

AKADÉMIAI KIADÓ

# When social status gets in the way of reproduction in modern settings: An evolutionary mismatch perspective

Culture and Evolution

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## ABSTRACT

Low fertility is a growing concern in modern societies. While economic and structural explanations of reproductive hindrances have been informative to some extent, they do not address the fundamental motives that underlie reproductive decisions and are inadequate to explain why East Asian countries, in particular, have such low fertility rates. The current paper advances a novel account of low fertility in modern contexts by describing how modern environments produce a mismatch between our evolved mechanisms and the inputs they were designed to process, leading to preoccupations with social status that get in the way of mating and reproductive outcomes. We also utilize developed East Asian countries as a case study to further highlight how culture may interact with modern features to produce ultralow fertility, sometimes to the extent that people may give up on parenthood or even mating altogether. Through our analysis, we integrate several lines of separate research, elucidate the fundamental dynamics that drive trade-offs between social status and reproductive effort, add to the growing literature on evolutionary mismatch, and provide an improved account of low fertility in modern contexts.

## KEYWORDS

mating, evolutionary mismatch, culture, fertility, social status

The issue of fertility is an increasingly urgent topic for researchers and policymakers. On the one hand, developing nations are experiencing problems with overpopulation, resource scarcity, and unsustainability (Cassils, 2003; Dao & Van, 2020); on the other hand, industrialized nations are experiencing fertility declines that create problems associated with labor shortages and ageing populations (Jarzebski et al., 2021). Among the nations experiencing low birthrates, developed East Asian countries (e.g., Japan, South Korea, Singapore) are the worst hit (Westley, Choe, & Retherford, 2010), with fertility rates as low as 1.10 compared to other developed regions like Western Europe (1.68) and the US (1.84).<sup>1</sup>

Discussions of a “low fertility problem” typically revolve around economic and structural accounts of reproductive hindrances, such as the high cost of raising children (Becker, 1960; Ogawa, Mason, Lee, Tung, & Matsukura, 2015) or the impact of education and employment on women’s preferences for children (Adserà, 2004; Choe & Retherford, 2009). While instructive to some extent, these accounts have fallen short—for instance, they do not explain why people under impoverished circumstances paradoxically have more children (Birdsall & Griffin, 1988; Muhoza, 2019), or why people are not converting their reproductive resources into additional offspring. Evolutionary researchers have taken an interest in addressing this paradox using explanations centered on variations in the adaptive use of resources, such as the greater capacity for the rich to exploit their wealth to increase market participation and

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<sup>1</sup>These fertility estimates were taken from *The World Factbook* compiled by the Central Intelligence Agency (<https://www.cia.gov/the-world-factbook/>).

generate even more resources rather than produce more offspring (Borgerhoff Mulder, 1998), and the degree to which additional investments in resource generation translate into long-term offspring lineage success (Hill & Reeve, 2004). However, absent is a discussion that examines the psychological experience of individuals residing in modern settings whilst accounting for the fundamental motives that underlie reproductive decisions (cf., Kenrick et al., 2002; Yong, Li, Jonason, & Tan, 2019). Moreover, while prior accounts may be useful in explaining the general decline in fertility among developed nations, it remains unclear why East Asian countries have overtaken the developed West in low fertility (Jones, 2007). In light of these issues, we offer an alternative psychological account guided by an evolutionary mismatch perspective for why reproduction may be greatly undermined in modern and some particular cultural contexts.

According to evolutionary theory, all living organisms—including humans—have fundamental goals that must be achieved in order to survive and reproduce. For instance, people evolved to pursue social status given its role in allowing people to exert social influence, acquire resources, attract mates, and ultimately produce and raise offspring (Henrich & Gil-White, 2001; Van Vugt & Tybur, 2015; Yong et al., 2019). Such evolved adaptations as those for status striving, mate selection, and the pursuit of other adaptive goals were shaped and crystallized over the long course of evolutionary history. Although well-designed to solve recurrent problems in the environment of evolutionary adaptedness (Tooby & Cosmides, 1992), these adaptations can become “mismatched” in evolutionarily novel modern settings, leading to unintended and often undesirable consequences (Li, Van Vugt, & Colarelli, 2018). The current paper utilizes this perspective to discuss how modern contexts produce obsessions with social status that come at the cost of mating and reproductive outcomes (e.g., dating, marrying, having children) and extends this discussion to developed East Asian countries, who are the front runners in ultralow fertility today.

## SOCIAL STATUS AS AN ADAPTIVE GOAL

All living organisms descended from evolutionary ancestors who found ways to overcome recurring obstacles to survival and reproduction. In turn, overcoming these challenges constitutes the fundamental goals that humans and other species must accomplish in order to gain a fitness edge, and those that were better adapted to do so could pass on their genes to succeeding generations (see Kenrick et al., 2002 for a review of fundamental goals relevant to humans). In a group-living species like ours, social status is a fundamental goal given the role of status hierarchies in regulating group behavior, and having social status is vital in allowing individuals to exert influence on other conspecifics and gain access to resources and extended social alliances (Van Vugt & Tybur, 2015). As social status signals the formidability of

an individual, people also give serious consideration to the social status of others before interacting with them (Durkee, Goetz, & Lukaszewski, 2018). In particular, people typically respond to higher status individuals with respect and deference rather than antagonism (Henrich & Gil-White, 2001), and those with higher status are seen as attractive allies or mates (von Rueden, Gurven, & Kaplan, 2011). The fitness costs and benefits of having low versus high status thus selected for adaptations to manage social status, such as attention toward cues of dominance, confidence, and prestige (Gutierrez, Kenrick, & Partch, 1999; Li, Yong, Tsai, et al., 2020), self-evaluations of one’s position in the status hierarchy (Van Vugt & Tybur, 2015), and motivations to maintain a decent standing relative to others (von Rueden, Redhead, O’Gorman, Kaplan, & Gurven, 2019).

Social status also has important implications for mating and reproductive outcomes because it is a desired trait in romantic partners (Li, Bailey, Kenrick, & Linsenmeier, 2002; Townsend, 1993). A well-established finding is the strong preference that women have for social status in prospective mates (Buss & Schmitt, 1993; Li et al., 2013; Yong, Tan, Li, & Meltzer, 2022). Sociocultural models suggest that patriarchal systems cause women to depend on men for access to resources that are institutionally beyond their reach (Zentner & Eagly, 2015), while evolutionary models suggest that reproductive processes (e.g., pregnancy, childbirth, child-rearing) render women highly vulnerable and thus in need of men’s protection and resource-provisioning abilities (Buss & Schmitt, 1993). These obstacles to obtaining resources drive women’s mate preference for social status as higher status individuals are better positioned to get what they want (Van Vugt & Tybur, 2015). In turn, this female preference dovetails men’s awareness of the need to have social status in order to compete for mates (Li, 2007). At the same time, research has shown that men’s reproductive outcomes can also improve when they pair up with higher status women (von Rueden & Jaeggi, 2016). For instance, the children of higher status parents have lower rates of mortality, healthier psychosocial functioning, and better social competitiveness later in life (Henz, 2019; Kaplan, Lancaster, & Anderson, 1998). As such, men may also value social status in their partners, particularly among men with higher mate value (Edlund & Sagarin, 2010) as well as men who reside in societies with high levels of social class homogeneity (Huber & Fieder, 2011; Kalmjin, 1998) and preoccupations with social status (Yong et al., 2022).

Importantly, the mate preference priority model (Li et al., 2002) stresses that people generally seek mates and allies who have at least a moderate level of evolutionarily critical traits (e.g., social status, physical attractiveness; Cottrell, Neuberg, & Li, 2007; Lewis, Al-Shawaf, Conroy-Beam, Asao, & Buss, 2012), as individuals on the low end of such traits were likely to have been survival and reproductive dead ends in ancestral times. Thus, given the disadvantages of having low social status, status sensitivities evolved to ensure that people sought sufficient levels of social status that would allow for optimal participation in groups and success in mating and reproduction.



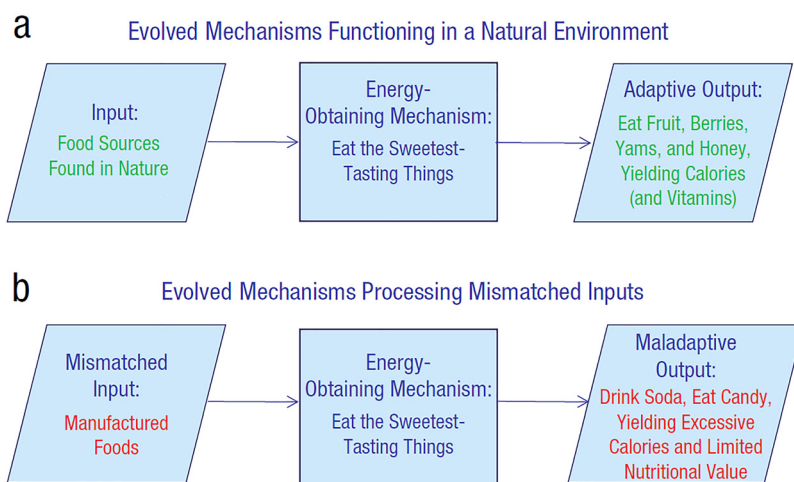
## THE EVOLUTIONARY MISMATCH

The evolutionary mismatch perspective offers insights into how people’s adaptations to pursue social status can lead to reduced fertility (Li & Manesi, 2017; Li et al., 2018). From an evolutionary viewpoint, the traits of a species reflect adaptations that evolved to facilitate the pursuit of survival and reproductive goals for the individuals of those species (Tooby & Cosmides, 1992). For instance, because moths and certain flies are nocturnal and must find ways to navigate in poor visual conditions, this recurring problem selected for the ability to utilize distant light sources such as the moon to travel in a particular direction (Warrant & Dacke, 2016). This logic can be similarly applied to illuminate the evolved traits of humans and the ancestral conditions that gave rise to them. For example, the presence of callus-producing mechanisms in our skin reveals that our ancestors had to deal repeatedly with friction, and our strong desires for sugar, fat, and protein suggest that calorie-rich food sources such as ripe fruits and meat were both valuable and scarce in ancestral environments. However, there are conditions under which initially adaptive mechanisms become counter-productive. With the invention of light bulbs just over a century ago, moths and flies now find themselves problematically drawn to light sources other than the moon, and with the mass production of processed foods containing large amounts of sugar and calories, people’s diets now lead to unprecedented levels of health disease such as obesity and diabetes (Gluckman & Hanson, 2006). This phenomenon, which is referred to as evolutionary mismatch, shows that adaptive mechanisms once designed to be functional in ancestral environments are poorly suited to process unfamiliar elements in evolutionarily novel contexts (Li et al., 2018; see Fig. 1).

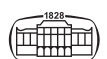
As descendants of the great apes, humans inherited a variety of adaptive traits including complex hands with opposable thumbs and long fingers, the ability to see colors,

and large brains in relation to body size (Roberts, 2011). Many other adaptive traits of modern humans, however, evolved during the past 200,000 years where humans mostly lived on the African savanna as hunter-gatherers in small, egalitarian, and nomadic kin-based tribes (von Rueden, 2020; Woodburn, 1982). As such, our adaptations tend to be suited specifically to such conditions. For example, because ancestral tribes comprised up to approximately 150 mostly related individuals, humans have evolved to handle a limited number of relationships, which is reflected in having a neocortex size that is optimized to process and maintain a social network of up to 150 people (Dunbar, 1992). Reflecting these constraints, a study of people’s online social media networks found that only 100-200 acquaintances were considered close or genuine, despite the allowance for much larger numbers of acquaintances on social networking sites (Dunbar, 2016).

There are at least two other features of our tribal past that influence human social psychology today. Because of the small size of tribal populations, any one person was at most three degrees of separation away from anybody else (Christakis & Fowler, 2009). Thus, events experienced by anybody (or any social information at all) in an ancestral village were likely to be self-relevant and important, and hence we evolved to be sensitive to information about ourselves and others (e.g., gossip, social comparisons) and take much of it seriously (Yong & Li, 2018). Furthermore, the egalitarian nature of ancestral societies meant that possessing a moderate amount of social status was likely sufficient to support one’s needs (Woodburn, 1982), and social monitoring mechanisms to regulate behavior and manage social status were primarily aimed at ensuring one’s social inclusionary status through being a valuable group member while avoiding behaviors that risked social disapproval (Leary, 2005; Lim & Yong, 2019). These various adaptive mechanisms worked in concert to improve individual survival within a tribe while maintaining the integrity of tribal societies and facilitating cooperation within the population.



**Fig. 1.** Schematic showing (a) how an evolved mechanism functions adaptively in natural or evolutionarily conducive settings and (b) how the same mechanism functions maladaptively in modern or evolutionarily novel settings (adapted from Li et al., 2018)



However, the world we now live in is substantially different due to lifestyle and technological changes brought about by major revolutions such as agriculture (~12,000 years ago), industry (~260 years ago), and information technology (~50 years ago). An increasing number of people reside in urban cities comprising hundreds of thousands of unrelated individuals, have abundant access to vital resources such as food and welfare, and use tools that allow for interactions with an unprecedented number of individuals at the click of a mouse. These changes have occurred too rapidly for our evolved mechanisms to keep up, resulting in a mismatch between our once-adaptive mechanisms and the evolutionarily novel inputs of modern settings (Gluckman & Hanson, 2006; Li et al., 2018). Today, the drive for social status—originally designed to improve survival and mating success—may ironically divert individuals from reproductively conducive behavior. We focus on three evolutionary mismatch considerations that are pertinent to how our social status motives may be excessively activated in modern contexts at the expense of fertility.

### Social status disparities

Anthropological studies suggest that the small, egalitarian, and roving bands in which people lived for the vast majority of human existence were characterized by resource scarcity, demand-sharing practices (the social norm by which individuals possessing highly coveted resources (e.g., meat) must share them with fellow group members), a lack of means for resource storage, and intolerance toward hoarding, arrogance, or aggrandizing behavior (Boehm, 1999; Lewis, Vinicius, Strods, Mace, & Migliano, 2014; Peterson, 1993). As these features hindered individuals from accumulating resources, people could only gain a higher social standing on the basis of factors like age and capabilities, rather than by having more resources and transmissible wealth (Lee, 1979; von Rueden, Gurven, Kaplan, & Stieglitz, 2014).

Nevertheless, social status concerns still played a significant role despite these egalitarian and resource-scarce circumstances. As social status in hunter-gatherer societies was linked with one's useful contributions to the group (e.g., being capable, knowledgeable, helpful), preoccupations with social status pertained to being mindful of one's value to society and motivated prosocial and cooperative actions (Woodburn, 1982). Coupled with the importance of social status as a determinant of social acceptability and reproductive outcomes (Van Vugt & Tybur, 2015), people living in hunter-gatherer societies were careful to avoid having low social status and sought to be at least on par with their peers. As such, social monitoring adaptations functioned well in ancestral settings because they helped to regulate attention (e.g., social comparisons), feelings (e.g., social status anxiety), and behaviors (e.g., self-enhancement) so as to maintain optimal social standing (Habermacher, 2015; Pickett & Gardner, 2005), which is achievable when social status gaps are not so large that they cannot be closed. In addition, given the generally low levels of social inequality in hunter-

gatherer societies, concerns about social status were moderate and, thus, not such a major preoccupation that they would excessively interfere with other aspects of daily life and functioning (Woodburn, 1982). Lastly, as hunter-gatherer populations were small and family-based, people typically knew almost everyone else in the tribe, so it was not only possible to gain a firm sense of one's social status relative to others, but also unnecessary (or even distasteful) to compete fiercely with related kin for social status (Boehm, 1999).

In modern settings, however, social status disparities are stark. Modern ways of living were preceded by the advent of agriculture when humans began switching from a nomadic, hunter-gatherer lifestyle to sedentary living, pastoralism, and the cultivation of personal food sources (Barker, 2006). This change enabled humans to not only overcome food shortages but also accumulate resources, thereby allowing populations and economies to expand (Biraben, 2003; Gowdy & Krall, 2014). In addition, people started becoming specialized within particular economic niches and could monopolize the supply and provision of resources within those niches. This new capacity for humans to distinguish themselves on the basis of accumulated resources heralded the levels of social stratification and inequality we now observe and allowed individuals with more resources to exploit further opportunities and achieve ever higher levels of social status (Price, 1995). Today, a high-status person like Elon Musk can have over 2 million times the net worth of the median American household, while it is not uncommon for CEOs to make between 300 and 1,000 times what their workers do (Leder, 2021; Mischel & Davis, 2015).

The growing divide between individuals with lower versus higher social standing in modern contexts can heighten the importance that people place on social status (Li, Yong, & Van Vugt, 2020; Yong et al., 2019). According to the status anxiety hypothesis, high social inequality causes people to feel threatened about and pay more attention to their position in the social hierarchy (e.g., Kraus, Park, & Tan, 2017; Wilkinson & Pickett, 2009). For instance, individuals living in highly unequal countries tend to be worried that others will look down on them because of their job or income (Layte & Whelan, 2014; Paskov, Gërkhani, & Van de Werfhorst, 2013), and they are more likely to measure their self-worth in terms of financial wealth (Walasek & Brown, 2019) and have a greater interest in material goods that serve to signal high social status (Frank, 1999; Walasek & Brown, 2015; Walasek, Bhatia, & Brown, 2018).

An important psychological factor that exacerbates the impact of social status disparities is that people's perceptions of status derive from relative standings between individuals rather than absolute values (Frank, 1999; Mattan, Kubota, & Cloutier, 2017). For example, a person with an annual salary of \$30,000 in a society where the average is \$10,000 would have a higher standing relative to others in that society, whereas a person with an annual salary of \$50,000 when the average is \$70,000 would have a lower standing, despite the former's \$30,000 being objectively less than the latter's \$50,000. Because "success in evolution is always relative



(a gene must do better than alternative alleles to spread)”, humans evolved to gauge their social status from how they fare against others rather than from how much they actually have (Griskevicius, Cantú, & Van Vugt, 2012, p. 120). Therefore, people can ironically perceive themselves as not having enough despite the abundance of goods, services, and welfare provisions in developed modern environments (Wilkinson & Pickett, 2009). As people respond to the pressure to keep up by focusing on finding better jobs, making more money, and displaying social status through wealth and material possessions, these preoccupations can overshadow other important pursuits, such as the maintenance of social and romantic relationships (Li, Patel, Balliet, Tov, & Scollon, 2011; Yong et al., 2019).

### Social comparisons

Modern environments also intensify people’s social comparison behaviors. As a gregarious species, humans evolved to be concerned about their worth as group members and rely on comparisons with others as diagnostic of their social value (Beach & Tesser, 2000). This self-evaluative mechanism allowed people to appraise whether they should work on improving their capabilities or increase their contributions to the group, thereby ensuring that people acted in ways to maintain optimal levels of social value (Hill & Buss, 2007), enhance their desirability as social allies or romantic partners (Gilbert, Price, & Allan, 1995), and avoid being excluded (Leary, 2005). But while a person in an ancestral village setting would have had to compare with only up to about 150 closely related individuals, modern urban dwellers can meet, interact, and compare with an unprecedented number of unrelated individuals.

Consequently, modern contexts comprising urban cities filled with diverse individuals bombard our social comparison mechanisms with more perceived persons than our psychology has evolved to process (Dunbar, 1992). Research has shown that when others are seen as a threat to self-evaluations, people pay more attention to them and experience the urge to behave in ways that make up for their self-perceived inadequacies (Garcia, Tor, & Schiff, 2013; Muller & Butera, 2007). Densely populated modern cities have no shortage of individuals who can provoke such reactions—there will always be some folks who are richer, more educated, better looking, or have nicer houses or more prestigious careers. Chronic exposure to such individuals in modern environments has been found to be associated with higher levels of perceived competition, status anxiety (Frank, 1985, 1999), and status-seeking behaviors such as wealth displays (Frank, 1999), competitiveness (Garcia et al., 2013), and compensatory prosociality (Telle & Pfister, 2016; Van Lange, 2008).

Moreover, mass media such as television and communication technologies like social media and online networking sites (e.g., Facebook, Instagram, TikTok) prompt greater awareness of the presence of people beyond one’s immediate community (Suvorov, 2021; Yong, Li, Valentine, & Smith, 2017), thus expanding the range of individuals that

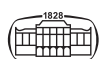
people may attend to and care about. As social media users often carefully select and curate the things they upload on social media platforms, social media usually portrays only the most perfect aspects of people’s lives, such as flattering photographs, fun holidays, and work successes (Siibak, 2009), causing avid social media users to experience envy and dissatisfaction with their own lives (Yong & Li, 2018). These various factors pressure those living in modern environments to enter into a rat race to “keep up with the Joneses” (Frank, 1985), which may leave little time and energy for other pursuits that are critical to fertility, such as pursuing romantic relationships or starting a family.

### Life history strategies

Life history theory offers another angle to understand how modern settings may reduce fertility through trade-offs between pursuing social status or reproduction (Ellis, Figueredo, Brumbach, & Schlomer, 2009; MacArthur & Wilson, 1967). According to the theory, all living organisms must budget their finite time, energy, and resources between somatic effort (i.e., maintenance and growth) and reproductive effort (i.e., mate seeking and reproduction). Although the satisfaction of each of these distinct motives carries fitness benefits, they often come at the expense of one another. For example, time spent pursuing mates cannot be used to search for food or develop one’s capabilities. Therefore, organisms must prioritize their energetic investments according to whether mating and having offspring sooner or later would be more adaptive. This prioritization, termed life history strategy, can be understood as a trade-off in faster versus slower reproduction and has implications for how soon an individual sexually matures and has their first child, as well as how many children they will have and the quality of parenting those children will receive (Del Giudice, Gangestad, & Kaplan, 2015; Ellis et al., 2009; Figueredo et al., 2006).<sup>2</sup> We consider two ways by which modern settings lead to reduced fertility due to excessive prioritization of somatic effort through social status pursuit.

**Crowdedness and resource competition.** A resource competition view of life history (MacArthur & Wilson, 1967) posits that when there is little competition for resources, organisms will adopt a fast, quantity-driven strategy (e.g., having more offspring sooner) to quickly exploit

<sup>2</sup>It is important to note that the application of life history theory to human psychology and behavior is currently debated (e.g., Sear, 2020). Critiques have argued that psychology researchers have deviated significantly from the theory’s biological foundations and are overly liberal in their predictions of psychological outcomes from the theory. Nevertheless, psychosocial applications of life history theory have received some empirical support (e.g., Griskevicius et al., 2013; Rotella et al., 2021; Sng et al., 2017; Tan et al., 2022; Yong et al., 2019), and some scholars suggest that the theory is in a validation phase where further research will likely clarify rather than eliminate it as a psychological framework (see, for example, the “LHT-P” model proposed by Nettle & Frankenhuys, 2020). As such, life history theory still has the potential to offer insights for the current paper’s discussion on social status and fertility, and future work through this perspective promises to contribute to this important validation effort.



available resources. Conversely, in environments where inhabitants must grapple for limited resources, less competitive individuals will be unable to acquire the resources needed for immediate survival and subsequent reproduction. Hence, the inhabitants of highly competitive environments are predicted to adopt a slower approach by delaying reproduction and focusing on building the capacities needed to compete for resources and opportunities (e.g., developing competencies and achieving social status).

The expansion of populations in urban cities produces high levels of crowdedness that signal a large number of competitors, thus compelling resident organisms to hold off on reproductive effort and focus on competition instead. An investigation that compared between countries (Study 1) and between states in the US (Study 2) showed that as population density increased, people exhibited slower life history strategies: they were more likely to plan for the future, have children later and in lower quantities, and invest heavily in their children (Sng, Neuberg, Varnum, & Kenrick, 2017). The researchers also found that participants exposed to crowdedness stimuli were more likely to prefer delayed but larger rewards relative to participants who were not exposed to any such stimuli, suggesting that elevated orientation toward the future is how population density slows reproduction and restricts fertility. Importantly, having social status and resources may enable individuals to be less affected by the fertility-reducing impact of crowdedness and competition. A large cross-national study found that income, which is an established proxy for social status (Barone, Hertel, & Smallenbroek, 2022), moderated the relationship between crowdedness and low fertility such that the poor had increasingly less children than the rich as population density increased, and these patterns were more pronounced for men than for women (Yong, Lim, & Jonason, submitted for publication). These findings suggest that evolutionarily unfamiliar levels of crowdedness can intensify people's concerns with the ability to acquire resources and focus on competition, particularly for men with fewer resources, resulting in delayed reproduction and reduced fertility.

**Safety and stability.** From a developmental perspective, organisms evolved to assess their long-term survival prospects based on their post-natal and subsequent juvenile circumstances (Ellis et al., 2009; Figueredo et al., 2006). People who grew up in harsh or unstable (i.e., desperation) environments calibrate their survival expectancies to be in line with a shorter time horizon such that, given the uncertainty of the future, having the impulse to consume available resources or seize immediate opportunities will be more adaptive, whereas people who grew up in safe or predictable (i.e., hopeful) environments align with a longer time horizon where growth and patient self-investments will likely pay off in reproductive terms later (Griskevicius et al., 2013).

In general, humans are slow strategists when compared with other species, but considerable variation exists within human populations. Desperation environments tend to correlate with increased fertility and reproductive rates, indicating that environmental harshness compels inhabitants

to focus less on somatic effort (e.g., status-striving) and more on immediate reproduction. Indeed, fertility varies as a function of environmental harshness as indexed by GDP (Weil, 2004), economic development (Hafner & Mayer-Foulkes, 2013), pathogen prevalence (Rotella, Varnum, Sng, & Grossmann, 2021), violent crime rates (Griskevicius, Delton, Robertson, & Tybur, 2011; Rotella et al., 2021), and mortality risk (Wilson & Daly, 1997), with populations exhibiting lower fertility as harshness decreases. As modern environments are more developed and possess abundant resources, social welfare, and stable infrastructure—all of which reduce environmental harshness and mortality risk—people may focus more on quality by building their individual capacities and producing fewer children in whom they invest greater time and resources (Borgerhoff Mulder, 1998).

Importantly, studies have shown that the distinct strategies calibrated by childhood environments may prompt divergent behavioral responses to stressors and challenges encountered in adulthood. For example, a set of experiments revealed that participants who grew up in poorer and harsher environments responded to cues of resource scarcity by discounting the future, becoming more impulsive, and engaging in riskier behaviors, whereas participants who grew up in safer and wealthier environments responded to the same cues by slowing down and becoming more cautious (Griskevicius et al., 2013). Similar outcomes were found when people were exposed to cues denoting economic uncertainty (Mittal & Griskevicius, 2014) and mortality (Griskevicius, Tybur, Delton, & Robertson, 2011). Extending these trends in fast versus slow strategies to reproductive behavior, a recent experimental study found that exposure to economic uncertainty led individuals with lower childhood socioeconomic status to prefer having children earlier, whereas those with higher childhood socioeconomic status responded by preferring children later (Tan et al., 2022). Such reactions and preferences are adaptive because in ancestral times, resource scarcity and other stressors were life threatening in poor and harsh environments but constituted problems that could be solved over time in abundant and predictable environments. Moreover, in ancestral times, the harshness and predictability of a local environment likely did not change much from childhood to adulthood; thus, it was adaptive to respond to environments faced in adulthood based on conditions experienced and strategies set forth during childhood. As such, the evolutionarily novel modern day, which presents unprecedented levels of safety and resources, may cultivate populations of slow strategists who react to the stress of increasing social status disparities and competition by grinding their reproductive life to a perpetual halt.

## THE DEVELOPED EAST ASIAN COUNTRY CASE STUDY

The evidence reviewed so far suggests that modern factors may produce inputs that are mismatched from those that



our adaptive mechanisms evolved to process, leading to an excessive prioritization of social status pursuit which then curtails reproduction. As such, the evolutionary mismatch perspective presents a viable yet underexplored approach to understanding why modernized societies—with their high levels of economic advancement, competition, urbanization, and crowdedness—experience low fertility.

Developed East Asian countries afford a means to further elucidate the aforementioned propositions of evolutionary mismatch. The East Asian cultural sphere is defined by reference to a category of regions, countries, and groups that were historically derived from and influenced by the Confucian philosophy and culture of ancient China (Reischauer & Fairbank, 1960), and today's developed countries with predominantly East Asian populations include Japan, South Korea, Hong Kong, Singapore, Taiwan, and China.<sup>3</sup> East Asian countries sustained high birth rates and large family units up until the mid-20th century while the West began economically developing and experiencing marriage and birth rate declines earlier. Declining fertility in the East Asian region was first observed in Japan as the birth rate dropped from 4.54 in 1947 to 2.04 in 1957 (Retherford & Ogawa, 2006). This decline to replacement-level fertility (~2.1 children per woman) then began approximately two decades later for three other East Asian countries: in 1960, Singaporean, South Korean, and Taiwanese women were still having roughly six children each on average, but birth rates dropped to 2.1 children per woman in 1975 in Singapore, 1983 in South Korea, and 1984 in Taiwan (Westley et al., 2010). Some observers initially regarded these trends as simply reflecting a “convergence to the West” (cf., Jones, 2007, p. 458), but developed East Asian countries have now overtaken the West and have the lowest birth rates compared to other developed nations (Yong et al., 2019).

The evolutionary mismatch perspective allows us to identify aspects of East Asian culture that may interact with features of the modern environment to exacerbate mismatch, thereby offering a unique and potentially improved explanation for why developed East Asian countries have levels of low fertility that are more extreme than that of the developed West. It is important to note that we are not looking for convenient features of East Asian culture to blame for poor reproductive outcomes, but rather find it informative to consider how cultural characteristics play a role in magnifying social status preoccupations while sidelining reproduction. Through this analysis, we strengthen the case for the evolutionary mismatch perspective as an account of low fertility and highlight areas that should be considered to manage reproductive rates in modern East Asian societies, as well as other societies that may be increasingly following suit.

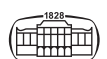
<sup>3</sup>China's contribution to low fertility is mainly constrained to the more developed Eastern region which includes cities such as Shanghai, Beijing, and Guangzhou. On that note, other Asian countries such as Malaysia and Indonesia follow similar patterns as low fertility is exhibited primarily within the ethnically Chinese segment of the population (e.g., Peng, 2020; Wu & Jia, 1992).

## Slow life history

Studies suggest cultural variations in life history strategy with East Asians on the slower end. For example, East Asians exhibit longer temporal orientation (Gao, 2016) as well as greater risk aversion (Guo, Chen, & Liu, 2022; Oppen, Nee, & Holm, 2016), self-restraint (Markus & Kitayama, 1991), sexual conservativeness (Ahrold & Meston, 2008), and parental investment (Sun, 1998) relative to individuals from other cultural groups. As slow strategists have been shown to respond to stressors by acting in ways that are associated with somatic effort and delayed reproduction (e.g., Griskevicius et al., 2011b, 2013; Tan et al., 2022), East Asian individuals may correspondingly exhibit increased concerns with social status while putting off reproduction as they experience economic uncertainty and competitive stress in modern settings.

Various sources of data indeed reveal that East Asians are more likely to value and strive for markers of social status like education, career, and wealth compared to individuals from other cultures. The 2012 *Pew Research Report*, for example, noted that Americans of Asian descent have the highest levels of income (US\$66,000 compared to the national median of US\$49,800) and education (49% with a bachelor's degree or higher among those aged 25 and older versus 28% in the overall population) and place more value on hard work and career success than Americans of other ethnicities do. A meta-analysis also found that the positive correlation between self-esteem and socioeconomic status was strongest among Asians and Asian Americans (Twenge & Campbell, 2002). Trends in other developed East Asian regions indicate an increasing importance paid to these success markers amidst rising competition in society. For instance, the phenomenon of “education fever” has gripped South Korea as people invest large amounts of time and money to ensure enrolment into top universities, with the ultimate aim of improving their odds of getting into top jobs (Anderson & Kohler, 2013). Although education as a means to achieve social status and economic prosperity is generally regarded as important in Asian culture (Seth, 2002), obsessive concerns with educational and career achievement are increasingly prevalent in developed East Asian countries (Beach, 2011; Mok & Jiang, 2017; Nakamura, 2003) and have been argued to be a symptom of the broader problem of “competitiveness fever” in modern East Asian societies (Anderson & Kohler, 2013).<sup>4</sup> Mirroring these trends, studies

<sup>4</sup>Recognizing the societal problems associated with the obsession over education and social status, China's state council prohibited for-profit companies from tutoring core curriculum subjects (as well as foreign investment in such companies) to remove the academic edge that the children of richer families can gain from private tuition (Davidson, 2021). This implementation was part of a broader move in 2021 to achieve “Common Prosperity” in response to China's widening wealth gap, which President Xi Jinping explained would “reasonably regulate excessively high incomes, and encourage high-income people and enterprises to return more to society” (cited in Koty, 2022). The move has led to the emergence of a black market, however, as the demand for ways to achieve a competitive advantage is not quelled and Chinese parents turn to illegal underground tutors instead (Yan, 2021).



have found that East Asians value social status and financial prospects in potential mates more highly than the earlier mate preference research using Western samples had predicted (Chang, Wang, Shackelford, & Buss, 2011; Li, Valentine, & Patel, 2011; Thomas et al., 2020; Yong et al., 2022).

These preoccupations with social status reflect a slow life history strategy as East Asians prioritize building individual capacities and competitiveness at the expense of reproduction and fertility. In particular, competitiveness fever in South Korea and other developed East Asian countries has been shown to underlie the postponement of marriage and childbearing as people opt to concentrate on education and employment first (Anderson & Kohler, 2013). The mean age of first marriage has risen across the region over the last two decades, and given the tight link between marriage and childbearing because few children are born out of wedlock in Asian societies, the age at first birth has also shifted in line with the age at first marriage (Suzuki, 2003). This trend is significantly driven by East Asian women who now study longer, enter the labor force at later ages, and invest more time in their work to improve their chances of reemployment after raising children (Choe & Retherford, 2009). As modern East Asian women have greater freedom to work and be financially independent, many also no longer experience the pressure their predecessors did to rush into marriage. The high cost of raising competitive children in status-driven societies also plays a significant role as East Asian individuals switch to a quality-over-quantity mindset, as is reflected in the rise of single- or two-child families (Anderson & Kohler, 2013; Ogawa et al., 2015).

When driven to the extreme, East Asians may even completely forgo mating by remaining single and childless (Chang, 2014; Cheng, 2020; Raymo, Park, Xie, & Yeung, 2015). East Asian individuals increasingly report being too busy to socialize, comfortable with singlehood, and disinterested in dating (Ghaznavi et al., 2020; Pei & Ho, 2009; Wang & Jiang, 2016). Neologisms such as the “Sampo” in South Korea and “Satori” in Japan have been coined to refer to an emerging generation of young adults who have given up on courtship, marriage, and having children because of socioeconomic factors such as rising living costs, scarcity of affordable housing, and the desire to pursue one’s career, hobbies, or other personal interests free of pressure from society (Gietel-Basten, 2019; Lim, 2021). Given the limited fertility timespans of women, these trends are particularly likely to result in permanent childlessness for women relative to men (Brinton & Oh, 2019; Cheng, 2020). In sum, East Asian individuals respond to the competitive and economic challenges wrought by modern environments in ways that are consistent with a slow life history strategy—by increasing somatic effort via social status pursuits (i.e., education, careers, and income) while delaying or forgoing mating opportunities or having less children, thereby contributing to ultralow fertility in developed East Asian countries.

### Endowed social status

It is well-documented that because East Asian cultures are collectivistic and value relational harmony, socially

disruptive or antagonistic actions are frowned upon (Kim & Pettit, 2019; Markus & Kitayama, 1991). To reduce conflict and determine who should get the right of way under such tight conditions, East Asian societies rely heavily on endowed social status, or social status conferred through formal means such as educational qualifications and occupational rank (Yong et al., 2019). This approach to determining social status stands in contrast to the less formal approaches (e.g., dominance, charisma, popularity) that individualistic cultures tend to be more accommodating of, but which carry a greater degree of ambiguity and potential for conflict over the legitimacy of status (Kim & Pettit, 2019; Kuwabara, Yu, Lee, & Galinsky, 2016). Charisma, for instance, is subjectively perceived, while dominance as a pathway to social status promotes the emergence of “might is right” norms and encourages individuals to gain influence through socially disruptive means such as physical coercion (Winegard, Winegard, & Geary, 2014). In contrast, an official certification of competence is widely recognized, easily validated, and allows for less ambiguous assessments of a person’s capabilities (Curhan et al., 2014), thus facilitating social mobility without upsetting the social order in tight and hierarchical societies. The drive for endowed social status is also fostered through East Asian values like Confucianism, which emphasizes the virtues of education, social stratification, and respect for authority (Tu, 1996), as well as the importance of having “face”, which is represented through the honor or respect gained from being well-regarded and looked up to by others (Gao, 1998).

While endowed social status serves an important function in preserving social order, the need to achieve endowed social status can intensify the obsession with furthering education, building careers, and accumulating wealth. Cross-cultural studies have noted that, in comparison with individuals from other cultures, East Asians have higher expectations for academic performance (Sue & Okazaki, 1990; Sun, 1998) and place greater emphasis on financial and achievement aspects when pursuing a career or business (Begley & Tan, 2001; Kim, Li, & Ng, 2005). The desire for endowed social status through educational credentials contributes to “degree inflation” in developed East Asian countries (Jung, 2020; Peng, Lin Lin, & Lin, 2022). When not all individuals gain a high school education, completing high school becomes a status marker, but when all individuals gain a high school education, it becomes necessary to achieve a higher level of education to attain status, and so on. As degree inflation has led to university degrees being common in developed East Asian societies, East Asian individuals have had to work harder to attain status through further education and ensure that their own children do the same.

The need to gain social status through well-paying, prestigious occupations also drives East Asian individuals to avoid jobs that are associated with low status. Research has shown, for example, that Singaporeans tend to shun jobs like nursing because they are perceived to be lower in prestige (Liaw et al., 2016), despite such jobs being important in society. The acute aversion toward low prestige further





depresses the status perceptions of less prestigious jobs in East Asian societies. For example, one study found strong cross-cultural agreement for high prestige jobs (e.g., judges, doctors) whereas jobs with ambiguous prestige (e.g., physiotherapists) were rated more poorly by Korean and Hong Kong participants relative to British and Australian participants (Turner & Whitfield, 2006). As people increasingly flock to higher status jobs, this strong demand causes such jobs to become more difficult to attain and reduces the perceived availability of acceptable occupations in society (Yong et al., 2019; see Fig. 2). By contrast, in countries that value endowed social status less, citizens perceive a wider availability of acceptable occupational niches from which they can gain income and social status.

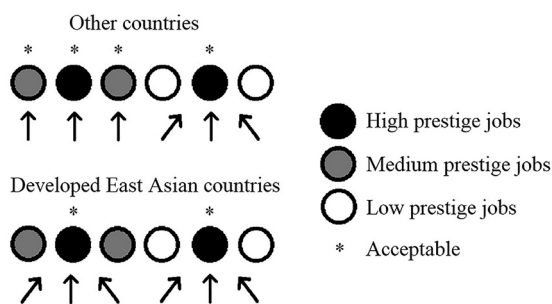
As people become overly concerned with educational and career prestige under the competitive dynamics of the desire for endowed social status, their reproductive motivations can weaken. A study that compared between participants from Singapore and urban regions of Australia (Sydney and Melbourne) found that Singaporeans generally perceived the available jobs in society to be lower in prestige relative to Australians, and this difference was associated with Singaporeans having less desire for marriage and wanting fewer children (Yong et al., 2019). These outcomes also reflect a resource competition-driven slow life history strategy as people put off reproductive effort to focus on building social status through competition for scarce occupational niches (Sng, Neuberg, Varnum, & Kenrick, 2018). The need for social status under such conditions has additionally been shown to be more detrimental to men’s (versus women’s) optimism toward dating and marrying given the significant implications of social status for men’s mating desirability (Yong et al., 2019). Lastly, as the processes to attain endowed social status typically require heavy investments in time (e.g., furthering one’s education and rising the ranks in one’s occupation), the pursuit of such forms of social status directly undermines fertility as people often find themselves much older by the time they are finally ready to

marry and start a family (Choe & Retherford, 2009; Suzuki, 2003).

**Materialism**

Another offshoot of the obsession with unambiguous proxies of social status is materialism, where social status is conveyed via the ability to purchase and display costly material goods and possessions (Li, Patel, et al., 2011, 2015; Richins & Dawson, 1992). The possession of material goods, in particular expensive brands and luxury products, functions as a strong indicator of socioeconomic standing because of its role in costly signaling and conspicuous consumption—only those who can afford it can do so (Goldsmith & Clark, 2012; Han, Nunes, & Drèze, 2010). Materialistic individuals often become fixated on investing time and effort to acquire costly luxury goods while neglecting other important goals like the development of close interpersonal relationships (Burroughs & Rindfleisch, 2002; Kasser, Ryan, Couchman, & Sheldon, 2004). Studies have shown that people who endorse materialistic attitudes tend to devalue relational warmth (Richins & Dawson, 1992), regard social relationships as less important (Burroughs & Rindfleisch, 2002), and experience less satisfaction with family life (Nickerson, Schwarz, Diener, & Kahneman, 2003). In romantic and marriage contexts, more materialistic individuals report higher levels of conflict with romantic partners (Kasser & Ryan, 2001), poorer marital outcomes (Carroll, Dean, Call, & Busby, 2011; Dean, Carroll, & Yang, 2007), less positive attitudes toward marriage and parenthood (Li, Patel, et al., 2011), and more regret having had children (Groat, Giordano, Cernkovich, Pugh, & Swinford, 1997) than less materialistic individuals do. Materialism can also impair reproduction as childlessness has been noted to be higher among materialistic than non-materialistic men (Claxton, Murray, & Janda, 1995). Extending the negative link between materialism and desire for marriage and children, an experimental study demonstrated that participants who imagined themselves shopping for luxury items along a high-end fashion street (as opposed to taking a stroll in a local park or frantically looking for a set of keys) reported increased endorsement of materialistic values, which then led to more negative attitudes toward marriage and having children as well as a preference for fewer children (Li, Lim, Tsai, & O, 2015).

As widely recognized, expensive material possessions serve as clear and unambiguous signals of social status, materialism is especially pronounced in developed East Asian countries (Croll, 2006; Podoshen, Li, & Zhang, 2011). East Asian consumers are significant contributors to the 80-billion-dollar luxury industry, accounting for more than half of the market and exceeding the US and Europe combined (Chadha & Husband, 2007). Empirical research has also confirmed higher levels of materialistic attitudes and behaviors in East Asian countries (e.g., Singapore, Japan, China) relative to other countries (Eastman, Fredenberger, Campbell, & Calvert, 1997; Li, Patel, et al., 2011; Podoshen et al., 2011; Schaefer, Hermans, & Parker, 2004;



**Fig. 2.** An illustration of the dynamic produced by the demand for high prestige jobs in developed East Asian countries. Arrows denote people’s preferences for particular jobs. As the high importance placed on endowed social status causes individuals from developed East Asian countries to prefer and gravitate toward high prestige jobs, the jobs that are relatively lower in prestige will be shunned and the overall availability of acceptable jobs in society will be perceived as fewer



Swinyard, Kau, & Phua, 2001). Importantly, the detrimental effects of materialism on reproduction have been empirically documented in modern East Asian populations. One study that compared between Singaporeans and Americans found that Singaporean participants indicated greater endorsement of materialistic values, which was subsequently related to lower life satisfaction and less favorable attitudes toward marriage and having children (Li, Patel, et al., 2011). The researchers further noted that Singaporean women had the highest materialistic standards within the sample, which resulted in them placing a greater emphasis on the earning capacity of romantic partners. In turn, men may face increased pressure to have a decent job and earn enough money before they feel confident enough to find a partner (Yong et al., 2019). This pressure may compel some men to entirely give up on mating effort. In Japan, approximately 85% of women own a product from Louis Vuitton (*The Economist*, 2012) while a growing number of men—dubbed as “herbivores”—are remaining single as they feel incapable of meeting women’s standards in an increasingly competitive world (Ghaznavi et al., 2020). Taken together, as modern and cultural factors intensify the pursuit of materialism in East Asian societies, people living in developed East Asian countries correspondingly experience reduced optimism or interest toward marrying and starting families, resulting in overall fertility declines.

## DISCUSSION

The present analysis describes how evolutionarily novel environments produce a mismatch between our evolved mechanisms and the inputs they were designed to process, leading to a host of problems associated with social status pursuit that contributes to undermining reproductive outcomes in modern settings. This perspective departs from classic, economically driven accounts of low fertility (e.g., Adserà, 2004; Westley et al., 2010) by offering a psychological explanation centered on people’s evolved motivations, from which several important contributions are made. First, we elucidate the evolutionary factors that drive the regulation of reproductive behavior, from which more precise insights may be gleaned on how fertility rates can be better managed. This approach complements and extends other evolutionarily guided efforts to unpack the paradox surrounding why having more resources does not necessarily translate into having more offspring (e.g., Borgerhoff Mulder, 1998; Hill & Reeve, 2004). Furthermore, the evolutionary mismatch perspective allows us to address the puzzle of why developed East Asian countries suffer from ultralow fertility at a level deeper than that afforded by prior economic, structural, cultural, and evolutionary accounts. Second, we add to a growing body of research on evolutionary mismatch (Li et al., 2018, 2020a, 2020b)—which has been used to understand a host of contemporary issues including psychological well-being (Li & Kanazawa, 2016), physical health (Gluckman & Hanson, 2006), and

organizational functioning (An, Colarelli, O’Brien, & Boyajian, 2016)—by extending this perspective to the realm of low fertility. Finally, we integrated several lines of research by situating scholarly observations of modern problems (e.g., Wilkinson & Pickett, 2009), demographic studies of delayed marriages and childrearing in East Asian societies (e.g., Jones, 2007; Westley et al., 2010), and research on the cultural determinants of social status (e.g., Kim & Pettit, 2019; Kuwabara et al., 2016) within an evolutionary framework.

Despite arguing that the intensified pursuit of social status in modern settings can undermine reproductive outcomes, it is important to note that social status remains evolutionarily crucial for mating success. For instance, East Asian men obsess over the pursuit of high level occupations because that is precisely what is necessary to attract a partner (Yong et al., 2019). In Japan, men who have full-time, standard employment and high income are most likely to be married (Piotrowski et al., 2015), while in South Korea, higher socioeconomic status in terms of income, education, and employment security is positively associated with fertility for men (Lim, 2021). As high status men are more likely to successfully compete for mates, men with a lower level of education or income or a less stable job are least likely to marry and have any children at all. Although married men in East Asia may have very few children in modern times, they still have more children than unmarried men. Hence, while the individual pursuit of status in modern settings may lead to extremely low fertility rates at the aggregate level, it continues to be essential to mating and reproduction at the individual level (Yong et al., 2022).

## Practical implications

As the present analysis makes clear that the evolutionarily novel inputs of modern environments activate our evolved concerns with social status that compete with reproductive motivations, several practical recommendations to address these social status preoccupations come to the fore. In particular, interventions that enable people to feel less anxious about social status may prove effective. We had discussed, for instance, the pressure to seek social status as a result of social status disparities. Several interventions suggested by Wilkinson and Pickett (2009) may help to mitigate societal inequality and its consequences, such as progressive taxation, shutting down of tax havens, implementation of trade unions, and increasing company democracy (e.g., greater employee ownership). The design of interventions can also be guided by the social status affordance perspective (Yong et al., 2019), which posits that the perceived attainability of social status may be improved by expanding the range of niches in society that people can fill (Rappaport, 2002). For example, initiatives to raise the prestige of occupations in society (e.g., improving the image or salaries of lower status jobs) or broaden the range of respectable pursuits that people can strive for (e.g., increasing the value placed on endeavors such as hobbies, volunteerism, and pro-environmental activities) may enable people to feel that sufficient social status can be achieved from what they are



doing or can do. This approach may be especially useful for the management of East Asian low fertility as it can lessen the perceived need to narrowly pursue only the most prestigious outlets in society. People's impressions of the affordances for starting a family may also improve if societies enhance their support systems for raising children, such as increasing the availability of affordable childcare and putting in place family-friendly policies (Rovny, 2011).

We also highlighted the major role of crowdedness in creating heightened perceptions of competition for scarce resources and opportunities. Insights from the environmental psychology and urban health literature may be instructive for how the environment could be engineered to reduce perceptions of crowdedness. For instance, urban development projects can aim to reduce the concentrated proximity of persons within areas (Galea, Ahern, Rudenstine, Wallace, & Vlahov, 2005), such as by situating neighborhoods and buildings further apart and allowing more space for people based on optimal subnational population densities (Dunbar & Sosis, 2018; Mathur, 2005). Nevertheless, rearranging the physical environment to influence crowdedness perceptions may be unfeasible in places like London or New York, where an enormous amount of resources and social engineering would be needed to make such modifications without discarding the preexisting infrastructure. Other ways of minimizing cues associated with crowded living include having more natural elements like parks and other greenery features as well as noise reduction features in the built environment, as these have been found to increase people's perceptions of open space and decreased social presence (Evans, 2003; Srinivasan, O'Fallon, & Dearry, 2003; Takano, Nakamura, & Watanabe, 2002).

Finally, as anxiety has been recognized as a cause of the aversion toward dating, marrying, and having children, educational courses and training programs aimed at allaying people's anxiety and improving relationship literacy may be a direct way to address the problem. In South Korea, for instance, university students get to take courses that teach them about sex and marriage, how to manage expectations in a relationship, and how to interact with the opposite sex through "dating missions" as part of the course assignment (Kwong, 2018). Such courses may be useful in drawing people's attention toward the rewarding aspects of having positive relationships and teaching individuals how to build them, particularly when modern anxieties may discourage people from dating or create unhealthy expectations of relationships that prevent people from forming meaningful, lasting romantic bonds. As research has indeed shown that people can be taught to be more socially confident which can have a positive impact on their mating outcomes (Li, Yong, Tsai, et al., 2020), it may be worth normalizing such courses by integrating them into everyday aspects of life skills development for young adults in affected societies.

### Directions for future research

While our analysis was based on a comprehensive review of current literature, some of our propositions remain

inadequately tested. More research is called for to uncover further nuances and gain a more thorough understanding of the fertility issues that have unfolded in the ever increasingly complex modern world. For instance, although population density (Sng et al., 2017) and perceptions of low prestige among available jobs (Yong et al., 2019) have been argued to limit fertility because of perceived competition for resources and opportunities, these mediated pathways have not been empirically confirmed. Similarly, the intensification of social comparisons by crowdedness (Hill & Buss, 2007) and social media (Lim & Yong, 2019) have been hypothesized but have yet to be directly examined. Therefore, future research should seek to empirically validate the various mechanisms proposed for the effects of modernity on excessive social status striving and low fertility.

Experiments will be needed to demonstrate the causality of modernity on key dependent variables (e.g., status striving, dating motivations, attitudes toward marriage and parenting) as well as the trade-offs between social status and reproductive effort. Prior experimental work offers some guidance on how such studies may be conducted. For instance, priming approaches have been used to test the effects of perceived crowdedness (Sng et al., 2017), economic stress (Tan et al., 2022), and luxury mindsets (Li et al., 2015) on outcome variables like short- versus long-term orientation, materialism, and desire for children. The budget allocation methodology (Li et al., 2002, 2013; Thomas et al., 2020), which forces participants to allocate a limited number of points to options that are pitted against one another, can also allow researchers to see how people make choices under the energetic constraints that are central to life history theory. Based on these prior studies, future research may seek to manipulate participants' perceptions of modern causes of evolutionary mismatch (e.g., social status disparity, social comparisons) and observe whether participants place greater weight on social status (e.g., investing in education or career) or reproduction (e.g., wanting to settle down and have children). In addition, a key argument advanced by the current paper is that perceptions of having low and/or uncertain social status (induced by the modern environment) drives status anxiety and shifts people's focus toward pursuing social status rather than marriage and children. Hence, further studies should examine how variations in social status level (e.g., having a low versus high prestige occupation) and the stability of social status (e.g., being in a volatile versus non-volatile industry) affect people's social status versus reproduction trade-offs.

The modern factors we highlighted are also inexhaustive, though our analysis provides a preliminary step to considering other modern features that may exacerbate evolutionary mismatch. For example, social media-fueled perceptions of high population densities have been argued to diminish the quality and frequency of social interactions while increasing chronic stress, all of which can suppress ovulation, sperm count, and sexual activity (Suvorov, 2021). Media technologies are also advancing to a stage where people can increasingly immerse themselves in realistic virtual environments. From the early beginnings of this



phenomenon, such as people's engagement with avatar games like *The Sims* and *Second Life*, to today's highly immersive capacities of Oculus Rift-type games and the impending Metaverse, people will have a wider range of alternative realms to escape to when the real world becomes too undesirable. While the long-term psychosocial effects of virtual reality remain poorly understood, some prior findings are suggestive of the impact that virtual reality and media technologies may have on mating and reproductive outcomes. For instance, research has shown that viewing pictures of physically attractive women reduced men's commitment to their long-term romantic partners and women's self-perceived desirability (Kenrick, Neuberg, Zierk, & Krones, 1994), while another study reported that men who regularly consume internet pornography become less sexually interested in and cannot maintain erections with their actual partners ("Italian Men Suffer," 2011). In extreme cases, some men have given up on seeking real partners and have opted to date or marry "anime" cartoon characters (Jozuka, Sato, Chan, & Mulholland, 2018) and sex robots (Yeoman & Mars, 2012; Cherry, 2021). Technology-enabled virtual reality may therefore allow people to opt for idealized worlds that are superior to actual reality, which may further depress reproduction and fertility. Thus, the identification of further sources of evolutionary mismatch that undermine fertility in the modern world is warranted.

## Conclusion

The current paper advances a novel account of low fertility in modern contexts by describing how evolutionary mismatch caused by modern environments leads to the prioritization of social status at the expense of fertility, as well as how cultural factors interact with modern features to produce ultralow fertility in developed East Asian countries. By elucidating the fundamental reasons that underlie people's proclivities to invest in either social status or reproductive effort, we can achieve a deeper understanding of the etiology of low reproductive motivation and develop fertility management interventions that work with rather than against our evolved human nature.

*Conflict of interest:* The authors declare that they have no conflict of interest.

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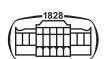
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