al. (2007) found that in low-resource environments, women showed a stronger preference for men with more feminine faces, rather than more masculine faces, as long-term partners. This suggests that under these conditions, women place greater value on potential investment cues associated with feminine faces than on the health cues associated with masculine faces. These differences in preferences for male facial masculinity between low-resource and poor health environments again reflect women's trade-off between the costs (e.g. low investment) and benefits (e.g. healthy offspring) during mate choice.

Apart from male facial masculinity, harsh environments may also be correlated with increased preferences for female facial adiposity. Previous studies have reported that people in rural areas in developing countries prefer this cue than those in developed world (e.g., Batres & Perrett, 2014, 2017; Furnham & Baguma, 1994). This finding support the view that preferences for facial adiposity is an adaptation to environments with high disease risk or unpredictable food supplies (Brown & Konner, 1987; Wells, 2006).

1.3.1.3 Kinship

Imprinting

Imprinting is the early learning process through which parental traits leave a lasting impression on the offspring's developing mind (Bereczkei et al., 2002, 2004; Perrett et al., 2002). For example, when presented with a choice between their mother's face and a stranger's, infants, who even at the end of their first day, are more likely to gaze at their mothers (Bushneil et al., 1989; Pascalis et al., 1995).

Early imprinting affects not only attraction to the mother during childhood but also the mate choice of the offspring many years later. For instance, individuals whose parents were relatively old (over 30) at their birth showed a weaker preference for youth and were more attracted to older faces. Conversely, those whose parents were younger (less than 29) at birth placed a higher value on youth and judged older faces more harshly (Perrett et al., 2002). Furthermore, young adults, even those who were adopted, tend to prefer and form partnerships with individuals who resemble their opposite-sex parents, and this effect depends on the quality of their early childhood relationship with that parent (Bereczkei et al., 2002, 2004; Wiszewska et al., 2007).

Inbreeding

The human face provides reliable information about genetic relatedness (Alvergne et al., 2007; Bressan & Martello, 2002), which can be perceived with considerable accuracy (Dal Martello & Maloney, 2006; DeBruine et al., 2009; Maloney & Dal Martello, 2006). Since judgments of facial similarity are strongly linked to judgments of kinship, our own faces, as well as our parents' faces, closely resemble those of our siblings. This raises a critical question: if we are predisposed to feel attraction to faces with a familial resemblance, what prevents this predisposition from resulting in incest?

Inbreeding increases the risk of genetic disorders (for reviews, see Bittles & Neel, 1994). Consequently, humans have evolved psychological adaptations to avoid incest. One such mechanism is a preference for self-resemblance in same-sex faces over opposite-sex faces (DeBruine, 2004). This pattern of attraction likely promotes prosocial behaviour toward same-sex kin while effectively reducing the risk of inbreeding with opposite-sex kin (DeBruine et al., 2008, 2011).

1.3.1.4 Visual experiences

The face-space encodes all recognisable faces encountered over the lifespan (Valentine, 1991; Valentine et al., 2016). Rather than remaining static, it is continuously shaped by perceptual learning, becoming fine-tuned to the faces an individual most frequently encounters. This developmental calibration optimises recognition for the specific visual environment. Consequently, each individual's face-space is unique, reflecting their personal history of visual experience (for a review, see Valentine et al., 2016).

In the visual adaptation paradigm, brief exposure to faces that have been consistently distorted, for example by expanding or contracting specific features, shifts subsequent judgments of what constitutes a normal face toward the direction of the distortion. This phenomenon is known as face aftereffects (Rhodes, Jeffery, et al., 2003; Rhodes, Robbins, et al., 2005). Critically, such adaptation not only recalibrates the perception of normality but also shifts attractiveness preferences accordingly. After adapting to faces with contracted features, previously normal faces appear expanded, while faces that are slightly contracted are judged as more normal and more attractive than they were before adaptation (Rhodes, Jeffery, et al., 2003). This suggests that attractiveness evaluations are made relative to the current norm (i.e., the average/prototypical face) within an individual's face-space, and that this norm is dynamically updated in response to the facial input encountered in the visual environment.

Beyond short-term adaptation in experimental settings, the long-term facial environment to which an individual is exposed plays a decisive role in shaping attractiveness standards. During the first few months of life, infants are able to distinguish faces from different ethnicities and even different species, such as monkeys (Kelly et al., 2007; Krasotkina et al., 2018; Pascalis et al., 2002). However, as visual experience accumulates, infants undergo a process of perceptual narrowing between six and nine months of age (Kelly et al., 2007). Through sustained exposure to particular types of faces, typically those from their own species and ethnic group, they begin to lose the ability to discriminate unfamiliar face categories, while simultaneously developing enhanced sensitivity and preference for the face types most common in their environment. This phenomenon, the tendency for individuals to recognise faces of their own race more easily than those of other races, is known as the other-race effect (for reviews, see Anzures et al., 2013; Meissner & Brigham, 2001). As a result, the face-space becomes optimally tuned to recognise own-race faces, but its dimensions may not be appropriately scaled to distinguish other-race faces effectively (Anzures et al., 2013; Valentine et al., 2016). For observers with minimal exposure to other-race faces, these faces are often perceived as more similar to each other and are mapped farther from the norm face in their face-space (Valentine, 1991). Nevertheless, with sufficient experience, the face-space can be recalibrated, leading to equivalent recognition accuracy for both own-race and other-race faces (Chiroro & Valentine, 1995; Rhodes, Robbins, et al., 2005). Furthermore, frequent exposure not only narrows the distance between distinctive faces and the norm face in the space, but also increases the subjective feeling of processing fluency, which in turn can enhance the perceived attractiveness of these faces (Principe & Langlois, 2012; Reber et al., 1998; Valentine et al., 2016).

1.3.2 Individual differences

1.3.2.1 Self-rated mate value

Mate value is defined as the overall desirability of an individual as a potential partner in the mating market, reflecting the fitness benefits they can offer to a mate (M. Fisher et al., 2008). These benefits include both direct benefits (e.g., resource provision and parenting ability) and indirect benefits (e.g., good genetic quality). When evaluating the facial attractiveness of potential partners, individuals calibrate their preferences in a condition-dependent manner based on their self-rated mate value (Arnocky, 2018; Buss & Shackelford, 2008; Chen et al., 2018; Little & Mannion, 2006). This calibration mechanism enables individuals to strike an optimal evolutionary trade-off between pursuing the highest possible genetic benefits and avoiding the costs associated with high-stakes competition, such as the risk of rejection or partner infidelity (Chen et al., 2018; Mehmetoglu et al., 2025).

For a woman, youth and physical attractiveness are two primary indicators of her mate value (Conroy-Beam & Buss, 2019; N. P. Li et al., 2002). Consequently, young and attractive women often have more mating opportunities and tend to be more selective in mate choice (Buss & Shackelford, 2008; Pawlwski & Dunbar, 1999). A number of studies revealed that self-rated attractive women showed stronger preferences for male traits associated with ‘good genes’ (e.g., Buss & Shackelford, 2008; Docherty et al., 2020; Little et al., 2001; Little & Mannion, 2006; Marcinkowska et al., 2021; Penton-Voak et al., 2003; Wincenciak et al., 2015). For instance, women who rated themselves as more attractive showed stronger preferences for masculine and symmetric male faces, but this effect was not observed in judgments of female faces (Little et al., 2001; Little & Mannion, 2006; Penton-Voak et al., 2003). This suggests that females who assess themselves as physically attractive may believe they are better positioned to compete for and retain high-quality mates. By contrast, women with low self-rated mate value are often forced to make trade-offs between good genes and parental investment. Because they cannot simultaneously secure both sets of traits, they may instead select partners who are less demanding in their standards but reliable in specific domains, such as resource provision, thereby reducing the risk of being rejected or suffering investment loss due to partner infidelity (Chen et al., 2018; N. P. Li et al., 2002; Mehmetoglu et al., 2025). Overall, this pattern again supports the view that women's facial preferences are not merely general aesthetic judgments but are specifically linked to mating strategies.

Similar to women, men with higher self-rated mate value also exhibit stricter mating standards, showing stronger preferences for women who are young, facially attractive, and of high social status (Arnocky, 2018). However, research has also revealed an interesting sex difference: men's own facial attractiveness, as rated by women, tends not to be correlated with their stated mate preferences (Arnocky, 2018). This suggests that men's calibration of mating standards relies more heavily on self-rated mate value derived from resources and social status rather than from physical appearance alone. This sex difference aligns with the predictions of the mate preference priority model (N. P. Li, 2007; N. P. Li et al., 2002; N. P. Li & Kenrick, 2006).

1.3.2.2 Hormone levels

Hormone levels of face owners influence the development of some facial features (e.g., sexual dimorphism). At the same time, hormone levels of face perceivers also influence how much they prefer certain facial features.

A typical human female menstrual cycle takes about 28 days, and hormone levels fluctuate throughout the cycle (Mihm et al., 2011; Sherman & Korenman, 1975). Around the time of ovulation, when women's fertility is highest, oestrogen levels surge to a peak, which helps trigger the luteinising hormone surge and ovulation. Following this, the ruptured follicle transforms into the corpus luteum, which releases progesterone, causing its levels to rise markedly during the subsequent luteal phase.

A number of early studies found that, women tend to prefer masculine male faces more around ovulation than in other cycle phases (Johnston et al., 2001; B. C. Jones, Little, et al., 2005; Penton-Voak et al., 1999; Penton-Voak &

Perrett, 2000). The dual mating strategy hypothesis interprets this shift as a strategic adaptation whereby favouring masculine features when most fertile may help women secure genes for healthy immunity for their offspring, meanwhile, maintaining a preference for less masculine (i.e., potentially more investing) partners throughout the rest of the cycle helps ensure long-term paternal care (Gangestad & Thornhill, 2008; B. C. Jones et al., 2019). Nevertheless, the early research has been criticised for methodological problems (B. C. Jones et al., 2018, 2019). Indeed, several recent large-scale longitudinal studies have failed to observe significant effects of menstrual cycle phase on facial masculinity preference, casting doubt on the dual mating strategy hypothesis (B. C. Jones et al., 2019).

Despite inconsistent evidence for cyclic shifts in facial masculinity preferences, compelling findings indicate that the menstrual cycle influences women's preferences for apparent health and self-resemblance in faces (B. C. Jones et al., 2008). Specifically, preferences for healthy-looking faces are strongest during high-progesterone phases (e.g., the luteal phase and pregnancy), independent of masculinity preferences (B. C. Jones, Little, et al., 2005; B. C. Jones, Perrett, et al., 2005). This may reflect an adaptation to compensate for suppressed immune responses during pregnancy, reducing the risk of infections that could disrupt fetal development. Additionally, preferences for self-resembling faces are also positively correlated with progesterone levels, but not with oestrogen or conception risk, and are stronger for female faces than for male faces (DeBruine et al., 2005). This pattern suggests that cyclic shifts in self-resemblance preferences may serve to promote kin support rather than avoid inbreeding.

Hormone levels similarly influence men's face preferences. Testosterone levels in men follow a daily rhythm, peaking in the morning upon waking and potentially declining by up to 35% by midday (Brambilla et al., 2009). Studies using this natural variation have found that men's preference for feminine features in women's faces is stronger when their testosterone levels are higher (e.g., Welling et al., 2008). Furthermore, experimental studies involving testosterone administration have also observed a similar reinforcing effect (e.g., Bird et al., 2016; Han et al., 2020). Collectively, these findings indicate that fluctuations in hormones like testosterone can generate consistent within-individual differences in men's face preferences.

1.3.2.3 Mating and reproductive strategies

Long-term vs short-term relationships

Besides fertility, as previously discussed, women's preference for facial masculinity is also moderated by their relationship context. In short-term mating contexts, because the potential costs of low investment from the partner are less of a concern than in long-term relationships, individuals tend to view short-term partners primarily as vehicles for genetic investment or sources of hedonic returns (N. P. Li & Kenrick, 2006). In this context, a potential partner's physical attractiveness, particularly cues of masculinity, becomes a necessity, whereas socioeconomic status and personality traits become luxuries (N. P. Li, 2007; N. P. Li & Kenrick, 2006). However, in long-term mating contexts, aesthetic evaluations are strongly moderated by the partner's cues to resource acquisition potential and social behaviour. For women, although male facial attractiveness continues to exert some influence, its weight is often secondary to indicators of socioeconomic status. When faced with trade-offs, women prioritise a partner's status and parental investment potential over purely physical attractiveness (N. P. Li, 2007; N. P. Li et al., 2002, 2013). Therefore, women tend to prefer men with more masculine faces, associated with genetic benefits, for short-term partnerships, while favouring more feminine-looking men, perceived as more likely to provide higher investment, for long-term commitments (Little et al., 2002; Penton-Voak et al., 2003). This strategic shift allows women to potentially maximise genetic benefits from short-term partners while securing greater parental investment and cooperation from long-term partners.

However, a recent study by Dong et al. (2024) directly challenges the view that women's facial masculinity preferences are moderated by relationship context. Using natural male faces, they found no evidence of stronger masculinity preferences in short-term relationships. This discrepancy points to a key methodological issue that findings from studies using manipulated face stimuli may not generalise to those using natural faces (see Section 1.4).

Desire to have children

Women's preferences for facial masculinity also vary with their reproductive strategies. Specifically, compared to women who desired fewer children, women who desired more children valued cues to paternal investment more important than cues to immunocompetence and showed a stronger preference for feminine male faces (Moore et al., 2009). This finding is consistent with the adaptive trade-off model, which proposes that the extent of women's preference for facial masculinity or femininity depends on their need for direct investment of paternal care in offspring.

An alternative explanation posits that preferences for feminine male faces originate from an innate human attraction to neotenous features, such as large eyes, high foreheads, and round cheeks (Luo et al., 2015; Numan & Young, 2016). These features activate the brain's reward system, eliciting caregiving and protective motivations, and women with high fertility intentions generally exhibit higher sensitivity to such neotenous features (Luo et al., 2015). Oxytocin plays a key mediating role in this process, increasing attention to infant faces and enhancing the pleasure derived from these visual stimuli (Luo et al., 2015; Scheele et al., 2016). Furthermore, these caregiving motivations affect aesthetic judgments of adults (Scheele et al., 2016). Consequently, in long-term mating contexts, women show stronger preferences for male faces with moderate neotenous features (i.e., feminine male faces) (DeBruine, Jones, Smith, et al., 2010; Little & Hancock, 2002; Perrett et al., 1998; Rhodes et al., 2000). This preference may reflect a generalisation of caregiving motivation to the domain of mate choice.

1.3.2.4 Sexual orientation

Facial attractiveness preferences vary as a function of sexual orientation. The longer people look at an object, the more they tend to like it, and conversely, increased liking leads to longer looking times (Leder et al., 2010; Mitrovic et al., 2016; Shimojo et al., 2003). This effect is strongly moderated by the sexual orientation of perceivers, presenting a preferred-sex bias. Empirical evidence shows that heterosexual men spend significantly more time gazing at female faces than at male faces, whereas homosexual men and heterosexual women pay greater attention to male faces, and findings for homosexual women are mixed (Glassenberg et al., 2010; Israel & Strassberg, 2009; Lippa, 2012; Mitrovic et al., 2016). More specifically, when viewing faces varying in attractiveness, sexual orientation determines the perceiver's sensitivity to signals of beauty. For the face of preferred sex, facial attractiveness strongly predicts gaze duration; for the non-preferred sex, however, increases in attractiveness often fail to generate comparable increases in attention of male perceivers (Lippa, 2012). An interesting finding is that for unattractive faces within the preferred sex, perceivers exhibit visual avoidance or an aversive response: heterosexual men, homosexual men, and homosexual women all show shorter gaze durations when viewing unattractive faces of their preferred sex compared to unattractive faces of their non-preferred sex (Mitrovic et al., 2016). From an evolutionary perspective, this pattern can be interpreted as an efficient mate screening mechanism. For potential mates, low attractiveness may signal poor genetic quality or health risks, prompting an automatic aversive response that helps individuals avoid incurring the costs associated with pursuing low-quality partners. By contrast, for individuals of non-preferred sex, unattractive faces carry no comparable biological threat or selective pressure, allowing perceivers to remain relatively neutral (Buss & Schmitt, 2019; Little, Jones, & DeBruine, 2011; Zahavi, 1975).

Preferences for facial sexually dimorphic features also show complex patterns in the context of sexual orientation. A robust finding is that homosexual men typically exhibit a stronger attraction to masculinity in male faces than heterosexual women (Glassenberg et al., 2010). Compared with men, women show a more diverse pattern of preferences. Homosexual women tend to show weaker preferences for femininity in female faces, sometimes even preferring faces with masculine features (Bjornsdottir et al., 2025; Glassenberg et al., 2010). Moreover, a recent study found that bisexual individuals display unique patterns of facial preference that are not simply intermediate between heterosexual and homosexual preferences; rather, they are significantly moderated by both the individual’s gender and cultural background (Bjornsdottir et al., 2025). These patterns suggest that the face preferences of homosexual and bisexual individuals appear to be shaped by a complex interaction of biological and social factors, similar in complexity to those observed in heterosexual individuals.

1.4 Methodological issues in facial attractiveness research

The existing body of research on facial attractiveness is marked by inconsistent findings. These discrepancies have been attributed to variations in experimental stimuli and assessment methods (e.g., Dong et al., 2023; A. L. Jones & Jaeger, 2019; A. J. Lee et al., 2021). This section reviews the development of both facial stimuli and evaluation techniques in the field.

1.4.1 Stimuli

In facial attractiveness research, face images are essential stimuli. Early studies often directly manipulated facial images as stimuli. For example, Kowner (1996) investigated the link between facial asymmetry and perceived attractiveness in humans using symmetrical chimeric faces created through mirror-imaging. They measured facial asymmetry in natural photos of male and female faces by calculating the total horizontal distance between mid-points of lateral feature points. The results showed that normal (i.e., slightly asymmetric) faces were preferred over perfectly symmetric ones.

Subsequent advances in computer graphics (CG) revolutionised the empirical study of facial attractiveness. The core strength of this approach lies in its ability to isolate and manipulate specific facial features to determine their causal effect on attractiveness judgements (for reviews, see O'Toole et al., 1999; Sutherland et al., 2017). The CG techniques provided the primary toolkit (e.g., Psychomorph) for operationalising abstract theoretical concepts such as symmetry, averageness, and sexual dimorphism, establishing a dominant research paradigm (Sutherland et al., 2017). Many foundational theories in this field rely on findings from computer-manipulated stimuli. For instance, studies employing CG methods to create perfectly symmetrical faces by blending normal and mirror-reversed images have shown that these images were rated as more attractive than the original (i.e., slightly asymmetric) versions (e.g., B. C. Jones et al., 2007; Perrett et al., 1999; Rhodes et al., 1998). This finding contradicted earlier claims that slightly asymmetric faces were preferred, which were based on symmetric versions created by the less sophisticated techniques (e.g., Kowner, 1996).

However, the CG approach has also met with criticism. Some critics argued that the composite faces might not truly represent averageness (Alley & Cunningham, 1991; Pittenger, 1991). Specifically, the composites may exhibit non-average features (e.g., larger eyes and thicker lips) because the outlines of individual features are not properly aligned before blending. Additionally, the blending process also create some attractive but non-average features like smoother skin texture and a soft-focus effect (Alley & Cunningham, 1991; Little & Hancock, 2002). Although later studies (e.g., B. C. Jones et al., 2007; Little & Hancock, 2002; O'Toole et al., 1999; Rhodes et al., 1999) have confirmed that averaged faces remain attractive when these effects are statistically controlled, it still reveals inherent limitations in stimuli with CG methods.

Another primary criticism of manipulated face stimuli is their poor ecological validity. This limitation challenges the generalisability of findings, as responses to these artificial faces may not accurately reflect perceptions and decisions made in response to real-world faces (Crookes et al., 2015; Scott et al., 2010). In line with this view, several recent studies have found that results from experiments using natural (i.e., unmanipulated) face images can differ qualitatively from those obtained using manipulated face stimuli. For example, Kleisner et al. (2024) and P. Lee et al. (2025) reported that facial symmetry had no significant effect on attractiveness when measured from natural faces using geometric morphometrics. These conflicting findings regarding the role of symmetry underscore the critical importance of stimulus and measurement selection in face perception research.

Natural face stimuli are the optimal choice for establishing ecological validity, but obtaining high-quality, standardised natural face databases suitable for diverse experimental goals poses significant challenges (Di Natale et al., 2024). Existing face databases are often constructed for specific research purposes and lack the standardisation required for broader application. Furthermore, technical inconsistencies across databases make data integration problematic. These issues limit researchers to conduct well-controlled facial attractiveness research (Di Natale et al., 2024).

Over the last decade, an increasing number of studies of face perception have employed computer-generated faces as stimuli (for reviews, see Dawel et al., 2022). A key advantage of this approach is that computer-generated faces are highly standardised and allow researchers to cleanly manipulate specific facial parameters (Dawel et al., 2022; Di Natale et al., 2024). Nevertheless, Dawel et al. (2022) noted that real faces cannot be replaced with computer-generated ones, as they elicit weaker other-race effects (Craig et al., 2012; Crookes et al., 2015), are harder to remember (Balas & Pacella, 2015), and evoke lower neural responses (Katsyri et al., 2019; Schindler et al., 2017) compared to real faces.

With the recent rapid advancement of artificial intelligence (AI), AI-generated faces have now become widely accessible. Notably, these faces are not only indistinguishable from real human faces but may even be perceived as more "human" than real faces (Miller et al., 2023; Nightingale & Farid, 2022). The emergence of AI-generated faces carries the potential for a paradigm shift, but it also introduces a core methodological concern. The hyper-realism of AI-generated faces represents not a simulation of real faces, but an amplification of the aesthetic norms embedded in the training data (Miller et al., 2023). Humans tend to perceive average faces as the most prototypical and thus the most real. Because AI face generation algorithms are trained on large-scale datasets, they produce a form of hyper-averageness that eliminates the minor imperfections common in real human faces. When perceivers encounter these hyper-average AI faces, they may therefore mistake them for being more attractive and more real than actual human faces (Boudníková & Kleisner, 2024; Miller et al., 2023; Nightingale & Farid, 2022). This illusion of being more real than real suggests that when researchers use AI-generated faces as stimuli, they may be presenting participants with supernormal stimuli. In such cases, the evolved aesthetic mechanisms of human perceivers may be biased by algorithmically optimised features, potentially leading findings to deviate from natural social interaction (Boudníková & Kleisner, 2024). Therefore, AI-generated faces have the potential to serve as alternatives for conventional face stimuli, but the feasibility of this method still requires further empirical support.

1.4.2 Assessment methods

Beyond the type of face stimuli used, the method of assessment is another major reason of inconsistent findings in facial attractiveness research. A significant portion of existing research has relied on two primary methods: the two-alternative forced-choice (2AFC) paradigm and Likert-scale ratings (A. L. Jones & Jaeger, 2019).

In the 2AFC paradigm, observers are presented two versions of a face, typically a manipulated version alongside its original or a counterpart altered in the opposite direction, then are asked to choose which one they perceived as more attractive. This method is useful for two reasons. First, it is an experimental manipulation that helps establish a causal link between a specific facial feature and perceived attractiveness, moving beyond mere correlation (Baudouin & Tiberghien, 2004; Grammer & Thornhill, 1994). Second, by keeping all other facial features constant and varying only the feature of interest, it cleanly isolates the effect of that single dimension (Baudouin & Tiberghien, 2004; Little, Jones, et al., 2008).

Nevertheless, this methodology is often criticised for its limited ecological validity. In real-world contexts, people rarely evaluate attractiveness by comparing nearly identical faces and selecting based on a single trait. Instead, such judgments typically involve the integration of numerous factors (Johansson et al., 2005). Consequently, while the 2AFC paradigm provides a sensitive measure capable of detecting statistical significance, its capacity to explain the complexity of real-life attractiveness judgments remains questionable (A. L. Jones & Jaeger, 2019; Penton-Voak, 2011).

In contrast, Likert-scale rating studies offer another way to investigate the causal role of facial features, where observers are presented with individual faces and asked to rate their attractiveness on a scale. This method more closely approximates real-world judgments, as it requires evaluating each face as a whole rather than comparing two nearly identical faces. However, this method is not without its limitations. When participants evaluate multiple stimuli in one session, they tend to compare the images against each other rather than judging them independently (i.e., carryover effect) , which potentially exaggerates the actual impact of the manipulated trait. (A. L. Jones & Jaeger, 2019).

The two assessment methods discussed above are typically employed in theory-driven (i.e., top-down) studies. While useful, the theory-driven approach has several limitations. First, the theoretical links between pre-selected facial characteristics and social perceptions are often weak and incompletely specified; second, the testing procedures themselves frequently lack ecological validity; finally, this method can only identify the influence of a single and isolated facial dimension, failing to capture the holistic nature of real-world face perception (B. C. Jones et al., 2023).

In recent years, an increasing number of studies have adopted data-driven (i.e., bottom-up) methods to investigate the features that contribute to facial attractiveness judgments based on global shape and colour properties of faces (e.g., Holzleitner et al., 2019; Said & Todorov, 2011). Compared to theory-driven methods, this approach offers two key advantages. First, it does not require a priori predictions about which facial features underlie specific social judgments, making it unconstrained by existing theories or researcher expectations; second, it is particularly suitable for analysing natural face images that vary across multiple dimensions simultaneously (Holzleitner et al., 2019; B. C. Jones et al., 2023).

A major barrier to applying data-driven methods is the extensive time required to manually place the facial landmarks needed for geometric analysis (A. L. Jones et al., 2021). This high time cost directly constrains sample sizes, which likely explains why many studies linking face shape to social or physical traits are statistically underpowered (e.g., Holzleitner et al., 2014). Furthermore, manual landmarking threatens the reproducibility of facial metrics, as different raters often place landmarks in slightly different locations, enlarging inter-observer error and reducing measurement consistency (A. L. Jones et al., 2021).

To overcome these barriers, fully automated landmark placement presents a promising alternative. Although widely used in domain of computer vision, this method remains insufficiently validated for facial perception research. A. L. Jones et al. (2021) demonstrated through a comparative study that automatic landmarks closely approximate manual ones and yield highly correlated facial measurements, suggesting the automated method can derive valid facial metrics. Furthermore, this approach eliminates the substantial time cost of manual labelling, potentially enabling larger-scale studies and enhancing the reproducibility of measurements.

However, the automated method is not flawless. The same study by A. L. Jones et al. (2021) showed that it sometimes fails to delineate faces accurately and produces substantial errors in a small percentage of cases (mainly for Caucasian faces). Therefore, a semi-supervised approach is currently likely optimal. As with AI-generated face stimuli, the feasibility of full automation requires further empirical support.

1.5 Mate preferences in the digital context

Although evaluating facial attractiveness with data-driven methods may mitigate the limitation of ecological validity to some extent, human mating preferences depend heavily on context (for a review, see Eastwick & Joel, 2025). Asking participants to rate static faces on a screen is a low-cost and consequence-free task. In such settings, participants can express their preferences without facing the complex trade-offs and interpersonal costs that usually come with actual mate selection. Indeed, some previous studies have shown that mate preferences examined using photograph-based methods fail to replicate in real-life mate selection (e.g., Eastwick & Finkel, 2008).

To avoid the ecological constraints of traditional experimental research, researchers have increasingly turned to online dating platforms as important channels for observing human mating behaviours in the real world (e.g., Davis & Fingerman, 2016; Fiore et al., 2008; Lee et al., 2019; Rosenfeld & Thomas, 2012). These platforms offer a large real-world data source that captures the dynamics of human courtship at an unprecedented scale (Finkel et al., 2012). In the past, research on mate preferences relied mostly on self-report questionnaires and tightly controlled lab studies (e.g., Buss, 1989, 2000; Langlois et al., 2000), whereas the massive data from online dating platforms allows researchers to compare individuals' stated preferences with their actual mating behaviours (e.g., Hitsch et al., 2010; Todd et al., 2007). Analysing such data helps address the low ecological validity of highly controlled studies and provides a real-world setting to test theories of human mate selection.

1.5.1 The emergence of online mating markets

Seeking a partner through public media has historical roots in newspaper personal advertisements (Cocks, 2009). In a typical advertisement, the advertiser described their own attributes, stated the type of relationship sought, and listed several qualities desired in an ideal partner (Finkel et al., 2012). However, these early methods were rarely considered a socially acceptable way to pursue romance. Individuals who placed such advertisements often did so discreetly to avoid public judgment (Darden & Koski, 1988).

Over the past three decades, the rise of the Internet facilitated the emergence of online dating platforms (for a review, see Finkel et al., 2012). Initially, these digital services carried a similar stigma of personal advertisements in the newspaper, being perceived as a last resort for individuals lacking traditional social networks (Orr, 2004; Whitty & Carr, 2006; Wildermuth & Vogl-Bauer, 2007). However, throughout the late 1990s and early 2000s, as the user base expanded and online dating experiences became normalised through peer sharing, this stigma gradually faded (Hogan et al., 2011). Today, the Internet is one of the primary environments for human mate selection, serving as the second most common way to meet a romantic partner, only behind introductions through friends (Rosenfeld & Thomas, 2012).

Existing online dating platforms generally offer services from three domains: access, communication, and matching (for a review, see Finkel et al., 2012). These services carry both advantages and disadvantages simultaneously. Regarding access, the most significant advantage of online dating is the unprecedented expansion of the potential partner pool compared to traditional dating, allowing users to evaluate potential partners whom they are otherwise unlikely to encounter (Rosenfeld & Thomas, 2012; Sautter et al., 2010). This is particularly beneficial for individuals with thin dating markets, such as older adults or sexual minorities, who may struggle to find an appropriate partner in their daily lives (Rosenfeld & Thomas, 2012). However, although online dating potentially enables the mating process to be more efficient, when faced with excessive options, users tend to adopt an evaluative "shopping" mindset, objectifying and commoditising potential partners (Heino et al., 2010; Lawson & Leck, 2006). Furthermore, browsing numerous profiles in a short time often leads to being cognitively overwhelmed, thereby leading users to make rapid decisions based on superficial traits (Lenton & Stewart, 2008). Consequently, this abundance of choice can ultimately decrease individuals' satisfaction with the partner they eventually select (Chiou & Yang, 2010; Wu & Chiou, 2009; Yang & Chiou, 2010).

In terms of communication, unlike traditional dating, online dating platforms with computer-mediated communication (CMC) allow users to interact and screen candidates before committing to an in-person date (Finkel et al., 2012). This initial screening process can enhance safety and help users filter out highly incompatible matches. Moreover, previous studies suggest that CMC can help individuals form initial romantic impressions by sharing more intimate disclosures (Altman & Taylor, 1973; Reis & Shaver, 1988). However, there are two points should be noted. First, a short time gap between the initial online interaction and the initial face-to-face meeting may improve positive impressions, while a prolonged delay often leads to over-idealisation, resulting in disappointment when reality does not meet expectations (McKenna et al., 2002; Ramirez & Zhang, 2007). Second, experiential attributes, such as rapport, humour, interaction style, and even body odours, must be assessed in person, as they cannot be fully conveyed through screens (Eastwick et al., 2011; Finkel et al., 2012). Thus, rather than one channel being better, online and face-to-face communication provide different but complementary information, both of which are necessary to form a complete impression of a potential partner (Finkel et al., 2012).

Regarding matching, some online dating platforms claim that their matching algorithms can identify uniquely compatible partners based on user self-reported personality traits and preferences (e.g., eHarmony, Match). While this approach theoretically reduces the randomness of traditional partner selection, empirical evidence supporting the effectiveness of these algorithms is insufficient (Heyman & Slep, 2001; Joel et al., 2017). Long-term relationship outcomes depend heavily on factors that cannot be measured before two people have met, such as how partners interact and cope with stress (Gottman, 1994; Gottman et al., 1998; M. D. Johnson et al., 2005; Karney & Bradbury, 1995; Neff & Karney, 2009). No compelling evidence shows that matching algorithms produce better romantic outcomes than other ways of meeting partners (Heyman & Slep, 2001; Joel et al., 2017). At best, matching sites may screen out individuals who are generally poor candidates, but they cannot reliably predict whether two specific strangers will form a satisfying and lasting relationship (Finkel et al., 2012; Joel et al., 2017).

Currently, the landscape of online dating can be classified into three primary categories based on their operational mechanisms and user interfaces. First, profile-centric matching platforms (e.g., eHarmony, Match) require users to complete extensive questionnaires. On these platforms, potential partners are usually searched manually using specific search criteria, or recommended by proprietary algorithms based on perceived psychological compatibility and shared interests (Finkel et al., 2012; Hitsch et al., 2010). Second, the prevalence of smartphones has driven the rapid rise of location-based dating applications (e.g., Tinder, Bumble). These applications utilise GPS technology and matching algorithms to connect proximate users and emphasise rapid image-based evaluations, typically through a 'swiping' mechanism, while minimising textual self-descriptions (David & Cambre, 2016; Sumter et al., 2017). Third, dating platforms designed for specific demographic groups, religious affiliations, or sexual orientations (e.g., Grindr for sexual minorities, OurTime for older adults). These specialised platforms facilitate targeted partner searches within inherent thin dating markets (Blackwell et al., 2015;

Rosenfeld & Thomas, 2012). Recognising these differences is methodologically important, as the specific design of a platform reflects both users' mating cues prioritised during the mate selection process (e.g., facial attractiveness vs. socioeconomic traits) and mating motivations (e.g., short-term casual encounters vs. long-term committed relationships) (Botnen et al., 2018; Olivera-La Rosa et al., 2019; Orosz et al., 2018; Sumter et al., 2017).

1.5.2 Facial attractiveness in online dating

The profile page is one of the most important elements of an online dating platform (Dai & Xia, 2025). Most users primarily rely on profile information to decide whether to communicate with potential partners (Dai & Xia, 2025). A profile typically includes user's photos, demographic information (e.g., age, education, occupation, and location), interests and textual self-description (usually on profile-centric matching platforms) (Finkel et al., 2012). The platform with the 'swiping' mechanism, such as Tinder, displays potential partners one at a time, showing each profile photo along with little textual information. Users decide whether they like a person based on the profile by swiping right for yes or left for no (Olivera-La Rosa et al., 2019; Orosz et al., 2018). In that case, profile photos are more likely to be the primary cue for forming first impressions (van der Zanden et al., 2022). Supporting this, some studies have found that the perceived attractiveness of profile photos is the strongest predictor of dating intention, particularly among male users (e.g., Abramova et al., 2016; Dai & Robbins, 2021; Fiore et al., 2008). This profound facial attractiveness advantage may result from the design of online dating platforms. Online daters are often exposed to numerous potential partners in a short time during the profile-browsing stage, in which users frequently decide on a potential partner after only a few seconds of viewing a profile and in which the next candidate is a mere click or swipe away (Finkel et al., 2012). In such a state of choice overload, online daters tend to employ decision-making strategies with less cognitive load (Lenton et al., 2009; Lenton & Stewart, 2008).

Research indicates that people can form multiple social judgements from the facial appearance of an unfamiliar person within hundreds milliseconds (Todorov et al., 2009; Willis & Todorov, 2006). Attractive faces transmit not only critical evolutionarily advantageous traits such as health and greater reproductive values (Little, Jones, & DeBruine, 2011; Rhodes, 2006), but also potential positive personality traits (e.g., more confident, emotionally stable, intelligent, responsible, sociable, and trustworthy) due to the attractiveness halo effect (Batres & Shiramizu, 2023; Dion et al., 1972; Eagly et al., 1991; Langlois et al., 2000). Furthermore, the first impression based on facial attractiveness may bias the evaluation of subsequent information (Cone et al., 2017). An attractive facial image may lead online daters to perceive the accompanying text descriptions more favourably and forgive potential shortcomings in the profile, whereas an unattractive photo may lead users to immediately reject the profile without evaluating any further information (Brand et al., 2012; Fiore et al., 2008; van der Zanden et al., 2020). Consequently, facial attractiveness exerts an immediate and robust influence on mating decision-making in the online dating context.

1.5.3 Beyond facial cues

Beyond photos, the textual self-description of the profile owner is another critical cue that shapes impressions of overall attractiveness and romantic appeal (Fiore et al., 2008; van der Zanden et al., 2022). Profile text contains not only cues that users' intentionally construct (e.g., mating goal) but also cues that they unintentionally give off (e.g., typographical errors) (Ellison et al., 2006; van der Zanden et al., 2020). Consequently, while photos capture initial attention, the text provides context to evaluate a user's communication style, educational level, and more accurate personality traits behind their face, reducing the uncertainty of interacting with strangers online (Ellison et al., 2006; Toma & Hancock, 2012; van der Zanden et al., 2020). This indicates that profile text and visual cues operate together to shape the overall impression of a potential partner (Brand et al., 2012; van der Zanden et al., 2020, 2022).

Finkel et al. (2012) suggest that online dating has fundamentally altered the romantic acquaintance process. Although personal traits such as age, height, socioeconomic characteristics (e.g., income, occupation and education), and reproductive status have always influenced mate choice (Buss, 1989; Conroy-Beam & Buss, 2019; Kramer & Jones, 2023; Walter et al., 2020; Xu, 2025), the online context alters how they are processed. In traditional in-person dating, individuals typically acquire only fragmentary information about potential partners prior to an initial face-to-face meeting, and they rarely have access to detailed personal profiles to aid in initial screening decisions (Finkel et al., 2012). In contrast, online dating platforms provide an efficient way to collect detailed information about potential partners, allowing users to systematically evaluate matches and screen out undesirable candidates before committing to an in-person date (Whitty & Carr, 2006). By converting personal characteristics into searchable parameters, reported demographic and physical attributes act as explicit filters. This mechanism enables users to execute evolutionary preferences for resources and genetic quality with precise cut-offs (e.g., filtering for a specific minimum income or maximum age) (Abramova et al., 2016; Hitsch et al., 2010). Furthermore, online daters also tend to filter for potential partners who share similar socioeconomic characteristics, religious beliefs, or cultural backgrounds, facilitating assortative mating (Finkel et al., 2012; J. Levy et al., 2019).

1.6 Current studies

Although it is well established that age influences attractiveness judgments and partner preferences, several issues relating to age preferences remain somewhat contentious. First, the claim that a substantial sex difference exists in age preferences, whereby straight men show stronger preferences for young partners than straight women do, is not necessarily well evidenced and, at least in the case of facial attractiveness judgments, depends on results of small-scale studies with small sample sizes (e.g., Perrett et al., 2002). Second, the claim that age preferences are moderated by parental age at birth and/or desire to have children, is dependent on results of small-scale studies of face preferences which have often used questionable methods to assess preferences for facial cues of age. Third, the claim that well established preferences for feminine shape cues in female faces reflect preferences for youth depends on studies showing that experimentally increasing feminine shape cues in female faces decreases perceived age (Perrett et al., 1998): No previous work has tested for correlations between measured shape femininity and age in female faces. Fourth, age preferences are typically assumed to operate in the same way regardless of how age preferences are assessed. However, this assumption is untested and the possibility that preferences for age revealed in online dating profiles and in facial-attractiveness judgments show different patterns of results has received no attention. My thesis will address these potentially important knowledge gaps.

The overall aim of this thesis is to examine the theoretical foundations and methodological paradigms underlying age preferences in human mate selection. Previous face-evaluation studies regarding age preferences have long relied on theory-driven highly controlled methods, often operating on hypotheses regarding evolutionary motivations and morphological cues. By testing these hypotheses and sequentially responding to the limitations of classical paradigms, this thesis transitions from investigating individual differences in controlled attractiveness-rating tasks to employing data-driven methodologies in real-world online mating markets. In other words, my thesis will first (Chapters 2 to 4) attempt to replicate sex differences in age preferences and moderating effects of both parental age at birth and desire to have children in facial-attractiveness judgments using methods that address limitations of previous work reporting these results (e.g., larger sample sizes and natural, rather than manipulated, face stimuli). I will then (Chapter 5) attempt to replicate some of these patterns of results (sex differences and fertility effects) in age preferences revealed in online dating profiles.

Chapter 2 describes a study testing whether imprinting-like effects, in which early exposure biases mate preferences in adulthood, shape subsequent preferences for younger faces, focusing specifically on parental age at the participant's birth. By examining the relationship between parental age at birth and attractiveness ratings toward age-diverse unmanipulated face stimuli, the study found no evidence to support the imprinting theory of age preference (Perrett et al., 2002).

Prompted by this lack of evidence for early developmental influences, the study in Chapter 3 shifted to explore an alternative evolutionary explanation that individuals with a greater desire to have children potentially show stronger preferences for younger faces (Buss, 1989, 2000; Conroy-Beam & Buss, 2019). Contrary to this prediction, the results revealed that a stronger desire for children was associated with weaker preferences for younger faces, regardless of the participant’s sex. Again, this unexpected finding challenged the existing evolutionary assumptions regarding the predictors of age preferences.

Given the consistent failure of evolutionary frameworks to explain age preferences through participants' psychological factors, the study in Chapter 4 next turned to question the fundamental hypotheses surrounding the facial stimuli themselves. There is a widely held view that feminine female faces are considered attractive because facial femininity serve as a cue to youth and, consequently, female reproductive potential (Johnston, 2000; Law Smith et al., 2005; Perrett et al., 1998; Pflüger et al., 2012). To determine whether the inconsistencies between empirical findings and evolutionary theories in age preferences lie not only in the hypotheses at the psychological level but also in assumptions regarding facial stimuli, this study adopted an automated landmark placement approach (A. L. Jones et al., 2021) to test whether youthful female faces are indeed more feminine than older female faces. Ultimately, the results suggested that facial femininity did not necessarily decline with age in women, challenging the claim that preferences for female faces with feminine face shapes are partly driven by preferences for cues of youth.

The findings from Chapters 2, 3, and 4 potentially highlight the ecological validity limitations of highly controlled face-evaluation paradigms. To overcome these limitations, the study in Chapter 5 abandoned artificial constraints and turned to analysing mating behaviours in the real world. Using a large-scale Chinese online dating sample, this chapter circles back to the core question initially raised in Chapter 3 to test the role of fertility intentions in shaping partner age preferences. Interestingly, in contrast to the findings of Chapter 3 but consistent with evolutionary theories, the results suggested that stated age preferences in the Chinese online dating sample indeed were partly driven by fertility intentions, and that this effect is moderated by both participant sex and age.

Finally, Chapter 6 synthesises the empirical findings across all four studies. It discusses how the transition from theory-driven to data-driven methodologies, and from controlled face-evaluation paradigms to online dating data analyses extends and reshapes our understanding of age preferences during mate selection. Furthermore, this chapter outlines the limitations of the current thesis and proposes directions for future research.

Chapter 2

No evidence that people born to older parents show weaker preferences for younger adult faces

The following chapter is based on work published in *Adaptive Human Behavior and Physiology*.

Li, J., Lee, P., Rafiee, Y., Jones, B. C., & Shiramizu, V. K. (2025). No evidence that people born to older parents show weaker preferences for younger adult faces. *Adaptive Human Behavior and Physiology*, 11(2), 9.

Abstract

People can judge others' ages from face images somewhat accurately and tend to rate younger adults' faces as more attractive than older adults' faces. However, individual differences in the strength of this preference for younger adult faces have also been reported, whereby people born to older parents (i.e., people whose parents were older when the participant was born) showed weaker preferences for younger adult faces. However, work showing this pattern of results used face stimuli in which cues of age were experimentally manipulated using computer-graphics methods and many researchers have recently raised concerns about how well findings obtained using such stimuli generalise to ratings of natural (i.e., unmanipulated) face images. Consequently, we tested whether people born to older parents showed weaker preferences for younger faces when rating the attractiveness of natural (i.e., unmanipulated) face images. Although our analyses demonstrated that participants generally showed strong preferences for younger adult faces, the strength of these preferences was not significantly correlated with parental age at birth. Thus, our results do not support the proposal that parental age at birth influences preferences for facial cues of age.

2.1 Introduction

People prefer to date, mate with, associate with, hire, and vote for individuals with attractive faces (for reviews, see Langlois et al., 2000; Little, Jones, & DeBruine, 2011; Rhodes, 2006). People can assess the ages of individuals somewhat accurately from face photographs, demonstrating that faces contain visual cues of age (e.g., Ebner et al., 2010; Voelkle et al., 2012). Moreover, people tend to rate younger adults' faces as more attractive than older adults' faces, suggesting that facial cues of youth are generally preferred (e.g., Foos & Clark, 2011; Perrett et al., 2002).

In a sample of 45 women and 38 men, Perrett et al. (2002) reported that people born to older parents (i.e., people whose parents were older when the participant was born) showed weaker preferences for facial cues of youth. This negative association between parental age at birth and strength of preference for younger adult faces is consistent with other work reporting preferences for other parental characteristics (e.g., hair and eye colour) in romantic partners (DeBruine et al., 2017; Little et al., 2003; Marcinkowska & Rantala, 2012) and may be analogous to imprinting-like effects reported in other species (Penn & Potts, 1998; Schielzeth et al., 2008; ten Cate et al., 2006). The function of imprinting-like effects, in which early exposure biases mate preferences in adulthood, are poorly understood, but could include avoiding allocating mating effort to individuals of other species and/or increasing the amount of investment offspring receive from family members (see DeBruine et al., 2008). It is also possible that they are simply a low-cost functionless byproduct of the effects of how visual experience shapes how we process faces and other types of social stimuli (e.g., Buckingham et al., 2006). Understanding of the function of imprinting-like effects on mate preferences is further complicated by the existence of negative imprinting, in which early exposure increases aversions to specific traits or individuals in sexual contexts (DeBruine, 2004, 2005). These negative-imprinting effects could function to increase incest-avoidance (DeBruine, 2004, 2005). Weaker preferences for younger adult faces in individuals born to older parents is also consistent with results of studies demonstrating that visual experience with particular faces can influence facial-attractiveness judgments (Little et al., 2005; Rhodes, Jeffery, et al., 2003).

Perrett et al. (2002) reported the negative association between parental age at birth and strength of preference for younger adult faces for attractiveness ratings of face stimuli in which cues of age were experimentally manipulated using computer-graphics methods. However, this methodological approach for manufacturing stimuli for studies of social judgments of faces has recently been criticised for having poor ecological validity (Dong et al., 2023; A. L. Jones & Jaeger, 2019; B. C. Jones et al., 2023; A. J. Lee et al., 2021; Satchell et al., 2023; Scott et al., 2013). Indeed, and consistent with this criticism, several recent studies have reported that findings obtained using stimuli in which facial cues were experimentally manipulated are often qualitatively different to those from studies in which natural (i.e., unmanipulated) face images were rated (Dong et al., 2023; A. L. Jones & Jaeger, 2019; A. J. Lee et al., 2021; Leger et al., 2023, 2024; Scott et al., 2010). Indeed, several studies have reported that effects obtained using manipulated stimuli are not evident when natural face images are employed (Dong et al., 2023; A. L. Jones & Jaeger, 2019; A. J. Lee et al., 2021; Leger et al., 2023, 2024; Scott et al., 2010). For example, the large effects of sexual dimorphism on perceptions of attractiveness, trustworthiness, and dominance that have been widely reported in studies using stimuli that were experimentally manipulated are either non-significant or significant but much smaller in size when natural (i.e., unmanipulated) face images are used (Dong et al., 2023; A. L. Jones & Jaeger, 2019; Leger et al., 2023; Scott et al., 2010). This difference in the pattern of results obtained for these two types of stimuli has also been observed in studies of the effects of facial symmetry on social judgments (A. J. Lee et al., 2021). In light of this potential criticism of the type of stimuli used by Perrett et al. (2002), here we tested whether people born to older parents showed weaker preferences for younger faces when rating the attractiveness of natural (i.e., unmanipulated) face images.

Whether findings for attractiveness judgments of faces translate into actual partner choices is unclear and somewhat controversial (see, e.g., DeBruine et al., 2006; Wincenciak et al., 2015). Indeed, Eastwick et al. (2025) recently reported that the large sex difference in stated preferences for youth in potential partners (men show stronger preferences for youth than women do) was not evident in partnership decisions following blind dates. In light of this issue, we tested whether people born to older parents also tended to report having older romantic partners.

2.2 Methods

All procedures used were approved by the Department of Psychological Sciences and Health (University of Strathclyde) Ethics Commitee, all work was undertaken in accordance with the Declaration of Helsinki, and all participants provided informed consent.

One hundred and fifty heterosexual men (mean age = 33.87 years, *SD* = 6.34 years), all of whom reported currently being in a romantic relationship (mean relationship duration = 8.45 years, *SD* = 5.66 years), and 150 heterosexual women (mean age = 34.48 years, *SD* = 6.27 years), all of whom also reported currently being in a romantic relationship (mean relationship duration = 10.97 years, *SD* = 6.74 years), took part in the study. Participants were recruited via Prolific and the study was carried out using Qualtrics. This sample size exceeds Simonsohn's (2015) recommended sample size for replication studies. Simonsohn (2015) recommended replications test 2.5 times the sample size used in the original study (Perrett et al., 2002 tested 35 men and 48 women).

Male participants rated the attractiveness of 50 female faces (mean age = 37.5 years, *SD* = 13.25 years, range = 19 to 55 years) and female participants rated the attractiveness of 50 male faces (mean age = 35.06 years, *SD* = 12.46 years, range = 20 to 54 years) using a 1 (not at all) to 7 (very) scale. Trial order was fully randomised, and the attractiveness-rating task was self-paced. The face images used in this attractiveness-rating task had been randomly selected from images of individuals between 19 and 55 years of age in an open-access face-image database (Ebner et al., 2010). Images were full colour and individuals depicted in the images were posed front on to the camera, with neutral expressions, and direct gaze. Clothing was standardised across individuals. Inter-rater agreement was high for attractiveness ratings of both male (Cronbach's alpha = .994) and female (Cronbach's alpha = .996) faces. The mean attractiveness rating for male faces was 2.82 (SD = 1.50) and the mean attractiveness rating for female faces was 2.79 (SD = 1.52).

Immediately after completing the attractiveness-rating task, participants completed a questionnaire in which they reported their romantic partner's age, mother's age, and father's age. Descriptive statistics for these variables are given in Table 2.1. Participants reported living with their mother until they were, on average, 21.28 years of age (SD = 5.83 years) and reported living with their father until they were, on average, 18.68 years of age (SD = 8.46 years).

Table 2.1. Descriptive statistics (means and *SD*s) for participant age, romantic partner age, mother's age, and father's age.

	Male participants	Female participants
Mean romantic partner age (*SD*)	32.61 years (6.65 years)	36.60 years (7.43 years)
Mean mother's age (*SD*)	62.77 years (7.64 years)	61.83 years (7.50 years)
Mean father's age (*SD*)	64.57 years (7.61 years)	64.94 years (7.79 years)

For each participant, we calculated their mother's age when the participant was born (M = 28.12 years, SD = 5.56 years) and their father's age when the participant was born (M = 30.58 years, SD = 6.21 years). Because these two scores were highly correlated (r = .70, p < .001), we calculated the average of these two scores for each participant to create a new variable (parental age at birth) that we used in our analyses (M = 29.35 years, SD = 5.43 years). This procedure is identical to that used by Perrett et al. (2002) to create the parental age at the participant's birth variable in their analyses. Parental age at birth and participant age were weakly but significantly correlated (r = -.24, p < .001).

Table 2.2 shows the intercorrelations among all continuous variables (95% CIs shown in parentheses).

Table 2.2. Intercorrelations among all continuous variables (95% CIs shown in parentheses).

Variable	*M*	*SD*	1	2	3	4	5
1. Participant age	34.17	6.32	1				
2. Partner age	34.61	7.32	.81*** (.77, .85)	1			
3. maternal age at birth	28.12	5.56	-.19** (-.30, -.08)	-.13* (-.24, -.02)	1		
4. paternal age at birth	30.58	6.21	-.25*** (-.35, -.14)	-.16** (-.27, -.05)	.70*** (.64, .76)	1	
5. parental age at birth	29.35	5.43	-.24*** (-.34, -.13)	-.16** (-.27, -.05)	.91*** (.89, .93)	.93*** (.91, .94)	1

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

2.3 Results

All analyses were carried out using R (R Core Team, 2024), with the packages kableExtra 1.3.4 (Zhu et al., 2024), lme4 (Bates et al., 2015), lmerTest 3.1-3 (Kuznetsova et al., 2017), jtools 2.2.3 (Long, 2022), psych 2.2.5 (Revelle, 2026), interactions 1.2.0 (Long, 2024), rstatix 0.7.2 (Kassambara, 2023b), parameters 0.24.2 (Lüdecke et al., 2020), performance 0.13.0 (Lüdecke et al., 2021), apaTables 2.0.8 (Stanley, 2021), and tidyverse 1.3.1 (Wickham et al., 2019). All data, full outputs, and analysis code are publicly available on the Open Science Framework (https://osf.io/bmfhy/).

Does parental age at the participant's birth predict preferences for facial cues of age?

To address this research question, attractiveness ratings were analysed using a linear mixed effects model. The model included participant sex (effect coded so that +0.5 corresponded to male and -0.5 corresponded to female), parental age at the participant's birth, participant age, and stimulus age as predictors, along with the two-way interactions between participant sex and parental age at the participant's birth, between participant sex and participant age, between participant sex and stimulus age, between participant age and stimulus age, and between parental age at the participant's birth and stimulus age, and the three-way interactions among participant sex, stimulus age, and parental age at the participant's birth, and among participant sex, stimulus age, and participant age. The model also included by-subject random intercepts, by-stimuli random intercepts, by-subject random slopes for stimulus age, and by-stimuli random slopes for parental age at the participant's birth. All continuous predictors were converted to *z* scores prior to analyses. Although attractiveness ratings were generally somewhat low, skewness (0.58, SE = 0.02) was comfortably within an acceptable range (Tabachnick & Fidell, 2013).

This analysis showed a significant negative effect of stimulus age, indicating that participants generally preferred younger faces. There was also a significant positive effect of participant age, indicating that older participants generally gave higher attractiveness ratings. No other effects or interactions were significant. The full results of this analysis are summarised in Table 2.3. Importantly, this analysis showed no evidence that participants born to older parents showed significantly weaker preferences for younger faces. Pseudo R squared (fixed effects) for this model was .33. Removing participant age from the model showed the same pattern of results as our initial model (see https://osf.io/bmfhy/ for full results of this analysis). Although the interaction between parental age at the participant's birth and stimulus age was not significant in our initial analysis (p = .078), we decomposed it using simple slope analysis. Results indicated that, at low levels of parents' age at birth (−1 *SD*), age at photo shoot was significantly negatively associated with attractiveness ratings, $b = -0.81$, $SE = 0.06$, $t = -13.55$, $p < .001$. At the mean level of parents' age at birth, the negative association persisted, $b = -0.84$, $SE = 0.06$, $t = -14.74$, $p < .001$. Similarly, at high levels of parents' age at birth (+1 *SD*), the association remained significant and negative, $b = -0.88$, $SE = 0.06$, $t = -14.41$, $p < .001$. This analysis showed that participants born to older parents tended to show stronger preferences for younger adult faces, rather than the weaker preferences for younger adult faces reported by Perrett et al. (2002).

Table 2.3. Results of our linear mixed effects model testing whether parental age at birth predicted preferences for facial cues of age.

	Estimate	*SE*	*t*	*df*	*p*
(Intercept)	2.814	0.068	41.454	218.372	< .001
participant sex	0.151	0.136	1.111	218.372	0.268
parental age at the participant's birth	-0.008	0.043	-0.176	302.903	0.860
stimulus age	-0.844	0.057	-14.744	121.464	< .001
participant age	0.130	0.043	3.060	306.644	0.002
participant sex x parental age at the participant's birth	-0.115	0.086	-1.347	302.903	0.179
participant sex x stimulus age	0.014	0.114	0.123	121.464	0.902
parental age at the participant's birth x stimulus age	-0.035	0.020	-1.766	298.186	0.078
participant sex x participant age	0.038	0.085	0.443	306.644	0.658
stimulus age x participant age	-0.015	0.020	-0.765	305.673	0.445
participant sex x parental age at the participant's birth x stimulus age	0.045	0.040	1.118	298.186	0.265
participant sex x participant age x stimulus age	-0.026	0.040	-0.634	305.673	0.527

We repeated the analysis described above, replacing parental age at the participant's birth with maternal age at the participant's birth and repeated it again replacing parental age at the participant's birth with paternal age at the participant's birth. We also repeated all of these analyses of attractiveness ratings, replacing stimulus age with the mean perceived (i.e., rated) age for each face. Perceived age data for these analyses were taken from Ebner et al. (2010) open-access data. These alternative analyses showed the same pattern of results as our initial analysis and are reported in full at https://osf.io/bmfhy/. Perceived age and actual age of the individuals photographed was highly and significantly correlated (r = .96, p < .001).

Does parental age at birth predict actual partner age?

To address this research question, partner age data were analysed using linear regression. The model included participant sex (effect coded so that +0.5 corresponded to male and -0.5 corresponded to female), parental age at birth, and participant age, as predictors, along with the two-way interactions between participant sex and parental age at birth and between participant sex and participant age. There was a significant positive effect of participant age, indicating that older participants tended to have older partners. There was also a significant effect of participant sex, indicating that female participants' partners tended to be older than male participants' partners. No other effects or interactions were significant. The full results of this analysis are summarised in Table 2.4. Importantly, this analysis showed no evidence that participants born to older parents had older partners. Pseudo R squared (fixed effects) for this model was .32. Removing participant age from the model showed the same pattern of results as our initial model (see https://osf.io/bmfhy/ for full results of this analysis).

We repeated the analysis described above, replacing parental age at the participant's birth with maternal age at the participant's birth and repeated it again replacing parental age at the participant's birth with paternal age at the participant's birth. These alternative analyses showed the same pattern of results as our initial analysis and are reported in full at https://osf.io/bmfhy/.

Table 2.4. Results of our regression analysis testing whether parental age at birth predicted actual partner age.

	Estimate	*SE*	*t*	*p*
(Intercept)	34.744	0.229	151.553	< .001
participant age	5.915	0.235	25.189	< .001
participant sex	-3.478	0.459	-7.585	< .001

parental age at the participant's birth	0.376	0.237	1.584	0.114
participant sex x participant age	-0.166	0.470	-0.353	0.724
participant sex x parental age at the participant's birth	0.324	0.475	0.683	0.495

2.4 Discussion

Consistent with findings from many previous studies (e.g., Foos & Clark, 2011; Perrett et al., 2002), we found that participants rated younger adult faces to be more attractive than older adult faces. However, we found no evidence that the strength of this preference for younger adult faces was significantly correlated with parental age at participant's birth. This null result for parental age at birth contrasts with Perrett et al. (2002), who found that people born to older parents (i.e., people whose parents were older when the participant was born) showed weaker preferences for younger adult faces. Indeed, a simple slopes analysis we conducted to decompose the non-significant interaction between parental age at the participant's birth and stimulus age (p = .078) indicated that participants in our study who were born to older parents tended to show *stronger* preferences for younger adult faces, rather than the *weaker* preferences for younger adult faces previously reported by Perrett et al. (2002).

Why do our findings for preferences for facial cues of age and parental age at birth differ from those reported by Perrett et al. (2002)? One possibility is that the differences in results between these two studies reflect differences in the type of face stimuli employed. Whereas Perrett et al. (2002) experimentally manipulated visual cues of age in prototype (i.e., synthetic) faces using computer-graphics methods, participants in our study rated the attractiveness of natural (i.e., unmanipulated) faces. This difference is potentially noteworthy, because many researchers have recently raised concerns about the ecological validity of using stimuli in which facial characteristics were experimentally manipulated to investigate social judgments of faces (Dong et al., 2023; A. L. Jones & Jaeger, 2019; B. C. Jones et al., 2023; A. J. Lee et al., 2021; Satchell et al., 2023; Scott et al., 2013). For example, several studies have reported that effects obtained using manipulated stimuli are not evident when natural face images are employed (Dong et al., 2023; A. L. Jones & Jaeger, 2019; A. J. Lee et al., 2021; Leger et al., 2023, 2024; Scott et al., 2010). While using natural or synthetic stimuli may influence whether an effect is present (i.e., significant) or absent (i.e., non-significant), it is unclear why it would reverse the direction of a significant effect. One possibility is that parental age predicted preferences for a facial correlate of age that is present in unmanipulated faces but not present in manipulated stimuli. An alternative explanation for the differences in results from the current study and those reported in Perrett et al. (2002) is that Perrett et al's results are a false positive arising from their smaller sample size or a file drawer effect.

Although we saw only weak evidence that individuals born to older parents show stronger preferences for younger individuals, it is possible that such an effect could be part of a suite of behaviours that function to reduce incest. Negative-imprinting effects have previously been reported in which early exposure is associated with increased aversions in adulthood to familial traits or specific individuals in sexual contexts (DeBruine, 2004, 2005). If people born to older parents do show stronger preferences for younger individuals, it could be a further example of negative imprinting. The factors that influence how individuals resolve the trade-off between the benefits of positive- and negative-imprinting are poorly understood but are a potentially important topic for future research. Considering possible effects of the relationship context for which potential partners are assessed (short- versus long-term relationships) may provide insight into this issue (see DeBruine, 2005 for further discussion). Although we randomly selected images of individuals between 19 and 55 years of age from Ebner et al's (2010) open-access face-image database to use as stimuli, Ebner et al's (2010) image set does not contain images between 32 and 38 years of age. Future studies on this issue may want to ensure stimuli have a fuller representation of ages.

Consistent with findings from many previous studies (for review, see McKenzie, 2021), we found that men reported having younger romantic partners than did women. However, we found no evidence that reported partner age was significantly correlated with parental age at participant's birth. Thus, we found no evidence that the pattern of results reported by Perrett et al. (2002), whereby people born to older parents (i.e., people whose parents were older when the participant was born) showed weaker preferences for younger adult faces, translates into actual partner choice.

Here we attempted to replicate Perrett et al's (2002) finding that people born to older parents showed weaker preferences for younger adult faces. Whereas Perrett et al. (2002) used synthetic face stimuli (i.e., prototypes) in which visual cues of age were experimentally manipulated using computer-graphics techniques, participants in our study rated the attractiveness of natural (i.e., unmanipulated) face images. By contrast with Perrett et al's (2002) results, we found no evidence that parental age at birth was significantly correlated with participants' preferences for younger adult faces. This pattern of null results was observed both when the actual age of the individuals depicted in the photographs was used as a predictor and when the rated (i.e., perceived) age of the individuals depicted in the photographs was used as a predictor. Thus, our results do not support the proposal that an imprinting-like effect causes parental age at birth to predict preferences for facial cues of age.

Chapter 2 found that attractiveness and age were strongly and negatively correlated, but that this preference for youth was not significantly correlated with parental age at birth or differed between men and women. Therefore, Chapter 3 investigated another potential source of individual differences in preferences for facial cues of youth: desire to have children.

Chapter 3

Participants reporting greater desire to have children demonstrate weaker preferences for younger adult faces

The following chapter is based on work published in *PLoS One*.

Li, J., Lee, P., Jones, B. C., & Shiramizu, V. K. (2025). Participants reporting greater desire to have children demonstrate weaker preferences for younger adult faces. *PLoS One*, 20(12), e0336292.

Abstract

The tendency for men to find younger adult women more attractive has been hypothesised to reflect preferences for cues of reproductive potential. To further test this hypothesis, we investigated the possible relationship between heterosexual men and women's reported desire to have children and their preferences for cues of youth in face images of potential mates. Contrary to our expectation that reported desire to have children would be correlated with stronger preferences for younger adult faces, and that this pattern of results would be particularly pronounced when men judged women's attractiveness, both men and women who reported greater desire to have children actually demonstrated weaker preferences for the faces of younger potential mates. Follow-up work suggested that this pattern of results was unlikely to have occurred because individuals with older faces were perceived as more likely to be better parents (Study 2) or wealthier (Study 3). While the role of individual differences in desire to have children in preferences for facial cues of age remains somewhat unclear, our results show no evidence for the widely held view that strong reliable sex differences exist in preferences for cues of youth.

3.1 Introduction

People with more attractive faces tend to be preferred as both romantic and social partners and preferred in hiring and voting decisions (for reviews, see Langlois et al., 2000; Little et al., 2011; Rhodes, 2006). Consequently, many studies have sought to identify characteristics in faces that influence attractiveness judgments (for a review, see Little et al., 2011). Many studies have demonstrated that people can assess age somewhat accurately from face photographs, indicating that faces contain valid cues of age (e.g., Ebner et al., 2010; Voelkle et al., 2012). Moreover, many studies have shown that people generally judge the faces of younger adults to be more attractive than the faces of older adults (e.g., Foos & Clark, 2011; Perrett et al., 2002).

Because age-related decline in fertility is considerably more pronounced in women than in men, preferences for cues of youth are predicted to be stronger when men assess women's suitability as mates than when women assess men's suitability as mates (Buss, 1989, 2000; Kenrick & Keefe, 1992; Sprecher et al., 1994). Consistent with this proposal, this sex difference in preferences for youth has been reported in many studies investigating stated preferences for youth (for a review, see Conroy-Beam & Buss, 2019). Given both the role that fertility is hypothesised to play in preferences for cues of youth and the sex difference in age-related decline in fertility, individuals, and men in particular, reporting greater desire to have children might be expected to show stronger preferences for cues of youth in potential mates' faces. However, to date, there have been no studies directly testing for sex differences in the association between reported desire to have children and preferences for facial cues of youth. Although Moore et al. (2009) found that women reporting greater desire to have children showed stronger preferences for men with feminine faces (a characteristic known to influence perceptions of youth; Alharbi et al., 2021; Boothroyd et al., 2005; Perrett et al., 1998), they did not test for possible links between male participants' face preferences and reported desire to have children.

In light of the above, in Study 1 we tested for possible associations between men's and women's reported desire to have children (assessed using Rholes et al.'s (1997) Desire to Having Children questionnaire) and preferences for facial cues of youth. Specifically, we tested the prediction that individuals reporting greater desire to have children would show stronger preferences for facial cues of youth and that this link between desire to have children and preferences for facial cues of youth will be stronger when men assess women's attractiveness than when women assess men's attractiveness. To aid in our interpretation of Study 1's results, we then tested for a possible association between facial cues of youth and the extent to which individuals were perceived as likely to be good parents (Study 2) or wealthy (Study 3). We investigated perceptions of parenting ability and wealth in these latter studies because these factors are hypothesised to play an important role in individual differences in human mate preferences (Boothroyd et al., 2007; Dong et al., 2024; Perrett et al., 1998; Zhang et al., 2019).

3.2 Study 1

Study 1 tested for possible associations between men's and women's reported desire to have children (assessed using Rholes et al.'s (1997) Desire to Having Children questionnaire) and preferences for facial cues of youth. Specifically, we tested the prediction that individuals reporting greater desire to have children will show stronger preferences for facial cues of youth and that this link between desire to have children and preferences for facial cues of youth will be stronger when men assess women's attractiveness than when women assess men's attractiveness.

3.2.1 Methods

All procedures used were approved by the Department of Psychological Sciences and Health (University of Strathclyde) Ethics Commitee (approval number: 27.13.11.2023.A, approval granted on 27 November 2023), all work was undertaken in accordance with the Declaration of Helsinki, and all participants provided written informed consent.

One hundred and forty-nine heterosexual men (mean age = 31.11 years, *SD* = 6.99 years) and 151 heterosexual women (mean age = 29.98 years, *SD* = 6.28 years) took part in the study. None of the participants had children, all were resident in the UK, and all reported having English as their first language. Participants were recruited via Prolific and the study was carried out using Qualtrics (from 09/08/2024 to 19/08/2024).

Male participants rated the attractiveness of 50 female faces (mean age = 37.5 years, *SD* = 13.25 years, range = 19 to 55 years) and female participants rated the attractiveness of 50 male faces (mean age = 35.06 years, *SD* = 12.46 years, range = 20 to 54 years) using a 1 (not at all) to 7 (very) scale. Trial order was fully randomised, and the attractiveness-rating task was self-paced. The face images used in this attractiveness-rating task had been randomly selected from images of individuals between 19 and 55 years of age in an open-access face-image database [4]. Images were full colour and individuals depicted in the images were posed front on to the camera, with neutral expressions, and direct gaze. Clothing was standardised across individuals. Inter-rater agreement was high for attractiveness ratings of both male (Cronbach's alpha = .993) and female (Cronbach's alpha = .995) faces. The mean attractiveness rating for male faces was 2.54 (*SD* = 1.42) and the mean attractiveness rating for female faces was 2.77 (*SD* = 1.49). Previous work (J. Li, Lee, Rafiee, et al., 2025) has shown that rated age and actual age are very highly correlated in this sample of faces (r = .96).

Immediately after completing the attractiveness-rating task, participants completed Rholes et al's (1997) Desire to Have Children questionnaire. This questionnaire is a 12-item scale on which participants indicate their level of agreement (on a seven-point scale) with statements such as "I have a strong desire to have children" (Cronbach's alpha = .89). Higher scores indicate greater desire for children. Female participants (M = 4.32, SD = 1.36) scored slightly higher on the Desire to Have Children questionnaire than did male participants (M = 4.14, SD = 1.25), but this difference was not significant (t = 1.22, p = .22).

3.2.2 Results

All analyses were carried out using R (R Core Team, 2024), with the packages tidyverse 1.3.1 (Wickham et al., 2019), psych 2.2.5 (Revelle, 2026), jtools 2.2.3 (Long, 2022), lmerTest 3.1-3 (Kuznetsova et al., 2017), kableExtra 1.3.4 (Zhu et al., 2024), interactions 1.2.0 (Long, 2024), rstatix 0.7.2 (Kassambara, 2023b), and pander 0.6.5 (Daróczi & Tsegelskyi, 2022). All data, full outputs, and analysis code are publicly available on the Open Science Framework (https://osf.io/mu4gz/).

Attractiveness ratings were analysed using a linear mixed effects model. The model included participant sex (effect coded so that +0.5 corresponded to female and -0.5 corresponded to male), desire to have children, stimulus age, and participant age as predictors. The model also included the two-way and three-way interactions shown in Table 1, as well as by-subject random intercepts, by-stimuli random intercepts, by-subject random slopes for stimulus age, and by-stimuli random slopes for desire to have children and participant age. All continuous variables were converted to *z* scores prior to analyses. Full results for this analysis are summarised in Table 3.1.

Table 3.1. Summary of results of linear mixed effects model analysing attractiveness ratings in Study 1.

	Estimate	*SE*	*t*	*df*	*p*
(Intercept)	2.655	0.066	40.005	253.315	< 0.001
participant sex	-0.342	0.133	-2.577	254.645	0.011
desire to have children	-0.071	0.046	-1.556	301.983	0.121
stimulus age	-0.752	0.053	-14.230	123.375	0.000
participant age	0.102	0.045	2.275	316.039	0.024
participant sex x desire to have children	0.176	0.088	1.994	300.855	0.047
participant sex x stimulus age	0.061	0.106	0.573	123.439	0.568
desire to have children x stimulus age	0.036	0.018	1.973	301.604	0.049
participant sex x desire to have children x stimulus age	0.027	0.036	0.755	301.620	0.451

The main effect of stimulus age was significant, indicating that participants generally rated younger adult faces as more attractive. The significant main effect of participant sex indicated that male participants rated faces as more attractive than did female participants. The significant main effect of participant age indicated that older participants rated faces as more attractive than did younger participants. The two-way interaction between desire to have children and stimulus age was significant (see Fig 3.1). A simple slopes analysis indicated that the two-way interaction between desire to have children and stimulus age reflected participants who scored higher on desire to have children showing weaker preferences for younger adult faces (see Fig 3.1). The two-way interaction between participant sex and desire to have children was also significant. Analysing responses separately for male and female participants showed that a significant negative effect of desire to have children for male participants and that the effect of desire to have children for female participants was not significant. Full results of analyses undertake to decompose the two-way interactions are given on the OSF (https://osf.io/mu4gz/).

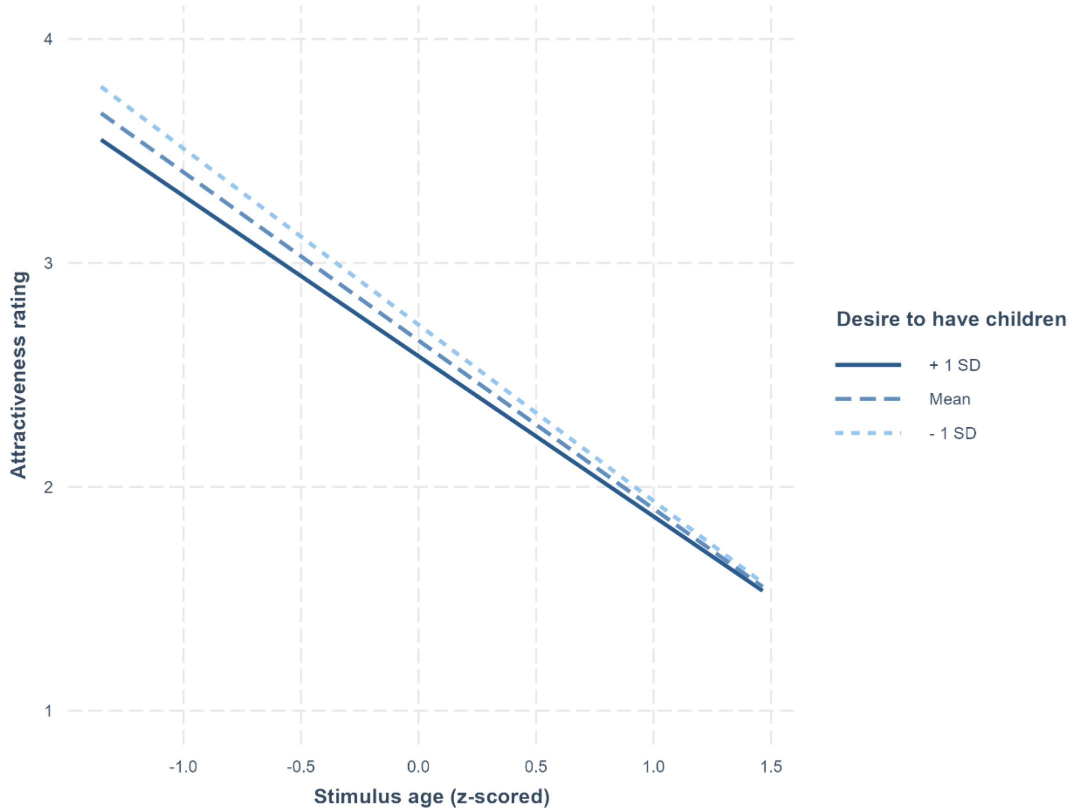

Fig 3.1. The significant two-way interaction between desire to have children and stimulus age in Study 1.

Next, we repeated the analyses described above, this time replacing stimulus age with the mean perceived (i.e., rated) age for each face. Perceived age data for these analyses were taken from Ebner et al's (2010) open-access data. These alternative analyses showed the same pattern of results as our initial analysis (although in this analysis, the interaction between desire to have children and stimulus age was not significant, p = .064, and the interaction between desire to have children and participant sex was not significant, p = .055) and are reported in full at https://osf.io/mu4gz/.

3.3 Study 2

Although we found that participants generally judged younger faces to be more attractive than older faces, we found no evidence that participants who scored higher on the desire to have children questionnaire showed stronger preferences for facial cues of youth. Indeed, our analysis of actual stimulus age found that participants who scored high on the desire to have children questionnaire actually showed significantly weaker preferences for facial cues of youth than did those who scored low on the desire to have children questionnaire. A similar pattern of results was also observed in our analysis of rated (i.e., perceived) stimulus age, although here the interaction between stimulus age and desire to have children was not significant (p = .064). One possible explanation for this potentially surprising pattern of results is that older individuals are perceived to be better parents than younger individuals and that weaker preferences for facial cues of youth among participants reporting greater desire to have children reflects this positive association between age and perceptions of parenting ability. Consistent with this possibility, some previous studies have reported that individuals displaying facial cues of age (i.e., older or older-looking faces) are perceived to be better parents than those displaying facial cues of youth (i.e., younger or younger-looking faces), at least when testing male faces (Boothroyd et al., 2007). Consequently, in study 2, we tested for possible relationships between perceptions of parenting ability and stimulus age using the stimuli we used in Study 1.

3.3.1 Methods

Thirty heterosexual women (mean age = 30.53 years, *SD* = 6.55 years) and 30 heterosexual men (mean age = 32.67 years, *SD* = 7.64 years) took part in the study. None of the participants had children, all were resident in the UK, and all reported having English as their first language. Participants were recruited via Prolific and the study was carried out using Qualtrics (from 25/11/2024 to 30/07/2025). Number of raters was based on recommendations in previous work (Hehman et al., 2018; B. C. Jones et al., 2021). These studies establish that this number of raters per condition is sufficient to produce reliable estimates of face perceptions (i.e., ratings). Note that the larger sample employed in study one’s investigation of individual differences in face preferences is not necessary here because we are not investigating potential individual differences in perceptions.

Male participants rated the 50 female faces from Study 1 and female participants rated the 50 male faces from Study 1 for 'how likely they are to be a good parent' using a 1 (very unlikely) to 7 (very likely) scale. Trial order was fully randomised, and the rating task was self-paced. Inter-rater agreement was high for ratings of both male (Cronbach's alpha = .85) and female (Cronbach's alpha = .85) faces. The mean rating for male faces was 3.65 (*SD* = 1.21) and the mean rating for female faces was 3.84 (*SD* = 1.32).

3.3.2 Results

All analyses were carried out using R, with the packages tidyverse 1.3.1 (Wickham et al., 2019), psych 2.2.5 (Revelle, 2026), jtools 2.2.3 (Long, 2022), lmerTest 3.1-3 (Kuznetsova et al., 2017), kableExtra 1.3.4 (Zhu et al., 2024), rstatix 0.7.2 (Kassambara, 2023b), and pander 0.6.5 (Daróczi & Tsegelskyi, 2022). All data, full outputs, and analysis code are publicly available on the Open Science Framework (https://osf.io/mu4gz/).

Good-parent ratings were analysed using a linear mixed effects model. The model included participant sex (effect coded so that +0.5 corresponded to female and -0.5 corresponded to male), stimulus age, and the interaction between stimulus age and participant sex as predictors. The model also included by-subject random intercepts, by-stimuli random intercepts, and by-subject random slopes for stimulus age. Continuous variables were converted to *z* scores prior to analyses. Full results for this analysis are summarised in Table 3.2. No effects were significant, indicating that face age was not significantly correlated with perceptions of being a good parent. Repeating this analysis with rated age in place of actual age showed the same pattern of results (see https://osf.io/mu4gz/ for full results of this alternative analysis).

Table 3.2. Summary of results of linear mixed effects model analysing good-parent ratings in Study 2.

	Estimate	*SE*	*t*	*df*	*p*

(Intercept)	3.751	0.091	41.394	89.229	< 0.001
participant sex	-0.218	0.181	-1.201	89.229	0.233
stimulus age	-0.120	0.066	-1.824	117.719	0.071
participant sex x stimulus age	0.132	0.132	0.999	117.719	0.320

3.4 Study 3

Results of Study 2 suggested that the tendency for people reporting greater to desire to have children to show weaker preferences for youth (i.e., the pattern of results seen in Study 1) was not due to older individuals being perceived to be better parents. In fact, we found that younger individuals tended to be perceived to be better parents, although this negative effect of age was not significant (p = .071). A different potential explanation of the pattern of results observed in Study 1 is that older individuals are relatively more attractive to people reporting greater desire to have children because older individuals are perceived to be wealthier and, consequently, have more resources available to invest in their family. Consequently, in study 3, we tested for possible relationships between face age and perceptions of wealth.

3.4.1 Methods

Methods and stimuli were identical to those used in Study 2, except a different group of 30 men (mean age = 32.73 years, SD = 6.67 years) and 30 women (mean age = 32.43 years, SD = 6.22 years) rated the faces for “How wealthy is this person?” on a 1 (not very wealthy) to 7 (very wealthy scale). Participants were recruited to take part in the study from 30/05/2025 to 30/07/2025. Cronbach’s alpha for male faces was .86 (M = 3.73, SD = 1.31) and for female faces was .81 (M = 3.68, SD = 1.42).

3.4.2 Results

Wealth ratings were analysed in the same was that good-parent ratings were analysed in Study 2. Full results for this analysis are summarised in Table 3.3. Similar to the findings of Study 2, none of the effects in Study 3 reached statistical significance, indicating that facial age was not significantly correlated with perceptions of wealth. Repeating this analysis with rated age in place of actual age showed a similar pattern of results (see https://osf.io/mu4gz/ for full results of this alternative analysis).

Table 3.3. Summary of results of linear mixed effects model analysing wealth ratings in Study 3.

	Estimate	*SE*	*t*	*df*	*p*
(Intercept)	3.719	0.079	46.967	112.067	< 0.001
participant sex	0.053	0.158	0.334	112.067	0.739
stimulus age	0.026	0.073	0.350	119.873	0.727
participant sex x stimulus age	0.279	0.147	1.899	119.873	0.060

3.5 Discussion

Consistent with previous research, Study 1's results suggested that participants generally judged younger adult faces to be more attractive than older adult faces (e.g., Foos & Clark, 2011; Perrett et al., 2002). However, we found no evidence that this preference for facial cues of youth was stronger when men judged women's attractiveness than when women judged men's attractiveness. This null result for the hypothesised sex difference in preferences for facial cues of youth suggests that the sex difference in the importance of youth in mate preferences that has been widely-reported in studies in which participants were asked to rate or rank the importance of various characteristics of potential romantic partners (for review see Conroy-Beam & Buss, 2019) does not necessarily occur when participants rate the attractiveness of face images. Indeed, recent work examining preferences for youth following blind dates found that men and women showed similar preferences for youthful partners (Eastwick et al., 2025).

Many researchers have proposed that preferences for youth reflect preferences for cues of fertility, particularly when men assess the attractiveness of women (Buss, 1989, 2000; Kenrick & Keefe, 1992; Sprecher et al., 1994). This claim leads to the prediction that reported desire to have children will be correlated with preferences for facial cues of youth and that this association between reported desire to have children and preferences for facial cues of youth will be stronger when men judge women's attractiveness than when women judge men's attractiveness. In Study 1, by contrast with this prediction, our analyses of facial attractiveness judgments found that participants reporting greater desire to have children showed *weaker* preferences for facial cues of youth and that the strength of this association did not differ significantly between when men judged women's attractiveness and when women judged men's attractiveness. In other words, regardless of participant sex, participants in our study who reported greater desire to have children showed weaker preferences for facial cues of youth.

Why might people reporting greater desire to have children show weaker preferences for younger adult faces? One possibility is that this pattern of results occurs because older individuals are perceived to be better parents than younger individuals. Indeed, some previous findings support this explanation, finding that adults with older-looking faces were perceived to be better parents (e.g., Boothroyd et al., 2007). However, in Study 2 we found that there was no significant association between face age and perceptions of being a good parent. These results suggest that the effect of desire to have children on preferences for facial cues of youth that we observed in Study 1 is unlikely to reflect older adults being perceived to be better parents. A different possible explanation for the pattern of results seen in Study 1 is that older people are perceived to be wealthier. However, Study 3 revealed no significant relationship between facial age and perceptions of wealth. Thus, Study 3's results suggest that tendency for both men and women reporting greater desire to have children to show weaker preferences for youth is unlikely to have occurred because older individuals are perceived to be wealthier and have more resources to invest in their family. We suggest that further work is needed to establish whether the positive effect of desire to have children on preferences for older looking faces is robust and, if it is robust, why it occurs.

Our results raise a number of issues that it may be useful to address in future work. First, whether individual differences in desire to have children are relevant to evolutionary theories of mate preferences or are evolutionarily novel remains an open question. On one hand, reliable contraceptives are a relatively recent technological innovation, meaning that individual differences in desire to have children may have little relevance to evolutionary theories of mate preferences because individuals would have had little opportunity to control their number of offspring. On the other hand, there is substantial variation in number of offspring both within and across low-contraception populations, reflecting the influence of ecological conditions, cultural norms, and individual circumstances rather than a uniform "natural" reproductive pattern (Sear et al., 2016). Indeed, whether participants already have children may also moderate the effects of desire to have children on preferences for facial cues of age.

Second, the specific cognitions that underpin perceptions of wealth and parenting ability (investigated in Studies 2 and 3) remain unclear. For example, it is not known whether such perceptions reflect impressions of current or potential parenting ability or wealth. This issue is potentially important for understanding the role perceptions of parenting ability and wealth play in mate preferences. Further work is also needed to establish whether reported desire to have children moderates perceptions of parenting ability and wealth.

Third, it is unclear why the results we observed in Study 1 (lack of sex differences in strength of preferences for facial cues of youth and weaker preferences for facial cues of youth among individuals reporting greater desire to have children) differ from those reported in previous work (e.g., Conroy-Beam & Buss, 2019; Moore et al., 2009). Differences between our results and those reported in studies of stated preferences for age (Conroy-Beam & Buss, 2019) may reflect methodological differences (i.e., revealed preferences for age assessed via preferences for facial cues versus explicitly stated preferences for partner age). Moore et al. (2009) found that women’s reported desire to have children was correlated with stronger preferences for feminine male faces. This pattern of results may initially seem at odds with our results because feminine faces are generally perceived to be younger than masculine faces (see, e.g., Boothroyd et al., 2005). These apparently contradictory results may reflect methodological differences, however. Moore et al. (2009) assessed preferences for femininity in young adult male faces only (faces in their early twenties), whereas we directly assessed preferences for age in adult faces that depicted a much wider range of ages. Similarly, Moore et al. (2009) assessed face preferences using manipulated face stimuli and assessed preferences using a forced-choice paradigm, whereas participants in our study rated individual natural (i.e., unmanipulated) face images. This latter point is potentially noteworthy since previous studies suggest these two methods for assessing perceptions of faces can produce very different findings (Dong et al., 2023; A. L. Jones & Jaeger, 2019; B. C. Jones et al., 2023; A. J. Lee et al., 2021; Scott et al., 2010).

The current work found that individuals reporting greater desire to have children showed weaker preferences for facial cues of youth in potential mates (Study 1). Results of follow-up studies testing for possible associations between age and perceptions of parenting and wealth suggested that the pattern of results observed in Study 1 is unlikely to have occurred simply because older individuals are perceived to be better parents (Study 2) or be wealthier (Study 3). Although the role of individual differences in desire to have children in preferences for facial cues of age remains somewhat unclear, our results, along with other recent work revisiting putative sex differences in preferences for youth, challenge the widely held view that strong reliable sex differences exist in preferences for youth when assessing the attractiveness of potential mates.

Chapter 3 found no evidence that participants reporting greater desire to have children showed stronger preferences for facial cues of youth, challenging evolutionary hypotheses regarding mate selection. Given this lack of empirical support for motivational hypotheses of reproduction, the underlying evolutionary theories should be revisited. A foundational evolutionary argument is that feminine face shapes in women are considered attractive because facial femininity acts as a reliable visual cue for youth and female reproductive potential. Consequently, Chapter 4 tested for potential correlations between age and shape sexual dimorphism in male and female faces.

Chapter 4

No evidence that younger women have more feminine face shapes

The following chapter is based on work submitted for publication in peer-reviewed journals.

Li, J., Jones, B. C., Jones, A. L., & Shiramizu, V. K. (submitted for publication). No evidence that younger women have more feminine face shapes.

Abstract

That female faces with exaggerated female sex-typical (i.e., feminine) shape characteristics are judged to be attractive is well established in the facial-attractiveness literature. A common account of this preference for female faces with feminine shapes is that the preference occurs, at least in part, because younger adult women have both more feminine faces and greater reproductive potential. To investigate this claim, we tested for potential correlations between aspects of face shape (femininity, distinctiveness, and asymmetry) and both actual and perceived age in samples of male and female faces depicting adults aged between 19 and 80 years of age. Although we found some evidence that older men had more masculine face shapes than younger men, none of our analyses indicated that younger adult women have significantly more feminine face shapes. Consequently, our results do not support the suggestion that younger women necessarily have more feminine face shapes than older women, challenging the claim that preferences for female faces with feminine face shapes are partly driven by preferences for cues of youth.

4.1 Introduction

Sexual dimorphism of face shape refers to the phenotypic differences between typical male and female face shapes and is thought to reflect the effects of sex hormones on physical development (Kordsmeyer et al., 2026; Little, Jones, & DeBruine, 2011). While evidence that men with more masculine face shapes are judged to be more attractive is mixed (DeBruine et al., 2006; DeBruine, Jones, Smith, et al., 2010; Docherty et al., 2020; Little & Hancock, 2002; Perrett et al., 1998; Rhodes et al., 2000), it is well established that women with more feminine face shapes are perceived to be more attractive (Kleisner et al., 2024; P. Lee et al., 2025; Little, Jones, & DeBruine, 2011; Perrett et al., 1998; Rhodes, 2006). Indeed, preferences for feminine female face shapes have been observed both in studies where sexual dimorphism of face shape was experimentally manipulated using computer graphics methods (e.g., Little et al., 2007, 2014; Perrett et al., 1998) and in studies in which natural (i.e., unmanipulated) faces were rated for attractiveness and shape femininity was assessed using facial metric techniques (e.g., Kleisner et al., 2024; Lee et al., 2025).

One explanation for preferences for female faces with feminine shapes that has been advanced in the literature is that femininity preferences reflect psychological adaptations for identifying healthy potential mates and/or healthy competitors for mates (for reviews, see Little et al., 2011; Rhodes, 2006; Rhodes et al., 2007). However, although there is good evidence that more feminine female faces are perceived to be healthier (e.g., Foo et al., 2017; Rhodes et al., 2003, 2007), studies have generally found little evidence for significant correlations between facial femininity and measures of women's actual health (e.g., Cai et al., 2019; Foo et al., 2017; Jones, 2018; Rhodes et al., 2003). These latter null results have been interpreted as evidence against the claim that femininity preferences reflect adaptations for identifying healthy individuals (Foo, Simmons, et al., 2017; Rhodes, Chan, et al., 2003).

An alternative to the explanation described above is that feminine female faces are considered attractive because femininity is a cue to youth and, consequently, women's reproductive potential (Johnston, 2000; Law Smith et al., 2005; Perrett et al., 1998; Pflüger et al., 2012). Indeed, exaggerating feminine shape characteristics in female face images increases perceptions of youth and decreases the perceived age of faces (Perrett et al., 1998). While such results indicate that manipulating sexually dimorphic shape information in female faces influences perceptions of age when all other facial characteristics are held constant, we know of no work that has tested for potential correlations between shape femininity measured from natural (i.e., unmanipulated) face images and the depicted women's ages and/or ratings of their ages. Such tests are desirable, however, since some previous studies have demonstrated that effects on perceptions of faces that were observed for manipulated sexual dimorphism of face shape are not necessarily observed when natural (i.e., unmanipulated) face images are used as stimuli (e.g., Dong et al., 2023; Jones & Jaeger, 2019; Lee et al., 2025; Leger et al., 2023, 2024).

In light of the above, here we tested for possible relationships between shape sexual dimorphism and both actual and rated age using an open-access database of face images depicting women from 19 to 80 years of age. Using the same methods and open-access database, we also tested for possible relationships between age and face-shape sexual dimorphism in men between 20 and 78 years of age. In addition to measuring sexual dimorphism, we also investigated the possible effects of two other putative facial markers of physical condition (shape asymmetry and shape distinctiveness) that have been implicated in facial-attractiveness judgments in previous work (Jones et al., 2001, 2007; Komori et al., 2009; Langlois & Roggman, 1990; Perrett et al., 1999; Thornhill & Gangestad, 1993).

4.2 Methods

Ethics

All procedures used were approved by the Department of Psychological Sciences and Health (University of Strathclyde) Ethics Committee, all work was undertaken in accordance with the Declaration of Helsinki, and all participants provided written informed consent.

Stimuli

Face stimuli were full-colour images of 86 white men (mean age = 48.15 years of age, SD = 19.73 years of age, range: 20 to 78 years of age) and 85 white women (mean age = 49.13 years of age, SD = 21.21 years of age, range: 19 to 80 years of age), obtained from an open-access database (Ebner et al., 2010). The database contains two images of each individual, both taken on the same occasion under identical photographic conditions.

Age ratings

Age ratings of the images made by 78 male raters (range: 20 to 78 years of age) and 76 female raters (range: 21 to 81 years of age) were also obtained from Ebner et al's (2010) open-access data. Cronbach's alpha for these age ratings was very high (0.88) and age ratings of the two images of each individual were highly correlated ($r = .97$, $p < .001$). Consequently, we calculated a single mean age for each individual photographed (M = 47.8 years of age, SD = 17.6 years of age, range: 21.4 to 80.2 years of age). For both male faces ($r = .99$, $p < .001$) and female faces ($r = .98$, $p < .001$) rated and actual age were very highly correlated.

Face-shape measurements

Asymmetry, distinctiveness, and sexual dimorphism of 2D face shape were calculated for each image using a method described in A. L. Jones et al. (2021). This method derives face-shape measures using automated facial-landmark placement and has been shown to produce asymmetry, distinctiveness, and sexual dimorphism measures that are very highly correlated with those calculated from manually placed landmarks (A. L. Jones et al., 2021).

Asymmetry was calculated by measuring the Euclidean distance between the original vector of facial landmark coordinates and its mirror-reflected version in a multidimensional shape space. Higher scores indicate more asymmetric face shapes. Distinctiveness was calculated by measuring the Euclidean distance between an individual's facial landmark vector and the average facial vector for that individual's sex. Higher scores indicate more distinctive face shapes.

Sexual dimorphism was calculated by projecting an individual's facial shape vector onto a sex-dimorphism axis, which was derived from a multivariate regression of shape coordinates onto biological sex. Higher scores indicate more feminine face shapes. Face-shape measures calculated in this way have been used in many previous studies of facial appearance (e.g., Cai et al., 2019; Dong et al., 2023; Holzleitner et al., 2019; Jones et al., 2021; Komori et al., 2009; Leger et al., 2023, 2024; Mitteroecker et al., 2015).

Because asymmetry ($r = .78$, $p < .001$), distinctiveness ($r = .83$, $p < .001$), and femininity ($r = .90$, $p < .001$) scores were highly correlated between the two images of each individual, we calculated single asymmetry, distinctiveness, and femininity shape scores for each individual by averaging the two values for each individual. For each of the three shape measures, we also checked for extreme values (i.e., scores more than three standard deviations from the mean). We identified one extreme value for asymmetry, three extreme values for distinctiveness, and two extreme values for femininity. These extreme values were winsorised to the boundary of ± three standard deviations from the relevant mean.

Additional face-shape measurements

Most previous research investigating potential correlates of measured sexual dimorphism and distinctiveness of face shape has tested for these correlations in samples of young adult faces with ages ranging from approximately 18 to 30 years of age (e.g., Cai et al., 2019; Dong et al., 2023; Holzleitner et al., 2019; Jones et al., 2021; Komori et al., 2009; Leger et al., 2023, 2024; Mitteroecker et al., 2015). Consequently, these studies have derived sexual dimorphism and distinctiveness measures using the average face shapes for young adults. To allow for more direct comparisons with the shape measures used in such studies, we calculated further measures of femininity and distinctiveness for each image using the same methods described above, but this time using the average face shapes of the 29 youngest men and the 29 youngest women in the sample (all of these individuals were between 19 and

31 years of age). Note that it was not necessary to calculate further asymmetry scores because asymmetry scores are not calculated using average face shapes. Because these distinctiveness (*r* = .88, *p* < .001) and femininity (*r* = .92, *p* < .001) scores were highly correlated between the two images of each individual, we calculated single distinctiveness and femininity shape scores for each individual to use in analyses by averaging the values for each individual. Two extreme values for distinctiveness and one extreme value for femininity were identified and winsorised.

4.3 Results

Statistical analyses were conducted using R (R Core Team, 2024), with the packages tidyverse 2.0.0 (Wickham et al., 2019), rstatix 0.7.2 (Kassambara, 2023c), kableExtra 1.4.0 (Zhu, 2021), and robustHD 0.8.1 (Alfons, 2021). All data, analysis code, and full outputs are publicly available on the Open Science Framework (https://osf.io/dxj56/). Table 1 shows the intercorrelations among all variables for female faces and Table 2 shows the intercorrelations among all variables for male faces. We adjusted *p* values using the Benjamini-Hochberg Procedure to take into account multiple tests. This procedure was applied separately to analyses of male and female faces.

For female faces (see Table 4.1), (1) actual age and femininity calculated using the average face shapes of young female and male faces were significantly and positively correlated, (2) actual age and femininity calculated using the average face shape of all female and male faces were positively correlated, though the relationship was not significant (*p* = .057), and (3) actual age and distinctiveness calculated using the average face shape of young female faces were significantly and positively correlated. By contrast, neither asymmetry nor distinctiveness calculated using the average shape of all the female faces in the sample were significantly correlated with actual age. The pattern of significant and nonsignificant results we observed for rated age was the same as we observed for actual age.

For male faces (see Table 4.2), (1) age and femininity calculated using the average shape of all of the male and female faces in the sample were significantly and negatively correlated, (2) age and distinctiveness calculated using the average shape of the young female and male faces in the sample were significantly and positively correlated, and (3) age and asymmetry were significantly and positively correlated. By contrast, age was not significantly correlated with femininity calculated using the average shape of young male and female faces or distinctiveness calculated using the average shape of all of the female and male faces in the sample. The pattern of significant and nonsignificant results we observed for rated age was the same as we observed for actual age.

Table 4.1. Intercorrelations among all variables for female faces. *N* = 85 for all correlations. Pearson's correlation coefficients (i.e., *r* values) are shown, with *p* values shown in parentheses (corrected for multiple tests using the Benjamini-Hochberg Procedure). $\text{Femininity}_{\text{all}}$ denotes femininity derived using average shapes for all the male and female faces in the sample and $\text{femininity}_{\text{young}}$ denotes femininity derived using the average shapes for the young male and female faces in the sample only. $\text{Distinctiveness}_{\text{all}}$ denotes distinctiveness derived using average shape for all the female faces in the sample and $\text{distinctiveness}_{\text{young}}$ denotes distinctiveness derived using the average shape for the young female faces in the sample only.

	$\text{Age}_{\text{actual}}$	$\text{Age}_{\text{rated}}$	$\text{Femininity}_{\text{young}}$	$\text{Femininity}_{\text{all}}$	$\text{Distinctiveness}_{\text{young}}$	$\text{Distinctiveness}_{\text{all}}$	Asymmetry
$\text{Age}_{\text{actual}}$	1						
$\text{Age}_{\text{rated}}$	.98 (<.001)	1					
$\text{Femininity}_{\text{young}}$	.39 (<.001)	.37 (.001)	1				
$\text{Femininity}_{\text{all}}$	.23 (.057)	.24 (.047)	.47 (<.001)	1			
$\text{Distinctiveness}_{\text{young}}$	.33 (.005)	.32 (.005)	.47 (<.001)	.41 (<.001)	1		
$\text{Distinctiveness}_{\text{all}}$	.092 (.474)	.10 (.457)	.059 (.631)	.13 (.323)	.86 (<.001)	1	
Asymmetry	.083 (.497)	.098 (.458)	-.26 (.031)	.53 (<.001)	.15 (.233)	.083 (.497)	1

Table 4.2. Intercorrelations among all variables for male faces. N = 86 for all correlations. Pearson's correlation coefficients (i.e., r values) are shown, with p values shown in parentheses (corrected for multiple tests using the Benjamini-Hochberg Procedure). $Femininity_{all}$ denotes femininity derived using average shapes for all of the male and female faces in the sample and $femininity_{young}$ denotes femininity derived using the average shapes for the young male and female faces in the sample only. $Distinctiveness_{all}$ denotes distinctiveness derived using average shape for all of the male faces in the sample and $distinctiveness_{young}$ denotes distinctiveness derived using the average shape for the young male faces in the sample only.

	Age_{actual}	Age_{rated}	$Femininity_{young}$	$Femininity_{all}$	$Distinctiveness_{young}$	$Distinctiveness_{all}$	Asymmetry
Age_{actual}	1						
Age_{rated}	.99 (<.001)	1					
$Femininity_{young}$	-.081 (.508)	-.089 (.474)	1				
$Femininity_{all}$	-.45 (<.001)	-.45 (<.001)	.54 (<.001)	1			
$Distinctiveness_{young}$	.42 (<.001)	.43 (<.001)	.023 (.861)	-.30 (.010)	1		
$Distinctiveness_{all}$	.18 (.129)	.19 (.129)	.095 (.459)	-.15 (.220)	.94 (<.001)	1	
Asymmetry	.25 (.040)	.24 (.046)	-.16 (.206)	.33 (.004)	.12 (.329)	-.042 (.747)	1

The analyses described above show no evidence for the predicted negative correlation between face-shape femininity and age in women. However, it is possible that our results for sexual dimorphism of face shape and age are influenced by correlations between the shape differences between male and female faces and the shape differences between younger and older faces. This overlap may distort our results. To address this issue, we modified the multivariate regression used to obtain the sexual dimorphism face-shape vector (see Methods) by including face age as a predictor. This approach produces the sexual dimorphism vector that best describes sex differences in faces while controlling for shape characteristics that describe age differences. We then obtained a new sexual dimorphism score (hereon referred to as 'age-controlled sexual dimorphism') by projecting face shapes onto this vector. For female faces, these age-controlled sexual dimorphism scores were not significantly correlated with either actual age (r = .004, p = .965) or perceived age (r = -.001, p = .985). For male faces, correlations between age-controlled sexual dimorphism scores and both actual (r = -.210, p = .052) and perceived age (r = -.211, p = .051) were larger in magnitude and negative, suggesting that older male faces have more masculine face shapes. However, neither of these correlations reached statistical significance. Full details and outputs for this set of additional analyses are publicly available at https://osf.io/dxj56/.

4.4 Discussion

The present study tested for possible relationships between aspects of face shape (i.e., sexual dimorphism, distinctiveness, and asymmetry) and both actual and perceived age in a sample of natural (i.e., unmanipulated) face images showing individuals between 19 and 80 years of age. Our results for female faces do not support the widespread claim that facial femininity is attractive, at least in part, because it serves as a cue to youth and reproductive potential (Johnston, 2000; Law Smith et al., 2005; Perrett et al., 1998; Pflüger et al., 2012). If femininity of female face shape functioned as a valid signal of youth, younger women would be expected to display more feminine face shapes than older women. However, our study showed a significant positive (rather than negative) correlation between female age and feminine face shape when femininity was calculated using the average shape of young faces, indicating that older women in our sample possessed more feminine face shapes. A similar pattern of results was observed when femininity was calculated using the average shape of all faces in our sample, but this relationship was not statistically significant (p = .057). Together, these results challenge the claim that perceptions of youth contribute to preferences for female faces with feminine shapes. Indeed, an alternative analysis using age-controlled sexual dimorphism scores also showed no significant correlations between this measure of sexual dimorphism of face shape and women's actual or perceived age. By contrast with our results for female faces, analyses of male faces revealed a significant negative correlation between age and femininity calculated from the average face for the full sample, suggesting that older male faces may have more masculine face shapes. However, this pattern of results for male faces was not significant for the age-controlled sexual dimorphism scores (p values = .052 and .051).

Our results regarding facial distinctiveness highlight a critical methodological issue for research involving age-diverse samples. We found that distinctiveness predicted age only when calculated using the average shape for the younger faces. This relationship might emerge because older faces naturally diverge from the typical morphology of young faces (i.e., are further away from the average shape of young faces). Importantly, this correlation disappeared when distinctiveness is calculated using the prototypical face of the all-aged sample. This difference underscores that using average shape derived from younger samples to calculate distinctiveness in older populations would confound effects of age and distinctiveness. Future research should utilise appropriate age prototypes to clarify the meaning of associations between distinctiveness and age-related variables.

Our analysis of facial asymmetry showed a potentially sex-specific effect to aging. We found that older male faces were significantly more asymmetric than younger male faces but saw no such pattern for female faces. This apparent sex difference in the effects of aging on facial symmetry is consistent with Penke et al. (2009), who reported that facial symmetry predicted the extent of cognitive decline in older men, but not older women. Our findings support the hypothesis that men experience a more pronounced breakdown in developmental stability and somatic maintenance mechanisms in later life than women do, manifesting physically as increased facial asymmetry (Penke et al., 2009).

Finally, previous research has reported symmetry is positively correlated with facial masculinity for male faces and with facial femininity for female faces, which was cited as evidence that both traits signal a common aspect of physical condition (e.g., Little et al., 2008; Thornhill & Gangestad, 2006). However, other work has not replicated this association (e.g., Leger et al., 2024). The current results offer mixed support for this mate quality hypothesis, finding that the relationship between sexual dimorphism and symmetry may depend on the methodology used to calculate dimorphism. Specifically, for female faces, symmetry was positively correlated with femininity derived from the young sample but negatively correlated with femininity derived from the full sample, this latter pattern that contradicts the mate quality hypothesis. For male faces, a significant positive correlation between symmetry and masculinity derived from the full sample was observed, but no significant association was found when masculinity derived from the young sample. These inconsistent findings suggest that the link between sexual dimorphism and symmetry may not be robust across samples and measurement methods.

In conclusion, our study provides evidence that facial shape cues associated with attractiveness and mate quality are dynamically linked to age and sex. Perhaps most importantly, our results suggest that facial femininity does not necessarily decline with age in women, suggesting that the widely reported preference for feminine faces is unlikely to be due to a preference for youth, as many researchers have claimed. Further research is needed to untangle the motivations that drive preferences for female faces with feminine shapes. While younger women may well possess faces that are more feminine in other regards (e.g., have fewer lines and wrinkles), our findings suggest that this is not the case for face shape.

Chapters 2 through 4 tested evolutionary assumptions regarding age preferences using face evaluation paradigms but provided no empirical support for these assumptions. These null results suggest that the sources of individual differences in preferences for facial cues of youth remain unclear. Because face preferences are only one window into possible mate preferences, Chapter 5 investigated age preferences in a large sample of online dating profiles.

Chapter 5

How fertility intentions shape partner age preferences: the moderating roles of sex and age in Chinese online dating

Abstract

While many researchers have argued that age preferences during mate selection will be influenced, at least in part, by reproductive strategies and intentions, evidence for this proposal is mixed. Consequently, we tested this hypothesis by analysing stated partner age preferences in a large sample of Chinese online daters (*N* = 3,374). Consistent with findings from recent research on online dating preferences in a UK sample, our results suggested that age preferences during mate selection are influenced by reproductive strategies and intentions. Men who desired children showed a stronger preference for younger partners than did men who did not desire children and the strength of this effect increased with participant age. By contrast, women's age preferences remained relatively stable and were largely unaffected by their reproductive status or intentions. Additionally, we found that individuals with high incomes sought younger partners than did individuals with a low income, suggesting social status allows individuals to seek younger partners. In conclusion, our findings suggest that age preferences during mate selection may be partly influenced by fertility intentions and that this effect is moderated by both participant sex and age.

5.1 Introduction

Mate selection is critical for many outcomes, such as marital satisfaction, reproductive success and mental health (Buss, 2000; Fletcher et al., 1999; Ju et al., 2026; Kenrick & Keefe, 1992; T. Li & Fung, 2011). Therefore, identifying the traits people prioritise when selecting a partner is a core focus in human mating research. Previous studies consistently revealed that mate preferences display distinct sex differences (e.g., Buss, 1989; Eagly & Wood, 1999; N. P. Li et al., 2013; Walter et al., 2020; Whyte et al., 2021). Among these evaluated traits, one of the most significant and widely established differences is the preferred age of a potential partner (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992; Walter et al., 2020). Consequently, mate age preference potentially serves as a highly reliable indicator of an individual's underlying mating strategy.

Many researchers have argued that individuals tend to prefer younger mates and that this preference is much stronger in men than in women (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992; Walter et al., 2020). This pattern of results is expected because women's fertility declines more sharply with age, meaning that men evolved to prioritise youth as a cue for women's reproductive potential (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992; Walter et al., 2020). Consequently, female youth is often considered as an important factor in male mate selection, whereas women are expected to prefer older men because male age historically correlates with the accumulation of resources and social status necessary to parental investment (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992; Walter et al., 2020).

Although this hypothesis is very well established in previous mate preference literature, recent empirical results have not necessarily supported this putative sex difference in preferences for youth. For example, when analysing data from a study of 4,500 blind dates, Eastwick et al. (2025) found that participants showed a slight overall attraction to younger partners but that this pattern did not differ significantly between men and women. Similarly, observing preferences for facial cues rather than behavioural interactions, J. Li et al. (2025) found no reliable sex differences in preferences for youth cues. These findings imply that evolutionary models in age preferences may overstate the sex differences in the preference for age of potential mates.

Online dating platforms often require users to explicitly define their stated preferences in the real mate selection process (for a review of online dating, see Finkel et al., 2012). These platforms function as digital mating markets where users set clear requirements for acceptable partner characteristics. Kramer and Jones (2023) investigated hundreds of thousands of online dating profiles to see if wanting or already having children predicted users' stated age requirements. Their results partly supported traditional evolutionary predictions. Men who did not have children, or who explicitly stated they wanted children, rated a partner's age as a highly important criterion and intended to select younger women. Conversely, although women considered age to be a more important criterion compared with men, their age preferences showed a weak association with whether they had or wanted children. This indicates that the preference for mate age is not consistent but is dynamically adjusted according to an individual's reproductive status and intentions.

Human mate preferences are profoundly shaped by one's cultural background (Eastwick & Joel, 2025; N. P. Li et al., 2011; Malovicki-Yaffe et al., 2024; Zhang et al., 2019). However, most of the existing research on mate selection relies heavily on tests using Western samples (Eastwick & Joel, 2025), including the findings by Kramer and Jones (2023) . Traditionally, Chinese culture places an exceptionally high value on childbirth and family lineage (Hwang, 1999; Yeung & Hu, 2016). Given this cultural emphasis on having children, fertility intentions in a Chinese dating market may play a different role in mate selection compared to Western contexts.

In light of the above, the present study replicated and extended Kramer and Jones' (2023) study of UK dating profiles by investigating how desire for children shapes partner age preferences in a Chinese online dating sample. Specifically, because age preferences may change over the lifespan (Kenrick & Keefe, 1992), we positioned the users' own age as another primary theoretical focus, aiming to explore how age preferences dynamically shift across different stages of adulthood. Furthermore, to account for the complexity of mate selection, we expanded upon previous research by incorporating various demographic variables into the analysis, including height, educational level, and income. In the framework of social exchange theory, which argues that mate selection is a marketplace where individuals trade socioeconomic resources for other advantageous traits like youth (Cropanzano & Mitchell, 2005; Eagly & Wood, 1999; Thibaut & Kelley, 1959), these traits collectively define an individual's bargaining power and constraints within the mating market (Cropanzano & Mitchell, 2005; Eagly & Wood, 1999; N. P. Li et al., 2002; Thibaut & Kelley, 1959). Controlling for these variables may allow us to more accurately measure the effect of reproductive status and intentions.

5.2 Methods

Dataset

The data for this study were collected from Jiayuan (https://www.jiayuan.com/), one of the largest online dating platforms in China. Unlike casual dating applications, Jiayuan is specifically designed for individuals pursuing long-term committed relationships and marriage, making it an ideal context to investigate the effect of desire for children.

Data collection was performed using automated web-scraping techniques with the Selenium library in Python between 26 October 2025 and 14 November 2025. All procedures used were approved by the Hong Kong University of Science and Technology (Guangzhou) Ethics Committee. The web-scraping process strictly adhered to the website's robots.txt protocol (https://www.jiayuan.com/robots.txt).

Each profile includes variables such as sex, age, height, current parental status (i.e., whether they already have children), fertility intentions (i.e., whether they desire children), desired timeline for marriage, educational level, monthly income, and preferred partner age. Users' fertility intentions were indicated by their response (Yes, Maybe, or No) to a question regarding their desire for children. However, for users beyond reproductive age, generally over 60 for males and over 50 for females (Kühnert & Nieschlag, 2004; WHO, 2006), responses of “Yes” for this question were recoded as missing values, as these individuals are theoretically unlikely to intend childbearing.

From an evolutionary life history perspective, parental status and fertility intentions do not affect independently; rather, they interact to shape an individual's mating goals by shifting priorities from mating effort (e.g., seeking a young and reproductive partner) to parenting effort (e.g., seeking companionship or a co-parent) (Kaplan & Gangestad, 2015). Therefore, in our analyses, current parental status (Yes / No) and fertility intentions (Yes / Maybe / No) were combined as a six-category variable termed “fertility typology” (e.g., Childless-Want / Childless-Maybe / HasKid-NoWant).

The initial dataset consisted of 11,113 samples. After excluding users older than 70 and removing entries with missing value for either "whether having children" or "whether want children", a final sample of 3,374 users (Mean = 49.33 years, *SD* = 8.57 years, range = 26–70 years) was retained, consisting of 1,743 males (Mean = 49.55 years, *SD* = 7.46 years, range = 30–70 years) and 1,631 females (Mean = 49.10 years, *SD* = 9.61 years, range = 26–70 years). Full details and outputs of descriptive statistics are publicly available on the Open Science Framework (https://osf.io/e279g/).

Notably, Jiayuan does not provide an option for sexual orientation, and the platform’s matching algorithm does not allow for same-sex pairing. Consequently, all users in this sample are assumed to be heterosexual.

Statistical Analysis

All statistical analyses were conducted using R (R Core Team, 2024), with the packages tidyverse 2.0.0 (Wickham et al., 2019), gtsummary (Sjoberg et al., 2021), ggcorrplot (Kassambara, 2023a), car (Fox & Weisberg, 2018), MASS (Venables & Ripley, 2013), ggeffects (Lüdecke, 2018), and emmeans (Lenth et al., 2026).

Regarding the preferences for partner age, users could state their preferred partner age as specific values (e.g., “25 years old”), close-ended ranges (e.g., "25–30 years old"), open-ended ranges (e.g., "25 or older"), or the option "No limit". In the analyses, inputs identified as ranges were converted into continuous variables by calculating the midpoint of the range. Specifically, for open-ended ranges, given that the maximum marital age gap typically observed in cross-cultural empirical studies rarely exceeds 15 years (Conroy-Beam & Buss, 2019), upper or lower boundaries were defined as the users’ own age + 15 or - 15 years, with a fixed minimum baseline of 18 years. For example, "25 or above" was treated as the range (25, own age + 15), while “25 or below” was treated as the range (18, 25). Finally, a preferred partner age difference was calculated as the preferred partner age minus the user's own age and used in analyses.

An ordinary least squares (OLS) linear regression was performed to examine predictors of preferred partner age difference. The model included user sex (female as the reference category), mean-centred age, fertility typology (“Childless-NoWant” group as the reference category), height, desired timeline for marriage, educational level, and monthly income as main effects. Additionally, the model specified all two-way interactions, as well as the three-way interaction, among user sex, age, and fertility typology. All "No limit" responses were coded as missing values and were thus excluded in the regression analysis. Analysis code and full results for this analysis are publicly available at https://osf.io/e279g/.

5.3 Results

Regarding main effects, the significant and negative effect of sex aligned with an established pattern that males generally prefer relatively younger partners than females do (b = -8.94, 95% CI [-11.38, -6.51], p < .001). In addition, the results also found that both the Childless_Want (b = -2.79, 95% CI [-4.64, -0.95], p = .003) and HasKid_Maybe (b = -1.84, 95% CI [-3.27, -0.42], p = .011) groups showed a stronger preference for younger partners compared to the

Childless_NoWant group. Furthermore, individual's income showed a significantly negative linear effect (b = -1.95, 95% CI [-2.73, -1.18], p < .001) and a significantly negative quadratic effect (b = -1.74, 95% CI [-2.39, -1.09], p < .001). As illustrated in Figure 5.1, age preferences followed an inverted U-shape curve. Individuals at lower- or middle-income levels (< 20,000 CNY per month) showed a relatively narrower preferred age difference (around 4 to 5 years younger). However, as income increased beyond this point, preferred age difference declined sharply, with the highest-income group preferring partners approximately 7.5 years younger than themselves.

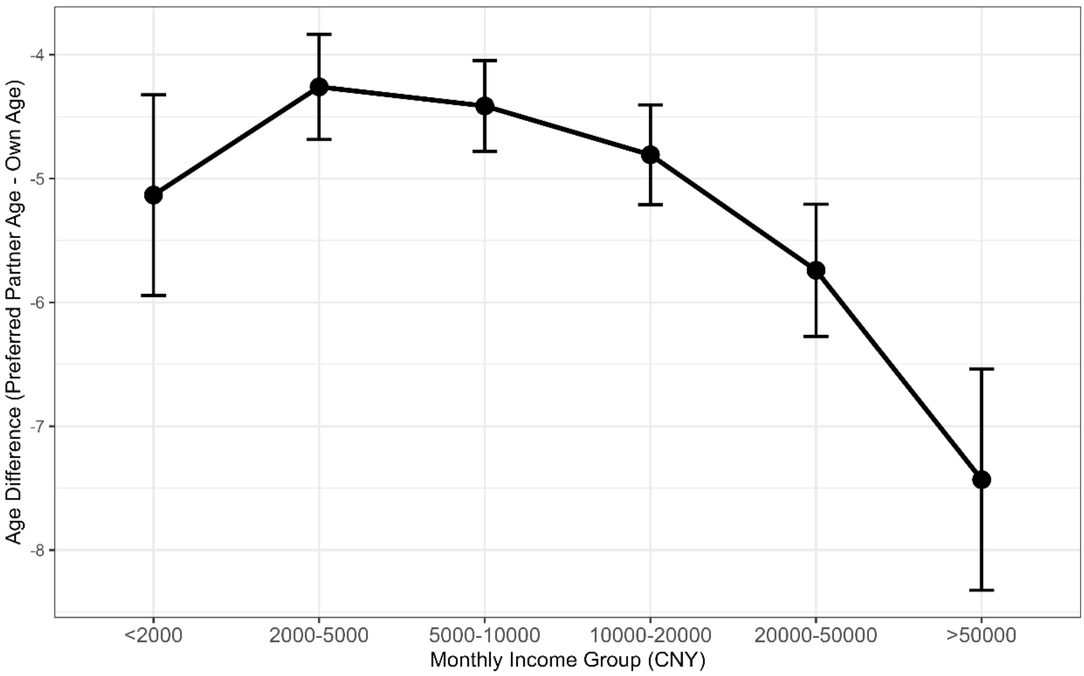

Figure 5.1. Trend in preferred partner age difference (partner age – own age) by income group.

This study specifically tested the interaction between individual sex (female as the reference category), age, and fertility typology ("Childless-NoWant" group as the reference category). The model found no significant two-way interaction, but it revealed a significant three-way interaction between age, sex, and fertility typology (male * age * Childless-Maybe: b = -0.37, 95% CI [-0.67, -0.08], p = .014; male * age * Childless-Want: b = -0.49, 95% CI [-0.77, -0.20], p < .001; male * age * HasKid-Want: b = -0.41, 95% CI [-0.70, -0.12], p = .005). This indicates that the sex difference in partner age preferences over time was largely moderated by male fertility typology (see Figure 5.2).

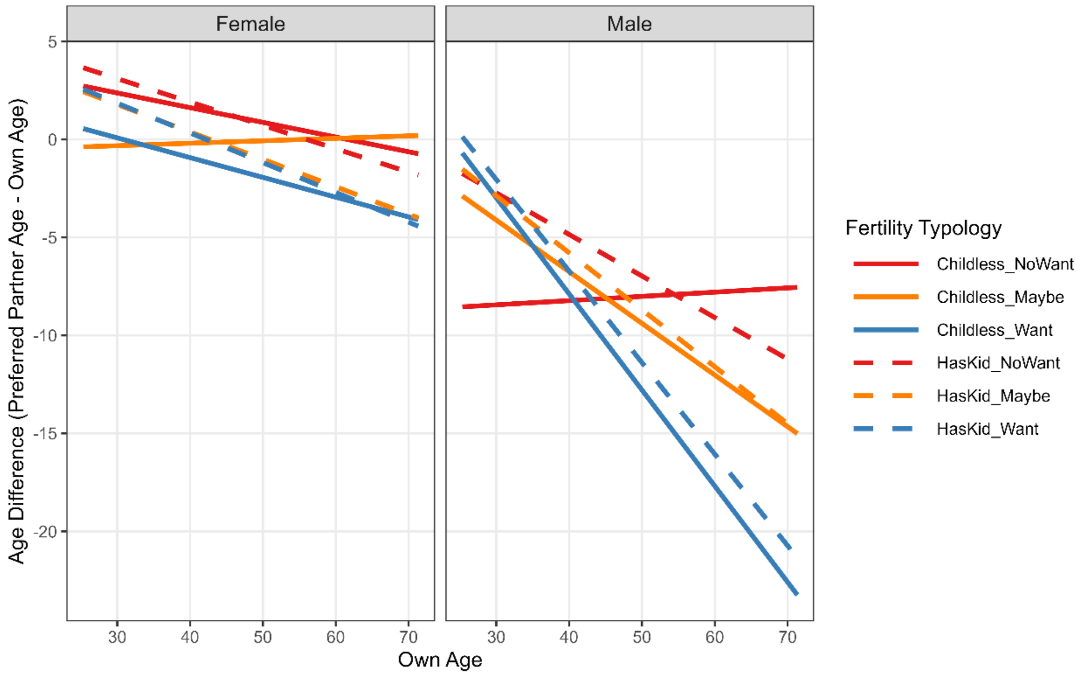

Figure 5.2. The three-way interaction between age, sex, and fertility typology on preferred partner age difference (partner age – own age).

To examine how advancing age, reproductive status, and intentions affect age preferences across sexes, simple slope analyses were conducted using the R package emmeans (Lenth et al., 2026). Full results of analyses undertaken to decompose this three-way interaction are given at https://osf.io/e279g/.

For females, most fertility typology groups initially preferred slightly older males, with increasing age leading to a modest preference for slightly younger partners than themselves, whereas the Childless-Maybe group showed the opposite trend. However, these age-related changes were statistically uniform across all fertility typologies. We found no significant slope differences between any fertility typology groups among females (all pairwise contrast $p > .575$), meaning female age preferences were not driven by their reproduction status or intentions.

For males, fertility typology showed a significant effect on their partner age preferences over time. Males who desired to have children (i.e., Childless-Want and HasKid-Want groups) had the steepest slopes, indicating they show stronger preferences for younger women as they age. Conversely, males in the Childless-NoWant group displayed a flat, even slightly increasing, trajectory: Their age difference preferences remained stable regardless of their own age (see Figure 2). Pairwise contrast tests validated that the rate of decline in age difference preference for Childless-Want males was significantly steeper than for males who did not plan to have child anymore, whether they were childless (b = 0.51, SE = 0.11, t = 4.90, p < .001) or already had children (b = 0.28, SE = 0.06, t = 4.91, p < .001). Similarly, males with existing children who still wanted more children (i.e., HasKid-Want group) showed significantly steeper declines in age preference than both Childless-NoWant males (b = 0.49, SE = 0.10, t = 4.74, p < .001) and HasKid-NoWant males (b = 0.26, SE = 0.05, t = 4.73, p < .001). These results revealed that male age preferences are closely associated with their fertility intentions (i.e., desire for children).

5.4 Discussion

This study investigated how age, reproductive status, and intentions interact to shape partner age preferences in a Chinese online dating sample. We found that the trajectory of partner age preferences differed by participant sex and was moderated by fertility intentions. For females, age preferences generally shifted from preferring slightly older males to slightly younger males at a modest rate as they aged, regardless of whether they already had children or intended to have them. However, for males, age preferences were highly dependent on fertility intentions. Males who explicitly desired to have children sought increasingly younger partners as they aged, whereas males who did not have and did not want children maintained a relatively flat and stable age preference over time. Additionally, we also found a strong effect for participant income, indicating individuals with higher monthly incomes showed significantly stronger preferences for younger partners.

Our findings are consistent with those from other online dating research. Consistent with Kramer and Jones (2023), our data support the evolutionary view that the desire for children predicts men's preferences for younger partners, but that a similar pattern was not observed in women. However, our findings contradict some experimental studies measuring age preferences via facial-attractiveness judgments. For example, J. Li et al. (2025) reported that participants with a greater desire for children showed weaker preferences for younger adult faces.

These conflicting findings for age preferences in online dating platforms and face preferences imply that setting filter parameters during online dating and evaluating visual stimuli may rely on different psychological mechanisms (Eastwick & Finkel, 2008; Todd et al., 2007). On text-based online dating platforms, users set specific numerical age limits, using chronological age as a proxy for fertility. Conversely, face evaluation introduces holistic visual cues (Little, Jones, & DeBruine, 2011; Zebrowitz & Montepare, 2008). Perceived health, physical cues of youth, or assumed personality traits could override abstract chronological age preferences. Eastwick et al. (2025) observed a similar effect in a large live blind-date study, where self-reported "upper-age limits" did not serve as a meaningful mate selection criterion in face-to-face dates. Although participants generally preferred younger partners, their choices were not significantly affected when a partner's age was above or below their limit. This suggests that a visual cues or in-person interaction may override those criteria users set online (Antheunis et al., 2020; Eastwick & Joel, 2025; Todd et al., 2007).

Another explanation for the discrepancy in the effect of fertility intentions on age preference is that existing research has generally overlooked the moderating role of participant age. For instance, J. Li et al. (2025) reported that men desiring children showed a weaker preference for younger faces, seemingly contradicting evolutionary theories. However, the male sample in their study had a mean age of 31.11 years (*SD* = 6.99). In fact, our results also replicated this pattern within that narrow participant age range. As shown in Figure 2, during early adulthood (around age 30), males desiring children also show a weaker preference for much younger partners compared to Childless-NoWant males, as reported by Li et al. (2025). The full trajectory can only be observed when a wide range of participant ages are included. Our findings indicate that age-preference slopes only begin to diverge after males enter middle adulthood. As men age, same-aged female peers increasingly exit their reproductive windows. Faced with this situation, males desiring children may need to shift their preferences toward substantially younger women, causing their age-preference slope to drop sharply. In contrast, males who do not intend to have children maintain a relatively flat and stable baseline throughout their lives. Consequently, studies drawing primarily from younger samples capture only an incomplete trajectory, missing the divergence in mate selection that manifests primarily later in the lifespan.

Moreover, supporting for social exchange theory, we found that individuals with high incomes generally preferred younger partners to a greater extent than did individuals with low incomes. The online dating environment arguably makes this exchange more straightforward and may throw it into sharper focus. It allows wealthy individuals to apply their economic advantage directly by setting strict age limits to secure partners with greater reproductive value.

To conclude, our data from a Chinese online dating platform showed a strong effect of fertility intentions on male mating behaviours, with males who desire to have children preferring increasingly younger partners as they age. By contrast, no such pattern was evident in women. We also found that high income allowed individuals to seek much younger partners and observed no cultural differences between Chinese and UK online dating contexts in partner age preferences. Taken together, these results provide empirical support for both evolutionary and social exchange theories of age preferences.

Chapter 6

General discussion

The main aim of this thesis was to examine the mechanisms behind age preferences in human mate selection. Across four empirical studies, this thesis tested common evolutionary hypotheses about age preferences using both face-rating tasks and online dating data. Overall, the findings suggest that face-rating tasks provide little support for evolutionary predictions, whereas online mating behaviours closely match these predictions, collectively highlighting the complexity of human mating strategies.

6.1 Summary of main findings

Chapter 2 attempted to replicate the imprinting-like effect on partner age preferences proposed by Perrett et al. (2002), which suggests that people born to older parents show weaker preferences for facial cues of youth. Instead of using CG-manipulated facial stimuli employed in Perrett et al.'s (2002) study, I tested this hypothesis by investigating whether these findings generalise to evaluations of natural (i.e., unmanipulated) face images. By removing the artificial manipulation of age cues, this study aimed to provide a more reliable assessment of how parental age at participants' birth influences their preferences for facial cues of youth.

My results support previous findings (e.g., Foos & Clark, 2011; Perrett et al., 2002), showing that participants generally rated younger adult faces as more attractive than older adult faces. However, in contrast with Perrett et al.'s (2002) finding, my analysis found no evidence of a significant relationship between the strength of this preference and how old the participants' parents were when they were born, and these preferences did not differ between men and women. Indeed, a simple slopes analysis conducted to decompose a marginally non-significant interaction between stimulus age and parental age at birth (p = .078) revealed an opposing trend in my sample, indicating that participants with older parents tended to show a stronger preference for younger adult faces. Overall, these results challenged the proposal that people born to older parents show weaker preferences for facial cues of youth.

Because the imprinting theory did not explain age preferences well, Chapter 3 further investigated another potential source of individual differences in preferences for facial cues of youth: the desire to have children. A prevailing evolutionary theoretical framework suggests that people generally prefer younger partners because youth serves as a proxy for greater reproductive potential, particularly when males are seeking a female partner (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992). Given that, individuals with a stronger desire to have children are expected to exhibit a stronger preference for younger faces. However, contrary to this prediction, my results revealed that participants reporting a greater desire to have children showed weaker preferences for younger adult faces. To understand this surprising result, I tested two possible explanations: older or older-looking people might be perceived to be better parents (e.g., Boothroyd et al., 2007) or wealthier (e.g., Mu & Xie, 2014) than those younger or younger-looking people, and consequently, participants with stronger fertility intentions showed weaker preferences for younger adult faces. However, follow-up studies ruled out both possible explanations, demonstrating that this pattern could not be explained by the hypotheses that older individuals are perceived as more likely to be better parents or wealthier.

In addition, Chapter 3 found no evidence that the preference for youthful facial cues was significantly stronger when men evaluated women than when women evaluated men. Along with other recent work (e.g., Eastwick et al., 2025), this study challenges the broadly held view that men and women differ strongly in their preference for youth (Buss, 1989, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992).

Since Chapter 2 and 3 showed that neither parental age nor fertility intentions predicted face age preferences as evolutionary theories suggest, Chapter 4 turned to test the fundamental assumptions about what face shapes make a face look younger. Specifically, it tested whether facial femininity serves as a reliable cue to youth and, consequently, women's reproductive potential. This study derived face-shape measures (i.e., asymmetry, distinctiveness, and sexual dimorphism) using an automated facial-landmark placement technique (A. L. Jones et al., 2021) from a large-scale age-diverse face database (Ebner et al., 2010). If femininity of female faces serves as a valid signal of youth, younger women would be expected to exhibit a more feminine face than older women. Nevertheless, my results showed that while older men had more masculine face shapes than younger men, younger women did not have more feminine face shapes than older women, regardless of whether the femininity was calculated using the average shape of only young faces ($p < .001$) or all faces in my sample ($p = .057$). Similarly, an alternative analysis using age-controlled sexual dimorphism scores also showed no significant correlations between this measure of facial sexual dimorphism and women's actual or perceived age. Together, Chapter 4 again challenges the well-established claim that the preference for female faces with feminine shapes is partly driven by the underlying preference for cues of youth and reproductive potential (Johnston, 2000; Law Smith et al., 2005; Perrett et al., 1998; Pflüger et al., 2012).

Beyond sexual dimorphism, the analysis of facial distinctiveness highlighted a methodological issue for studies involving samples with wide age ranges. I found that distinctiveness predicted age only when calculated using the average shape of young faces, but not when calculated using the average shape of all faces combined. This difference might emerge because older faces naturally diverge from the average shape of young faces, which highlights the importance of using appropriate prototypical faces to test the age-related effect. Moreover, the results regarding facial asymmetry revealed a potentially sex-specific effect to ageing. Consistent with the findings of Penke et al. (2009), older male faces were significantly more asymmetric than younger male faces, but such a pattern was not found for female faces.

Because studies measuring responses to static faces (i.e., Chapter 2-4) found little evidence to support evolutionary theories regarding partner age preferences, Chapter 5 investigated whether these theories explain mating behaviours better in the real-world context. By analysing stated age requirements and fertility typology (i.e., the intersection of current parental status and future desire for children) in Chinese online dating profiles, Chapter 5 found that mating behaviours in an online mate market do indeed more closely follow evolutionary theories regarding age preferences (Buss, 2000; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992). Contrary to the face-rating result in Chapter 3, the online dating analysis showed the significant effect of desire to have children on partner age preferences, and this effect is moderated by both own sex and age. For women, partner age preferences gradually shift from slightly older to slightly younger as they age, regardless of their fertility typologies. However, for men, age preferences depend heavily on whether they want children. Men who desire children seek increasingly younger partners as they age, whereas men who do not want children maintain stable age preferences over time. Consistent with another study analysed with a UK online dating sample (Kramer & Jones, 2023), my results support the evolutionary view that the desire for children predicts men's preferences for younger partners, but that a similar pattern was not observed in women.

In addition, results of Chapter 5 revealed a clear difference in partner age preferences based on earning capacity. Higher-income individuals showed a significantly stronger preference for younger partners than those with lower incomes. This pattern provides empirical support for social exchange theory, which suggests that mate selection works like a marketplace where socioeconomic capital is traded for advantageous biological traits, such as youth (Cropanzano & Mitchell, 2005; Eagly & Wood, 1999; Thibaut & Kelley, 1959). Taken together, the findings from Chapter 5 suggest that when chronological age and socioeconomic status are evaluated within a real dating market, human mating behaviours are more likely to follow classical theoretical models, in contrast to the previous findings derived solely from face ratings.

The difference in results for age preferences reported in the current studies of face preferences (Chapters 2 – 4) and those reported in the study of online dating profiles (Chapter 5) is striking. One possibility is that facial-attractiveness judgments are relatively unimportant for actual partner choices. Indeed, although it is often claimed that facial-attractiveness judgments provide useful insight into partner preferences, there is surprisingly little direct evidence that this is necessarily the case. For example, there is little evidence that stated partner preferences and those revealed through face preferences are highly correlated and studies testing this issue have either reported nonsignificant relationships, relationships that are statistically significant but weak, or relationships that are only significant for subgroups of participants (e.g., participants who consider themselves to be highly attractive and able to compete successfully for their preferred partner types, DeBruine et al., 2006; Wincenciak et al., 2015). A further point is that face-preference tasks are one-sided, where participants evaluate images of strangers with no opportunity for interaction. In contrast, actual mate selection is a mutual process in which both individuals evaluate each other's attractiveness, behaviour, and responsiveness. This fundamental difference may limit the extent to which passive face-rating tasks can capture the interactive nature of romantic decision-making.

Based on my results, researchers may wish to be cautious more cautious in equating face preferences with partner preferences more generally. Of course, this does not mean that studies of facial attractiveness may not be useful for understanding facial attractiveness specifically. It may be the case that there are boundaries in the extent to which such results can be meaningfully generalised to other domains (i.e., results for facial attractiveness may increase understanding of facial-attractiveness judgments but not other aspects of partner preferences). Consistent with this view, studies testing correlations among face, voice and odour preferences are typically modest (Cornwell et al., 2004; Feinberg et al., 2008). More strong tests of potential intercorrelations among different methods for assessing partner preferences are needed to clarify this issue.

6.2 Limitations and future directions

Study designs

The discrepancies between the face-rating findings and the online dating findings regarding age preference underscored that human mating preferences are deeply context-dependent (for a review, see Eastwick & Joel, 2025). Rating only static faces on a screen is a low-cost and consequence-free task. In such scenarios, participants can express their preferences without facing the complex trade-offs and interpersonal costs which are inherent in actual mate selection. Indeed, Eastwick and Finkel (2008) indicated that the preference patterns examined from a photograph-based paradigm fail to replicate in real-life mate selection. However, although online dating data do reflect one's desired partner traits in an actual mate selection to some extent, some studies have revealed that stated preferences showed on online dating profiles or questionnaires cannot predict actual choices made during the in-person dates (Eastwick et al., 2025; Eastwick & Finkel, 2008; Todd et al., 2007). For example, in actual dating scenarios, people often accept partners who fall short of their stated ideals due to a fear of missing out on potential romantic opportunities (Joel et al., 2019) or the discomfort of rejecting romantic suitors (Bohns & DeVincent, 2019). These demonstrate that mate selection is not a passive evaluation of single sensory cues, but a mutual interaction that requires individuals to process multiple cues simultaneously (Buss, 2016; Darwin, 1871; Lenschow et al., 2022). Therefore, to enhance ecological validity, future research on mate preferences can shift methods for assessing preferences from evaluating single-sensory stimuli toward multisensory stimuli, or even better, directly adopting more realistic and interactive research designs.

Most current studies investigate mate preferences by isolating one sensory modality at a time, having participants evaluate faces (e.g., Boothroyd et al., 2007; Johnston, 2006; Rhodes et al., 2005; Wincenciak et al., 2015), voices (e.g., Feinberg et al., 2005; Pisanski et al., 2018; Puts, 2005), body shapes (e.g., Fisher et al., 2014; Swami et al., 2010; Tovée et al., 2002), or body odours (e.g., Herz & Inzlicht, 2002; Mahmut et al., 2019; White & Cunningham, 2017) separately. Although this approach offers highly experimental control, few studies integrate these cues to examine how they work together (e.g., Feinberg, 2008; Little et al., 2011; Puts et al., 2012). In real life, mate selection depends on combining multiple sensory inputs (Grammer et al., 2003; Groyecka et al., 2017; Lenschow et al., 2022). During actual social encounters, people simultaneously process visual, auditory, and olfactory information to form an overall impression of a potential partner (Grammer et al., 2003; Groyecka et al., 2017; Lenschow et al., 2022). Therefore, measuring preferences through only one sensory channel may misrepresent the complex decision-making involved in mate choice. By using multisensory stimuli (e.g., Feinberg, 2008; Little et al., 2011; Puts et al., 2012), future research can test whether different sensory cues provide overlapping signals that point to the same underlying trait, or whether they convey different kinds of information about mate quality.

However, simply presenting multisensory stimuli to participants still does not fully capture the real dynamics of human mate behaviours. In nature, mate selection is a mutual process in which both individuals assess and respond to each other (Buss, 2016; Darwin, 1871; Finkel et al., 2007, 2012). Thus, future research should to move beyond passive evaluations toward using more realistic and interactive research designs, such as in-person speed-dating (Eastwick et al., 2025; Finkel et al., 2007; Todd et al., 2007) or online virtual dates (Antheunis et al., 2020; Frost et al., 2007; Moreno et al., 2026). The speed-dating paradigm has unique scientific advantages because it combines tight experimental control with strong ecological validity. Specifically, it allows researchers to observe actual romantic decisions that have real consequences (e.g., getting a date or being rejected), rather than relying on low-cost and consequence-free experimental tasks. In addition, because participants interact with multiple partners in real time, speed-dating offers a useful way to study how mate preferences work during mutual interactions in social encounters (for methodological review of speed-dating, see Finkel et al., 2007).

Recently, online virtual dates via video conferencing (e.g., Zoom) have become a practical alternative research design (e.g., Antheunis et al., 2020; Frost et al., 2007; Moreno et al., 2026). This method retains the mutual interaction and multisensory exchange of real-world mating scenarios while removing geographical barriers, allowing researchers to recruit larger and more culturally diverse samples (Frost et al., 2007; Moreno et al., 2026). Furthermore, recent evidence shows that virtual dates can lead to similar rating outcomes of date enjoyment and attraction as in-person dates (Moreno et al., 2026), suggesting that this approach is both ecologically valid and efficient for assessing mating preferences. Taken together, integrating multiple sensory modalities and adopting more realistic and interactive research designs will provide more accurate conclusions about human mating preferences.

Stimuli

Beyond study designs, the findings across Chapters 3 through 5 also suggest another methodological concern for research about the effects of age: studies should incorporate broader age ranges for both the experimental stimuli and the participants recruited. Much of the existing literature relies on samples of young adults or face stimuli with a relatively narrow age range (e.g., Burt & Perrett, 1995; Ganel & Goodale, 2018; Hass et al., 2016). The results presented in this thesis expose the severe limitations of that approach. At the stimulus level, Chapter 4 demonstrated that analysing only young faces could produce different results compared to using age-diverse facial images, which would confound effects of age and distinctiveness. At the participant level, the interactions observed in Chapter 5 show that age preferences shift dynamically across the lifespan rather than remaining static. Participant age profoundly moderates how individual fertility intentions shape preferred partner age. When research designs lack sufficient age range in either the stimulus set or the participant pool, these age-related patterns in mate selection may be masked within a restricted young-adult sample. Thus, it is suggested that future studies regarding effects of age use a wider age range of both stimuli and participants.

For example, based on the valence-dominance model of social judgments (Todorov et al., 2008), Sutherland et al. (2013) identified age as a third dimension alongside valence and dominance, but relied solely on young-adult participants. Therefore, future research can test this extended theoretical framework using a wider age range for both facial stimuli and participants to clarify how the youth dimension functions in social judgments. Apart from social perception, another future direction is to re-evaluate the theoretical assumptions underlying facial shape preferences. Chapter 4 failed to demonstrate that younger adult women have significantly more feminine face shapes, challenging the evolutionary claim that individuals prefer feminine female faces because femininity serves as a cue for youth. Consequently, further research needs to untangle the actual motivations that drive preferences for female faces with feminine shapes.

Participants

Lastly, the demographic homogeneity of the experimental studies presents another clear limitation. The facial studies in this thesis relied exclusively on White facial stimuli (Ebner et al., 2010) and participants based in the UK. This reflects a persistent issue in face perception and mating research, where samples overwhelmingly consist of Western and White populations (Cook & Over, 2021; Eastwick & Joel, 2025). This lack of racial and cultural diversity restricts the generalisability of the conclusions. Different racial and cultural backgrounds significantly influence how faces change with ageing (Alexis & Obioha, 2017; Flament et al., 2018; Vashi et al., 2016), how people perceive faces (Anzures et al., 2013; Blais et al., 2008; Han et al., 2018; B. C. Jones et al., 2021; Voegeli et al., 2021), and how they select romantic partners (Li et al., 2011; Malovicki-Yaffe et al., 2024; Zhang et al., 2019). To develop a universally applicable understanding of age preference, it is suggested that future research incorporate diverse facial stimuli and recruit participants from a wide range of racial and cultural contexts.

6.3 Conclusions

This thesis presents a comprehensive investigation of age preferences in human mate selection. By transitioning from experimentally controlled facial evaluation paradigms to data-driven analyses of real-world dating behaviours, the research exposes the profound complexity of preferences for partner age. The results found no evidence that younger adult women have significantly more feminine face shapes, challenging the claim that individuals prefer feminine female faces because femininity serves as a cue for youth. While the facial studies also challenged the evolutionary hypotheses regarding the age preference, the subsequent analysis of online dating data demonstrated that fertility intentions do influence age preferences during actual mate selection, and this effect shifts dynamically across the lifespan and differs significantly between sexes.

The results of this thesis highlight two methodological limitations of research on mate preferences. To understand the dynamic nature of human mate preferences, researchers should use a wider age range of both stimuli and participants to avoid masking the moderating effects of age. In addition, mate selection is a mutual behaviour. To enhance ecological validity, future studies should utilise more realistic and interactive research designs. By studying broad age ranges in realistic dating environments, future research can build a more accurate model of how individuals choose their romantic partners.

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Appendices

Appendix A

Ethics application form

Please answer all questions

1. Title of the investigation
Investigating potential sources of variance in the effects of facial cues of age on attractiveness judgments
Please state the title on the PIS and Consent Form, if different: Facial attractiveness study

2. Chief Investigator (must be at least a Grade 7 member of staff or equivalent)
Name: Benedict Jones ☒ Professor ☐ Reader ☐ Senior Lecturer ☐ Lecturer ☐ Senior Teaching Fellow ☐ Teaching Fellow Department: Psychological Sciences & Health Telephone: E-mail: benedict.jones@strath.ac.uk

3. Other Strathclyde investigator(s)
Name: Dr Victor Shiramizu Status (e.g. lecturer, post-/undergraduate): Lecturer Department: Psychological Sciences & Health Telephone: E-mail: victor.shiramizu@strath.ac.uk Name: Jingheng Li Status (e.g. lecturer, post-/undergraduate): PGR Department: Psychological Sciences & Health Telephone: E-mail: jingheng.li@strath.ac.uk

4. Non-Strathclyde collaborating investigator(s) (where applicable)
Name: Status (e.g. lecturer, post-/undergraduate): Department/Institution: If student(s), name of supervisor: Telephone: E-mail: Please provide details for all investigators involved in the study:

5. Overseas Supervisor(s) (where applicable)
Name(s): Status: Department/Institution: Telephone: Email: I can confirm that the local supervisor has obtained a copy of the Code of Practice: Yes

☐ No ☐
Please provide details for all supervisors involved in the study:

6. Location of the investigation
At what place(s) will the investigation be conducted The study will be run online via Qualtrics with participants recruited from the online recruitment platform Prolific.
If this is not on University of Strathclyde premises, how have you satisfied yourself that adequate Health and Safety arrangements are in place to prevent injury or harm? N/A

7. Duration of the investigation
Duration(years/months) : 3 years Start date (expected): 1 / 1 / 2024 Completion date (expected): 1 / 1 / 2027

8. Sponsor Please note that this is not the funder; refer to Section C and Annexes 1 and 3 of the Code of Practice for a definition and the key responsibilities of the sponsor.
Will the sponsor be the University of Strathclyde: Yes ☒ No ☐ If not, please specify who is the sponsor:

9. Funding body or proposed funding body (if applicable)
Name of funding body: N/A Status of proposal – if seeking funding (please click appropriate box): ☐ In preparation ☐ Submitted ☐ Accepted Date of submission of proposal: / / Date of start of funding: / /

10. Ethical issues
Describe the main ethical issues and how you propose to address them: This online study, which will be conducted via Qualtrics with participants recruited from an online participant recruitment platform (Prolific), consists of two parts. In the first part (face-rating task), participants will rate the attractiveness of 50 faces taken from an open-access image set (Ebner et al., 2010). In the second part (questionnaire), they will be invited to answer questions about their own age, parental age, partner age, and ideal partner age. These questions have been used in previous studies. Informed consent will be obtained from all participants prior to them starting the study. Because previous studies on this topic tested only heterosexual participants between 25 and 45 years of age who are currently in a romantic relationship, we will recruit only participants meeting these criteria. All face images used in the study are from an open-access image set. All participants who provided images have consented to their images being rated for attractiveness (including in online studies). All data will be fully anonymous and made publicly available on the Open Science Framework (German server) once analyses have been completed. A data entry will be created in PURE linking to the Open Science Framework dataset. Participants can withdraw from the study at any point up until the end of the tasks and do not have to answer any questions they would prefer not to answer.

11. Objectives of investigation (including the academic rationale and justification for the investigation) Please use plain English.
Previous research has identified four possible sources of variance in heterosexual participants' preferences for age in potential romantic partners (see, e.g., Perrett et al., 2002): (1) Participant age (older people tend to show stronger preferences for older individuals). (2) Parental age (people born to older parents tend to show stronger preferences for older individuals). (3) Participant gender (women tend to show stronger preferences for older individuals than men do). (4) Romantic-partner age (people with older partners tend to show stronger preferences for older individuals). The current study will attempt to replicate these four patterns of results when analysing participants' ratings of the attractiveness of face images from an open-access database (Ebner et al., 2010).

12. Participants
Please detail the nature of the participants: Heterosexual participants who currently have a romantic partner, have English as their first language, and are between 25 and 45 years of age will be recruited from the online recruitment platform Prolific. Summarise the number and age (range) of each group of participants: Number: 200 Age (range) 25 to 45 years of age Please detail any inclusion/exclusion criteria and any further screening procedures to be used: To replicate the demographic characteristics of previous studies on this topic, only heterosexual participants between 25 and 45 years of age who are currently in a romantic relationship will be recruited. To ensure participants understand the questions and instructions, we will only recruit participants for whom English is their first language.

13. Nature of the participants Please note that investigations governed by the Code of Practice that involve any of the types of participants listed in B1(b) must be submitted to the University Ethics Committee (UEC) rather than DEC/SEC for approval.
Do any of the participants fall into a category listed in Section B1(b) (participant considerations) applicable in this investigation?: Yes ☐ No ☒ If yes, please detail which category (and submit this application to the UEC):

14. Method of recruitment
Describe the method of recruitment (see section B4 of the Code of Practice), providing information on any payments, expenses or other incentives. Participants will be recruited through the online recruitment platform Prolific and will receive £2 compensation for their time. This compensation amount is based on Prolific's guidelines for participant compensation.

15. Participant consent

Please state the groups from whom consent/assent will be sought (please refer to the Guidance Document). The PIS and Consent Form(s) to be used should be attached to this application form. Consent will be sought from all participants

16. Methodology Investigations governed by the Code of Practice which involve any of the types of projects listed in B1(a) must be submitted to the University Ethics Committee rather than DEC/SEC for approval.
Are any of the categories mentioned in the Code of Practice Section B1(a) (project considerations) applicable in this investigation? ☐ Yes ☒ No If 'yes' please detail:
Describe the research methodology and procedure, providing a timeline of activities where possible. Please use plain English. The study will be run using Qualtrics and consists of two parts (a questionnaire and a face-rating task). In the face-rating task, participants will rate the attractiveness of 50 face images (these images were obtained from an open-access image set, Ebden et al., 2010). In the questionnaire (see appendix), participants will be invited to answer questions about their own age, partner age, ideal partner age, and parental age (note that participants are told they do not have to answer any questions they would prefer not to answer). Based on our experience running similar online studies, the study will take approximately 10 to 15 minutes.
What specific techniques will be employed and what exactly is asked of the participants? Please identify any non-validated scale or measure and include any scale and measures charts as an Appendix to this application. Please include questionnaires, interview schedules or any other non-standardised method of data collection as appendices to this application. Both the face-rating task and questionnaire are standard for research in this area. The questionnaire has been included in the Appendix. The face-rating task asks participants to give a rating on a 7-point scale reflecting their impressions of facial attractiveness.
Where an independent reviewer is not used, then the UEC, DEC or SEC reserves the right to scrutinise the methodology. Has this methodology been subject to independent scrutiny? Yes ☐ No ☒ If yes, please provide the name and contact details of the independent reviewer: All aspects of the methods and analyses are widely used in published (i.e., peer-reviewed) research on this topic.

17. Previous experience of the investigator(s) with the procedures involved. Experience should demonstrate an ability to carry out the proposed research in accordance with the written methodology.
Prof Jones and Dr Shiramizu have considerable experience collecting, analysing, archiving, and writing up for publication research on this topic (>250 and >30 papers in peer-reviewed journals, respectively). Jingheng Li has completed a Masters degree in Psychology and Education and was awarded this qualification with "Distinction".

18. Data collection, storage and security
How and where are data handled? Please specify whether it will be fully anonymous (i.e. the identity unknown even to the researchers) or pseudo-anonymised (i.e. the raw data is

anonymised and given a code name, with the key for code names being stored in a separate location from the raw data) - if neither please justify. All data will be fully anoymous.
Explain how and where it will be stored, who has access to it, how long it will be stored and whether it will be securely destroyed after use: After data collection is completed, data will be downloaded from Qualtrics, deleted from Qualtrics, and then stored on University of Strathclyde OneDrive during analyses and writing up. Data will be made publicly available on the Open Science Framework once analyses are completed. Prior to making the data publicly available, only the named researchers will have access. Once uploaded to the Open Science Framework, data will be removed from the OneDrive.
Will anyone other than the named investigators have access to the data? Yes ☒ No ☐ If 'yes' please explain: Only the named researchers will have access to the data until it is posted on the Open Science Framework.

19. Potential risks or hazards
Briefly describe the potential Occupational Health and Safety (OHS) hazards and risks associated with the investigation: We envisage no risks or hazards (eRisk Assessment attached).
Please attach a completed eRisk Assessment for the research. Further Guidance on Risk Assessment and Form can be obtained on Occupational Health, Safety and Wellbeing's webpages

20. What method will you use to communicate the outcomes and any additional relevant details of the study to the participants?
Once they have completed the study, participants will be debriefed about the purpose of the study and expected results.

21. How will the outcomes of the study be disseminated (e.g. will you seek to publish the results and, if relevant, how will you protect the identities of your participants in said dissemination)?
We will post a preprint reporting the results prior to submitting it for publication in a peer-reviewed journal.

Checklist	**Enclosed**	**N/A**
Participant Information Sheet(s)	☒	☐
Consent Form(s)	☒	☐
Sample questionnaire(s)	☒	☐
Sample interview format(s)	☐	☒
Sample advertisement(s)	☒	☐
OHS Risk Assessment (S20)	☒	
Any other documents (please specify below)	☐	☒
	☐	☐
	☐	☐
	☐	☐
	☐	☐

22. Chief Investigator and Head of Department Declaration
Please note that unsigned applications will not be accepted and both signatures are required

I have read the University's Code of Practice on Investigations involving Human Beings and have completed this application accordingly. By signing below, I acknowledge that I am aware of and accept my responsibilities as Chief Investigator under Clauses 3.11 – 3.13 of the Research Governance Framework and that this investigation cannot proceed before all approvals required have been obtained.

Signature of Chief Investigator

Please also type name here: Prof Benedict Jones

I confirm I have read this application, I am happy that the study is consistent with departmental strategy, that the staff and/or students involved have the appropriate expertise to undertake the study and that adequate arrangements are in place to supervise any students that might be acting as investigators, that the study has access to the resources needed to conduct the proposed research successfully, and that there are no other departmental-specific issues relating to the study of which I am aware.

Signature of Head of Department

Please also type name here

Date: / /

23. Only for University sponsored projects under the remit of the DEC/SEC, with no external funding and no NHS involvement

Head of Department statement on Sponsorship
This application requires the University to sponsor the investigation. This is done by the Head of Department for all DEC applications with exception of those that are externally funded and those which are connected to the NHS (those exceptions should be submitted to R&KES). I am aware of the implications of University sponsorship of the investigation and have assessed this investigation with respect to sponsorship and management risk. As this particular investigation is within the remit of the DEC and has no external funding and no NHS involvement, I agree on behalf of the University that the University is the appropriate sponsor of the investigation and there are no management risks posed by the investigation.

If not applicable, tick here ☐

Signature of Head of Department

Please also type name here

Date: / /

For applications to the University Ethics Committee, the completed form should be sent to ethics@strath.ac.uk with the relevant electronic signatures.

24. Insurance
The questionnaire below must be completed and included in your submission to the UEC/DEC/SEC:

Is the proposed research an investigation or series of investigations conducted on any person for a Medicinal Purpose? Medicinal Purpose means: ▪ treating or preventing disease or diagnosing disease or ▪ ascertaining the existence degree of or extent of a physiological condition or ▪ assisting with or altering in any way the process of conception or ▪ investigating or participating in methods of contraception or ▪ inducing anaesthesia or ▪ otherwise preventing or interfering with the normal operation of a physiological function or ▪ altering the administration of prescribed medication.	NO

If "**Yes**" please go to **Section A (Clinical Trials)** – all questions must be completed
If "**No**" please go to **Section B (Public Liability)** – all questions must be completed

Section A (Clinical Trials)

Does the proposed research involve subjects who are either: i. under the age of 5 years at the time of the trial; ii. known to be pregnant at the time of the trial	Yes / No

*If "**Yes**" the UEC should refer to Finance*

Is the proposed research limited to: iii. Questionnaires, interviews, psychological activity including CBT; iv. Venepuncture (withdrawal of blood); v. Muscle biopsy; vi. Measurements or monitoring of physiological processes including scanning; vii. Collections of body secretions by non-invasive methods; viii. Intake of foods or nutrients or variation of diet (excluding administration of drugs).	Yes / No

*If "**No**" the UEC should refer to Finance*

Will the proposed research take place within the UK?	Yes / No

*If "**No**" the UEC should refer to Finance*

Title of Research		
Chief Investigator		
Sponsoring Organisation		
Does the proposed research involve:		
a)	investigating or participating in methods of contraception?	Yes / No
b)	assisting with or altering the process of conception?	Yes / No
c)	the use of drugs?	Yes / No
d)	the use of surgery (other than biopsy)?	Yes / No
e)	genetic engineering?	Yes / No
f)	participants under 5 years of age(other than activities i-vi above)?	Yes / No
g)	participants known to be pregnant (other than activities i-vi above)?	Yes / No
h)	pharmaceutical product/appliance designed or manufactured by the institution?	Yes / No
i)	work outside the United Kingdom?	Yes / No

If **"YES"** to **any** of the questions a-i please also complete the **Employee Activity Form** (attached).
If **"YES"** to **any** of the questions a-i, and this is a follow-on phase, please provide details of SUSARs on a separate sheet.
*If "**Yes**" to any of the questions a-i then the UEC/DEC/SEC should refer to Finance (insurance-services@strath.ac.uk).*

Section B (Public Liability)		
Does the proposed research involve :		
a)	aircraft or any aerial device	NO
b)	hovercraft or any water borne craft	NO
c)	ionising radiation	NO
d)	asbestos	NO
e)	participants under 5 years of age	NO
f)	participants known to be pregnant	NO
g)	pharmaceutical product/appliance designed or manufactured by the institution?	NO
h)	work outside the United Kingdom?	NO

*If **"YES"** to any of the questions the UEC/DEC/SEC should refer to Finance (insurance-services@strath.ac.uk).*

For NHS applications only - Employee Activity Form

Has NHS Indemnity been provided?	Yes / No
Are Medical Practitioners involved in the project?	Yes / No
If YES, will Medical Practitioners be covered by the MDU or other body?	Yes / No

This section aims to identify the staff involved, their employment contract and the extent of their involvement in the research (in some cases it may be more appropriate to refer to a group of persons rather than individuals).

Chief Investigator		
Name	**Employer**	**NHS Honorary Contract?**
		Yes / No
Others		
Name	**Employer**	**NHS Honorary Contract?**
		Yes / No
		Yes / No
		Yes / No
		Yes / No

Please provide any further relevant information here:

Appendix B

Participant information sheet

Name of department: Department of Psychological and Health Sciences
Title of the study: Facial attractiveness study

Introduction. This project investigates facial attractiveness judgments. The project is being run by Prof Benedict Jones, Mr Jingheng Li, and Dr Victor Shiramizu, Department of Psychological and Health Sciences, University of Strathclyde. Prof Jones can be contacted at benedict.jones@strath.ac.uk if you have any questions or comments on this research.

What is the purpose of this research? The purpose of this research is to investigate factors that may influence facial attractiveness judgments.

Do you have to take part? No, you do not. Participation in the project is voluntary and you are free to stop at any time (e.g., by closing the browser). However, you will only receive payment if you complete the study in full (i.e., complete and submit all parts of the study). You will have the option of skipping questions on the questionnaire parts of the study. Please note that skipping questions on these parts of the study will not affect your payment. Since all data are fully anonymous, you will not be able to request that your data be destroyed.

What will you do in the project? You will be asked to rate the attractiveness of 50 faces using a 1 (much less than average) to 7 (much more than average) scale. You will then be asked to compete a short questionnaire. Participation should take approximately 10 to 15 minutes.

What information is being collected in the project? Only rating data and questionnaire responses will be recorded and these will be fully anonymised.

Who will have access to the information? During data collection and analyses, only the researchers running the project will have access to the data, which will be held on University of Strathclyde secure data servers. When the study is completed, the anonymous data will be made publicly accessible on the Open Science Framework servers. We do this so that other researchers can confirm our results by rerunning the analyses.

Where will the information be stored and how long will it be kept for? During data collection and analyses, data will be stored on a secure server and can be accessed only by the researchers running the project. When the study is completed, the anonymous data will be made publicly accessible on the Open Science Framework servers. We do this so that other researchers can confirm our results by rerunning the analyses. The data will be retained indefinitely.

Thank you for reading this information – please ask any questions if you are unsure about what is written here.

What happens next?
Next you will be invited to consent to take part in the study. If you have any questions you would like answered at this point, please email Prof Ben Jones benedict.jones@strath.ac.uk. If you would prefer not to participate, thank you for your time.

Researcher contact details:
If you have any questions about this study, please email Prof Ben Jones benedict.jones@strath.ac.uk

Chief Investigator details:

Prof Ben Jones benedict.jones@strath.ac.uk and Dr Victor Shiramizu victor.shiramizu@strath.ac.uk

This research was granted ethical approval by the Department of Psychological Sciences and Health Ethics Committee.

If you have any questions/concerns, during or after the research, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:

Department of Psychological Sciences and Health Ethics Committee
University of Strathclyde
Graham Hills Building
50 George Street
Glasgow
G1 1QE

Email: hass-psh-ethics@strath.ac.uk

Appendix C

Consent form

Name of department: Department of Psychological and Health Sciences
Title of the study: Facial attractiveness study

- I confirm that I have read and understood the Participant Information Sheet for the above project and the researcher has answered any queries to my satisfaction.
- I confirm that I have read and understood the Privacy Notice for Participants in Research Projects and understand how my personal information will be used and what will happen to it (i.e. how it will be stored and for how long).
- I understand that my participation is voluntary and that I am free to stop participating in the project at any time, up to the point of completion, without having to give a reason and without any consequences.
- I understand that anonymised data (i.e. data that do not identify me personally) cannot be withdrawn once they have been included in the study.
- I understand that no information that identifies me will be recorded or made publicly available.
- I understand that my anonymous data will be made publicly accessible on the Open Science Framework so that other researchers can confirm the results of this study.
- I consent to being a participant in the project.

CLICK HERE TO CONFIRM THAT YOU CONSENT TO PARTICIPATE IN THIS STUDY

Appendix D

Debriefing sheet

Thank you for participating in this study of facial attractiveness judgments. Here we are investigating factors that influence attractiveness judgments of faces of different ages. Once data collection is completed, we will analyse attractiveness ratings to identify how these judgments are influenced by factors such as the participants' own age. We expect that older participants and participants with older parents or partners will tend to find faces of older people more attractive.

You can contact the researchers here if you have any questions.

Prof Ben Jones benedict.jones@strath.ac.uk and Dr Victor Shiramizu victor.shiramizu@strath.ac.uk.

Department of Psychological Sciences and Health Ethics Committee
University of Strathclyde
Graham Hills Building
40 George Street
Glasgow
G1 1QE