



# Life History-related Traits Predict Preferences for Dominant or Prestigious Leaders

Nan Zhu<sup>1</sup> · Binbin Chen<sup>2</sup> · Hui Jing Lu<sup>3</sup> · Lei Chang<sup>1</sup>

Received: 28 September 2020 / Revised: 20 December 2020 / Accepted: 22 December 2020 / Published online: 14 January 2021  
© The Author(s), under exclusive licence to Springer Nature Switzerland AG part of Springer Nature 2021

## Abstract

Dominance and prestige, as two distinct status-attaining qualities, are present in modern-day leaders at various levels of social hierarchies to various degrees. From an evolutionary perspective, we speculate that individuals' preference for dominant (prestigious) leaders can be partly predicted by “fast” (“slow”) life history–related traits. Moreover, we predict that the link between fast traits and the preference for dominance would be stronger when individuals face uncontrollable dangers resembling the evolutionary challenges faced by our ancestors in a less structured and predictable world. Two experiments tested these speculations. Experiment 1 ( $N = 67$ ) used the Implicit Association Test (IAT) technique and showed that people implicitly associate dominance (prestige) with negative (positive) evaluations, and such association was stronger for individuals exhibited slow life history–related psychosocial traits. Experiment 2 ( $N = 95$ ) replicated this finding using explicit leader choices in response to hypothetical scenarios. Moreover, Experiment 2 demonstrated that individuals with faster psychosocial traits showed a stronger preference for dominant leaders in the face of experimentally primed danger than in a control condition.

**Keywords** Social status · Dominance · Prestige · Life history strategy · Leadership

Human societies are larger and more complex than other primate groups (Chudek and Henrich, 2011). From an evolutionary perspective, leadership in human society must serve adaptive functions such as resolving within-group conflicts and preventing free-riding (Hooper et al., 2010; Van Vugt et al., 2008; von Rueden et al., 2014) or serving as social-learning models (Henrich and Gil-White, 2001). Therefore, various leadership qualities relevant to these group-level functions might have been shaped by followers who exert considerable influence on the ascent and descent of leaders and their powers (Boehm, 1999).

The current research investigates a novel hypothesis that there is a link between followers' life history–related psychosocial traits<sup>1</sup> and their preference for dominance-based

or prestige-based leadership. The former type of leadership provides protection against threats to a group's immediate survival (e.g., intergroup violence, natural disasters). Thus, dominant leaders should be preferred by persons with fast life history–related traits prioritizing current fitness components (e.g., immediate survival, current reproduction, and short-term mating success). By contrast, prestige-based leadership offers opportunities to follow, observe, and emulate knowledgeable and well-connected individuals, which is crucial for the accumulation of knowledge and information for future development (Henrich et al., 2015; Henrich and Gil-White, 2001; von Rueden et al., 2014). Therefore, persons with slow LH traits that prioritize future fitness components (e.g., development, future reproduction, and long-term mating success) should prefer prestigious leaders. Moreover, when facing uncontrollable threats that

✉ Lei Chang  
chang@um.edu.mo

<sup>1</sup> Department of Psychology, University of Macau, Taipa, Macau

<sup>2</sup> Department of Psychology, Fudan University, Shanghai, China

<sup>3</sup> Department of Applied Social Sciences, The Hong Kong Polytechnic University, Kowloon, Hong Kong

<sup>1</sup> We do not regard our psychometric measure of life history in this research as reflecting human life-history strategy at population or species levels. Nor do we assume that these measures capture all the variances in individuals' life history. Because these measures are theoretically linked to the fundamental tradeoff between current and future fitness, we adopted the recommended wording of Del Giudice (in press) and named the relevant variable in our studies “life history-related traits” to avoid the misconception.

render protection and immediate survival more relevant than future-oriented social learning and long-term fitness gains, the link between fast LH traits and dominance preference should be further strengthened. These predictions are tested in two experiments.

## Dominance and Prestige as Power Strategies

Researchers have elaborated on the different ethological and psychological dynamics of dominance and prestige as two evolutionarily adaptive routes to attaining social status (Barkow, 1975; Cheng et al., 2010; Henrich and Gil-White, 2001). Dominance is imposed upon followers through threats of aggression and coercive displays, which cause followers to fear and avoid the dominant individual, whereas prestige is freely conferred to potential leader-figures with superior skills, knowledge, or achievements in valued domains as ideal learning models (Henrich et al., 2015; Henrich and Gil-White, 2001; von Rueden et al., 2014).

Although the ethological and psychological analyses pertain to both leaders and followers in deference hierarchies, existing research on status and leadership focuses overwhelmingly on the traits of leaders rather than followers (Van Vugt et al., 2008). For instance, studies showed that self-rated and peer-rated dominance was positively correlated with narcissistic self-aggrandizement, aggression, extraversion, and disagreeableness (e.g., Cheng et al., 2010; Tracy and Robins, 2007). Prestige, on the other hand, has been linked to traits such as genuine self-esteem, agreeableness, conscientiousness, achievement, advice-giving, and prosociality (e.g., Cheng et al., 2010; Henrich and Gil-White, 2001). Much less is known about how these two categories of leadership qualities are linked to the preferences and individual differences of the followers.

The different personality and behavioral patterns of dominant and prestige leaders are related to different social roles and functions they serve. A key function served especially by dominant leaders is to maintain group integrity by preventing intragroup conflicts and protecting vulnerable group members from exploitation. Dominance hierarchies are quite common in non-human species. Although individuals lower on the dominance hierarchy might not benefit as much as those higher on the hierarchy, once the dominance rank is established, individuals try to maintain the status quo to preserve overall fitness by avoiding unnecessary clashes with other group members (Chance and Jolly, 1970). Moreover, in more complex group cooperation situations, dominant leaders who are both able and willing to use force and punishment might serve as effective deterrents to free-riders, thus preventing potential defectors from exploiting other group members and derailing collective actions that are crucial for group integrity (O’Gorman et al., 2009;

Sidanius and Pratto, 2001). Indeed, behavioral research and mathematical modeling have shown that punishment, especially those carried out in a centralized or coordinated manner, is one of the most effective ways of maintaining/restoring cooperation in increasingly complex human society (Balliet et al., 2011; Boyd et al., 2010; Henrich et al., 2010). Thus, the need to enforce group rules and prevent freeriding might have contributed to the transformation of individual dominance orientation to dominance-based leadership.

Another important function of leaders is to serve as social-learning models, which is better served by prestigious than dominant leaders. Humans benefitted massively from socially transmitting problem-solving abilities to inhabit wide-ranging environments because, by following successful models, individuals can emulate their adaptive know-hows and skills without having to go through costly trial-and-error processes (Boyd and Richerson, 1995, 2005; Chang et al., 2011). An effective social-learning model must be accessible to the followers to facilitate close observation and emulation (Henrich and Gil-White, 2001; Henrich et al., 2015). Therefore, individuals who are more amicable and, at the same time, possess valued skills or expertise, would become social-learning models bestowed with deference and prestige. By contrast, overly dominant leaders who are feared and shunned by group members would not serve as good social-learning models (Henrich and Gil-White, 2001).

Anthropological studies on traditional societies did show that the relative importance and acceptability of dominance and prestige in tribal leadership vary considerably across and within societies. Many small-scale societies seem to enact powerful egalitarian norms that restrain and punish overt dominant behaviors displayed by the leaders (Boehm, 1999). In other equally small-scale tribal societies, however, physical dominance (e.g., pertaining to warriors) is a common pathway to leadership (Werner, 1982). In his study of Yąnomamö Indians, Chagnon (1988) noted that prevalent tribal violence and blood feuds might favor dominant men, who use force to acquire mates, execute revenge, and impose fear on outgroups. Such dominant and feared leaders also typically achieve greater inclusive fitness and mating success than non-violent individuals (Chagnon, 1988).

There is also evidence for within-society and even within-person variations in leadership preference. People who prioritize short- over long-term interests seem to favor dominance over prestige in areas of mate selection and informal leadership. Studies among college students have found that dominant men were preferred by women as short-term dates (Sadalla et al., 1987), whereas prestigious men were preferred over dominant men as long-term partners (Synder et al., 2008). In a longitudinal study of social ranking dynamics of collaboration task groups, Redhead et al. (2019) found that peer rating of dominance predicted leadership in the initial group formation phase, whereas prestige rating

became more predictive of actual leadership in later phases. However, there is not yet a systematic investigation into these style variations of the leaders as functions of individual differences and preferences of the followers.

### Life History–related Traits and Leadership Preference

To the degree that dominance-based leadership and prestige-based leadership can be aligned with the life history (LH) tradeoff between current and future fitness, we can expect that the followers' preference for these two types of leaders are similarly related to the followers' LH. Originated from evolutionary biology, LH theory accounts for interspecific as well as intraspecific variations from the perspective of allocating limited energetic resources to different fitness components (e.g., survival, reproduction, parenting; Del Giudice and Belsky, 2010; Del Giudice et al., 2015; Roff, 1992). The efficacy of such investment depends on ecologies that the organisms and their offspring live in (e.g., resource scarcity and unpredictability, population density; Del Giudice, *in press*; Ellis et al., 2009). As a result, many (if not all) biological and behavioral traits should be viewed from a “tradeoff” perspective and can be theoretically linked to several fundamental tradeoffs between fitness components, such as current and future reproduction (Del Giudice, *in press*; Del Giudice et al., 2015), or reproductive efforts (including mating, childbirth, and parenting) and somatic efforts (including bodily maintenance and learning Del Giudice et al., 2015; Geary, 2002). All these tradeoffs are essentially variants of the tradeoff between current and future fitness, which corresponds to the popular conceptualization of life histories as varying along a fast-slow continuum (Ellis et al., 2009). In recent decades, this fast-slow conceptualization is borrowed by psychologists to explicate covariation among personality and psychosocial traits in humans, leading to the research program of psychometric measurement of human individual differences (e.g., Figueredo et al., 2006; Figueredo et al., 2005).

The relationship between ecology and human LH patterns are mediated by a myriad of behavioral and psychosocial traits that often indirectly pertain to LH outcomes (e.g., age-specific fertility and mortality) and not necessarily determined by genes (Del Giudice, *in press*). Psychological researchers have attributed the developmental plasticity of psychosocial and behavioral traits in humans to “LH calibration” processes mediated by attachment security in early life stages, which purportedly serves as cues of external environments (Belsky et al., 1991; Del Giudice and Belsky, 2010). Studies have supported this view, showing that early experiences of harshness and unpredictability (i.e., resource scarcity, exposure to violence, and frequent changes in lives

beyond personal control) predicted psychosocial outcomes such as increased deviancy, decreased sexual restrictiveness, and lower prosociality through emotional attachment with parents (Belsky et al., 2012; Brumbach et al., 2009; Chang and Lu, 2017; Zhu et al., 2018). Overall, these psychosocial traits seem adapted to environments where ensuring survival, current reproduction, and mating success are more important than setting the stage for a better future (e.g., skill learning, personal development).

The tradeoff between current and future fitness, as manifested in psychosocial traits, would lead to predictable individual differences in relative emphases on different leader functions (as protector of group integrity or as social learning model) and, hence, leadership preference. Specifically, we predict that fast (current-oriented) traits should be associated with a preference for dominant leaders, which constitutes a current-oriented bid for safety and protection at the cost of social-learning opportunities. By contrast, slow (future-oriented) traits should be associated with a preference for prestigious leaders, which constitutes a long-term investment in skills and personal development.

### The Interaction Between Unpredictability and Life History–related Traits on Leadership Preference

Human psychosocial traits exhibit considerable plasticity and are largely contingent on the environment and context where these psychosocial traits manifest (Ellis et al., 2009). For instance, previous research showed that beliefs of danger activated Black stereotyping in situations with cues of danger (ambient darkness), but not in situations without cues of danger (Schaller et al., 2003). More relevantly, Griskevicius and colleagues found that individuals with low childhood socioeconomic status (SES) were especially likely to demonstrate behaviors and psychosocial traits compatible with fast life history (e.g., increased risk-taking propensity, earlier reproductive timing estimates, and increased impulsivity) when exposed to cues of uncontrollable danger (e.g., mortality risks, financial crisis). In comparison, individuals with high childhood SES were less sensitive to environmental cues of danger (Griskevicius et al., 2013; Griskevicius et al., 2011a; Griskevicius et al., 2011b). These findings indicate that it is important to distinguish between life history–relevant environments (e.g., past and current resource availability as indicated by SES) and life history–related traits.

There are more specific reasons that environmental cues of danger and unpredictability might affect followers' dominance-versus-prestige leadership preferences. First, the function of dominant leaders as protectors of group integrity would be more crucial in unpredictable situations. Because of the coordination problem faced

by human societies (Van Vugt et al., 2008), dominance-based leadership that relies on the use of coercion and intimidation to subdue others might be warranted or even encouraged in dangerous and unpredictable environments. Inferential uncertainty and errors in unpredictable situations might easily taint the trustworthiness of cooperative partners and the reliability of reputation (Bendor, 1993; Panchanathan and Boyd, 2003), which endangers group integrity (Rapoport et al., 1992; Wit and Wilke, 1998; Zhu et al., 2019). Research using experimental games showed that participants' contribution to common resources declined when the probability of benefiting from public goods became uncertain (Wit and Wilke, 1998). Similarly, participants tended to harvest more irresponsibly from a common resource pool as the variability of the size of harvestable resources increased (Rapoport et al., 1992). When participants were asked to imagine dangerous situations (compared with imagining non-dangerous situations), they were less generous with donations volunteering work (Zhu et al., 2019). Without a central authority to maintain group cohesion (e.g., inducing cooperation or punishing defectors), environmental unpredictability would expose individual group members to potential intergroup violence and intragroup conflicts (Hooper et al., 2010), thus undermining their current fitness.

Secondly, the importance of prestigious leaders as social-learning models is likely to diminish in unpredictable environments. The social-learning process that is conducive to prestige hierarchies would only be beneficial for the followers when the know-how and skills learned from others do not quickly become obsolete with environmental and situational changes (Boyd and Richerson, 1985, 1995; Chang et al., 2011). As the emulation becomes futile in a changing environment, the cost associated with deferring to prestigious models thus outweighs the efficiency of social learning. Therefore, combined with the increased need for protection and restoration of cooperation, a dangerous and unpredictable environment should prompt followers to favor dominant leaders over prestigious leaders.

There is some tentative evidence in support of the link between unpredictability and a preference for dominant leaders. One study showed that participants preferred to vote for leaders with dominant-looking face over leaders with non-dominant-looking face in wartime, whereas the opposite was true during peace (Little et al., 2007). Although this special case seems to support our functional analysis of dominant leaders, it did not invoke the LH framework. From the LH theory perspective, we would further expect individuals who prioritize current fitness to seek protection from dominant leaders more than individuals who prioritize future fitness, when they are

exposed to dangerous and unpredictable situations. This should manifest as an interaction between environmental cues of danger and participants' fast traits.

We conducted two experiments to test the hypotheses put forward above. Specifically, Experiment 1 sought to understand how individual-differences in LH traits might affect the evaluation of dominant versus prestigious leaders. Experiment 2 additionally examined whether such LH effects on leader choices are modified by situational constraints.

## Experiment 1: Implicit Associations of Dominance and Prestige

Experiment 1 used an Implicit Association Test (IAT; Greenwald et al., 1998) task to assess the relative strength of the implicit association between leadership qualities (dominance versus prestige) and subjective evaluations (positive versus negative). The IAT technique is usually used to examine automatic social responses that do not require deliberate cognitive processing (Greenwald and Banaji, 1995; Nosek et al., 2005). This is ideal for our purpose, which is to gain an understanding of people's "default" leadership preference and to what degree is such preference linked to individual differences regarding the current-versus-future tradeoff. As humans have achieved ecological dominance, social competition among conspecifics has become the major selection pressure in relatively stable and competitive human society (Flinn et al., 2005; Nesse, 2007). Social competition facilitates the cognitive capacity responsible for the prevalence of social learning in humans and the transference of prestige to individuals with expertise, valuable contributions, and social skills (Henrich et al., 2015; Henrich and Gil-White, 2001). Therefore, social competition might be one reason that human societies generally favor prestigious leaders over dominant leaders. The sedentary lifestyle adopted by most humans in the past thousands of years further reduced the environmental variability and made leaders as social learning models far more desirable. This might explain why dominant behaviors are almost universally suppressed in contemporary traditional as well as modern societies (Boehm, 1999; Ridgeway and Diekema, 1989; von Rueden et al., 2014). Therefore, we expected that the combination of dominance (prestige) and negative (positive) would appear more compatible than the opposite link. We also examined whether the strength of this IAT effect correlates with participants' life history-related psychosocial traits and economic conditions. Because LH strategies are not conscious strategies (Del Giudice et al., 2015), the K-SF-42 might better elicit participants' prioritization for future fitness than explicit self-evaluation of future orientation.

## Participants

Participants were 67 undergraduate students aged from 18 to 23 years ( $M_{\text{age}} = 19.77$  years,  $SD_{\text{age}} = 1.27$  years). They were recruited through a social psychology course at a university in Eastern China and received a participation fee of 40 RMB (approximately 6 USD). A sensitivity power analysis using the software program G\*Power 3.1 (Faul et al., 2007) revealed that the minimal effect size detectable for the main results in Experiment 1 ( $t$  of the IAT effect) with the current sample at two-tailed  $\alpha = 0.05$ , power = 0.80, was  $d = 0.35$  (critical  $t = 2.00$ ). This effect size was much lower than the actual effect size obtained, indicating that our sample size was sufficient.

## Material

### Stimuli for the Implicit Association Test

A total of 24 words were used as stimuli in the IAT (Greenwald et al., 1998) task. These words were grouped into four categories: dominance (“authority,” “military force,” “punishment”), prestige (“knowledge,” “talents,” “expert”), positive evaluation (e.g., “honest,” “outstanding,” “wise”), and negative evaluation (“hypocritical,” “narrow-minded,” “foolish”). The stimuli words used in the formal experiment were selected from 60 candidate words through a pilot test, in which 11 master’s students rated these words on three dimensions: dominance, prestige, and evaluative valence on 7-point scales. All candidate words were familiar, two-character words in Chinese. We selected 6 words rated as most related to dominance ( $M = 6.38$ ,  $SD = 0.40$ ) but not highly related to prestige ( $M = 2.78$ ,  $SD = 0.77$ ) to be the “dominance” words, and 6 words rated as most related to prestige ( $M = 6.15$ ,  $SD = 0.42$ ) but not highly related to dominance ( $M = 3.38$ ,  $SD = 0.56$ ) to be the “prestige” words. The positive evaluation words ( $M = 6.50$ ,  $SD = 0.10$ ) and negative evaluation words ( $M = 1.48$ ,  $SD = 0.17$ ) were selected from the highest and lowest in terms of evaluative valence, respectively. A full list of stimuli words and the detailed process to select the stimuli for this task are included in the [Supplementary Material](#).

### Life History-related Traits

We used 36 items taken from the K-SF-42 (Figueredo et al., 2017), a newly developed short-form of the Arizona Life History Battery (ALHB), to represent participants’ life history-related traits. We included all items belonging to the first six subscales (1) insight, planning, and control; (2) romantic partner attachment; (3) general altruism; (4) mother/father relationship quality; (5) family social contact and support; and (6) friends social contact and support.

Because most students in our sample were not religious, the religiosity subscale was removed. Subscales 1–3 were rated on 6-point scales (1 = *strongly disagree*, 6 = *strongly agree*), whereas Subscales 4–6 were rated on 4-point scales (1 = *seldom*, 2 = *sometimes*, 3 = *frequently*, 4 = *always*). These self-report items measured individual differences in various complementary facets of coherent and coordinated LH strategy, as specified by the life history theory, and were scored and averaged (with equal weights of each subscale). A higher score indicates slower (more future-oriented) life history-related traits. The  $\alpha$  coefficient for the scale was 0.90.

### Economic Conditions

Participants reported their current and childhood economic condition using six Likert-scale items developed by Griskevicius et al. (2011b). Three items measure current economic conditions (“I have enough money to buy things I want”; “I don’t worry too much about paying my bills”; “I don’t think I’ll have to worry about money too much in the future”) and another three measure childhood economic conditions (“My family usually had enough money for things when I was growing up”; “I grew up in a relatively wealthy neighborhood”; “I felt relatively wealthy compared with the other kids in my school.”). All items were rated from 1 (*strongly disagree*) to 6 (*strongly agree*). The  $\alpha$  coefficients for current and childhood economic conditions were 0.89 and 0.85, respectively.

### Procedure

Participants came to a computer lab in groups of 4–8 and were seated in cubicles with a computer. They first completed the IAT task designed in the E-prime 2.0 framework (Schneider et al., 2002; their responses and reaction time were automatically recorded by the program).

The IAT task consisted of 11 blocks, including 7 practice blocks and 4 scoring blocks. Blocks 1, 2, and 7 each consisted of 36 trials and aimed to familiarize participants with single category associations (each response key was associated with only one category of words in these blocks). In each trial, one word from a certain category would show in the middle of the screen, with response-key reminders showing in the upper-left and upper-right corners. All words appeared in random order without replacement until the available stimuli for a given block were exhausted. Stimuli appeared on the screen until the participant responded. Trials were presented with an interval of 700 ms. Participants needed to press one key (“A”) as soon as they see certain categories of words and press another key (“K”) when seeing opposite categories of words. Each word appeared three times in these practice blocks. Blocks

**Table 1** Summary of response keys for each block in the IAT tasks in Experiment 1

	“A”	“K”
Block 1 (Practice)	Negative	Positive
Block 2 (Practice)	Dominance	Prestige
Block 3 (Practice, Compatible)	Negative, Dominance	Positive, Prestige
Block 4 (Scoring, Compatible)	Negative, Dominance	Positive, Prestige
Block 5 (Practice, Non-Compatible)	Positive, Dominance	Negative, Prestige
Block 6 (Scoring, Non-Compatible)	Positive, Dominance	Negative, Prestige
Block 7 (Practice)	Prestige	Dominance
Block 8 (Practice, Compatible)	Positive, Prestige	Negative, Dominance
Block 9 (Scoring, Compatible)	Positive, Prestige	Negative, Dominance
Block 10 (Practice, Non-Compatible)	Negative, Prestige	Positive, Dominance
Block 11 (Scoring, Non-Compatible)	Negative, Prestige	Positive, Dominance

3, 5, 8, and 10 each consisted of 24 trials and prepared participants for dual-category associations (each response key was associated with two categories in these blocks). Each word from four categories (e.g., negative + dominance and positive + prestige) appeared for once in these blocks. Finally, Blocks 4, 6, 9, and 11 each consisted of 72 trials of dual-category associations (each word appeared three times) identical to the precedent practice block. The response keys for each block were summarized in Table 1.

Stimuli combinations that lead to superior performance (i.e., shorter reaction time and higher accuracy) are considered evaluatively compatible in IAT. In our case, compatible combinations consisted of negative evaluation + dominance, or positive evaluation + prestige blocks, whereas non-compatible combinations consisted of negative evaluation + prestige, or positive evaluation + dominance blocks. Two of the scoring blocks required participants to respond to compatible combinations, whereas the other two blocks required participants to respond to non-compatible combinations. For each pair of scoring blocks, half of the participants responded to compatible combination blocks first, whereas the other half responded to non-compatible combination blocks first. These blocks comprised the scoring blocks. An IAT effect was calculated by subtracting the average reaction time for valid trials from all compatible scoring blocks from the average reaction time for valid trials from all non-compatible scoring blocks (Greenwald et al., 1998).

After the IAT task, the participants in both studies completed an online questionnaire with additional measures regarding participants' gender, age, life history-related traits, and current and childhood economic conditions.

## Results

Correlations among the variables and their descriptive statistics are presented in Table 2. For the IAT task, like Greenwald et al. (1998), we eliminated outlying trials with reaction time (RT) longer than 5000 ms (ms) because these

responses lack theoretical interest (such long response latency might provide sufficient time for deliberation, rather than reflecting implicit associations) and severely distort the means. This resulted in a loss of 0.2% of all trials. We also excluded seven participants with an accuracy rate lower than 0.85 (2 *SDs* below the mean accuracy for the entire task, which was 0.91; this did not change the qualitative pattern of our findings) to avoid data contamination by low-effort responses. We did not examine response accuracy as a dependent variable, as error rates were quite low, which might lead to a floor effect ( $M = 0.96$ ,  $SD = 0.03$  for compatible blocks,  $M = 0.88$ ,  $SD = 0.05$  for non-compatible blocks). Moreover, we noticed that accuracy and RT showed weak negative correlations ( $r_s = -0.03$  and  $-0.23$ ,  $p_s > 0.05$  for compatible and non-compatible blocks, respectively). Thus, the accuracy-speed tradeoff should not affect the interpretation of the results here.

The average RT for non-compatible scoring blocks (negative + prestige and positive + dominance;  $M = 1141.14$ ,  $SD = 234.12$ ) was, on average, 475.21 ms higher than that for compatible scoring blocks (negative + dominance and positive + prestige;  $M = 665.93$ ,  $SD = 110.81$ ),  $t(59) = 18.42$ ,

**Table 2** Experiment 1: Correlations among variables and their means and standard deviations

	(1)	(2)	(3)	(4)
IAT effect (ms) (1)	--			
Slow life history-related traits (2)	0.31**	--		
Childhood economic condition (3)	-0.09	0.33**	--	
Current economic condition (4)	-0.001	0.34**	0.67***	--
<i>M</i>	471.05	0.70	10.77	11.97
<i>SD</i>	227.36	0.10	2.65	3.23
Skewness	0.50	0.10	-0.53	-0.03
Kurtosis	1.03	-0.02	-0.66	-0.22

\*\* $p < 0.01$  \*\*\* $p < 0.001$

**Table 3** Experiment 1: Predictors of the IAT effect

Predictors	<i>B</i>	<i>S.E</i>	$\beta$
(Constant)	– 490.17	376.89	
Slow life history–related traits	1028.13	241.30	0.52***
Current economic condition	– 37.21	27.10	– 0.21
Childhood economic Condition	27.92	35.76	0.12
Age	13.48	18.40	0.09
Gender = Male	72.43	49.07	0.17

\*\*\*  $p < 0.001$

$p < 0.001$ , 95% CI [423.58, 526.84],  $d = 2.59$ . This indicated that participants implicitly associate dominance (prestige) with negative (positive) evaluations. Block sequence did not affect the IAT effect,  $t(58) = 0.46$ ,  $p = 0.647$ . In a multiple linear regression analysis (Table 3), we regressed the IAT effect on participants' slow life history–related traits (SLH), their current and childhood economic conditions, and their age and gender (0 = *female*, 1 = *male*). Continuous variables were mean-centered to prevent potential multicollinearity problems. The predictors accounted for 31% of variance in the IAT effect,  $F(5, 54) = 4.75$ ,  $p = 0.001$ . Of them, only SLH was positively associated with the IAT effect ( $\beta = 0.52$ ,  $p < 0.001$ ).

## Discussion

The IAT effect is consistent with the speculation that prestige-based leadership should be perceived more favorably than dominance-based leadership. This is consistent with our expectation that participants would, in general, have a more favorable opinion toward prestigious leaders than toward dominant leaders in human society. It is also consistent with other research that showed that those who seek status by earning prestige were viewed as likable, whereas those who seek status via dominance were not well-liked (Cheng et al., 2013). Those who are overtly dominant were viewed as less effective leaders and bystanders might intervene to constrain dominant behaviors in task groups (Ames and Flynn, 2007; Ridgeway and Diekema, 1989).

More importantly, the IAT effect was positively associated with slow traits, which supported our hypothesis that the leadership preference for dominance would be weaker among individuals prioritizing future fitness. It is important to note, however, that a mere implicit association does not necessarily mean that people would choose prestigious leaders over dominant leaders in all situations. Although IAT effects in intergroup studies are predictive of actual discriminative behaviors or explicit prejudice (e.g., Rudman and Ashmore, 2007; see Hofmann et al., 2005 for a review), the IAT technique has long faced criticisms for lacking

a conceptual explanation for the “implicit association” (Gawronski, 2002). For instance, Olson and Fazio (2004) argued that implicit personal attitudes that predict individuals' behaviors toward the evaluative targets might be different from “extrapersonal” associations derived from one's knowledge of common attitudes shared by other members of the society. As a result, the IAT effect might be alternatively interpreted as extrapersonal associations and do not reflect personal evaluations pertaining to the tradeoff between current and future fitness. Therefore, it is necessary to examine explicit leadership choices, which are less ambiguous in interpretation than implicit associations.

## Experiment 2: Environmental Cues Affect Participants' Leader Preference in Hypothetical Scenarios

Experiment 2 assessed participants' leadership preferences in response to hypothetical scenarios after priming participants with danger or control conditions using an imagination procedure. This allowed us to examine whether the link between participants' life history–related traits and their leadership preferences is moderated by environmental cues of unpredictability. Like Griskevicius and colleagues (e.g., Griskevicius et al., 2011b), we examined participants' economic conditions and subjective social status. These measures were included as covariates given the possibility that the manifestation of psychosocial traits and their association with leadership preference might be contingent on resource constraints. For example, individuals with more resources or higher status might perceive a greater sense of control in the face of danger (Lachman and Weaver, 1998; Mittal and Griskevicius, 2014), thus mitigating their need for social certainty offered by dominant leaders. Hence, these covariates might have implications for the relations among environmental danger, LH traits, and leadership preferences.

## Participants

Ninety-five college students at a university in Eastern China were randomly assigned to two conditions (danger vs control). They received 40 RMB (approximately 6 USD) for their participation. A sensitivity power analysis using the software program G\*Power 3.1 (Faul et al., 2007) revealed that the minimal effect size detectable for the main results in Experiment 2 ( $R^2$  of the linear regressions) with the current sample at two-tailed  $\alpha = 0.05$ , power = 0.80, was  $f^2 = 0.18$  (critical  $F = 1.99$ ). This effect size was lower than the actual effect sizes obtained, indicating that we have recruited enough participants.

## Materials

### Environmental Manipulation

An imagination task (Zhu et al., 2019) was used to prime environmental danger. In each condition, participants first read nine cue sentences (presented for 45 s each) imagining personally being in the situations described in this sentence. In the danger condition, participants imagined facing unpredictable threats such as disease, violence, and social unrest (e.g., “You live in a chaotic country, where any person might be prosecuted and sent to prison any time”; “the village you live in is controlled by a mafia, who conduct all kinds of crimes like extortion, robbery, and murder”). In the control condition, participants imagined facing daily events that cause mild anxiety (e.g., “You encountered a traffic jam on your way to work”; “You forgot where you parked your car in a large underground parking garage”). After separate presentations of the nine sentences, participants were further asked to “rehearse their imagination” with all cue sentences presented together for 2 min. This task has been demonstrated by Zhu et al. (2019) to elicit relevant feelings (e.g., danger and uncertainty beyond daily-encountered anxiety in the danger condition).

### Leadership Preference Scenario Task

Participants read four scenarios assessing their choices and expected winners between dominant candidates and prestigious candidates in different leadership contests (see Appendix 1 for an example scenario; the full list of scenarios is included in the [Supplementary Material](#)). The scenarios were developed to reflect different everyday situations (e.g., selecting team leaders for a group assignment, electing a leader for a university sports club, choosing a business executive, and electing a mayor) based on ethological analyses of dominant and prestigious leaders by Henrich and Gil-White (2001). The dominant candidates in each scenario were described as enjoying control over other members of the group, trying to get their own way regardless of what others in the group may want, willing to use aggressive tactics to get their way, and not permitting others to control themselves (descriptions in each scenario differ from each other in exact wording). By contrast, the prestigious candidate in each scenario was described as respected and admired by other group members, having unique talents and abilities that are recognized by others, considered an expert on some matters, and gave advice to others on a variety of matters. These criteria were considered central to the characteristics of dominant and prestigious individuals, respectively (Cheng et al., 2010), and

were also used to measure individuals’ dominance and prestige in Redhead et al. (2019). We conducted extensive pilot testing to ensure that the candidates in these scenarios reflect dominant or prestigious traits (details of the pilot test are documented in [Supplementary Material](#)).

### Measurement of Life History–related Traits, Economic Conditions, and Social Status

Participants responded to the same measures of life history–related traits and childhood and current economic conditions used in Experiment 2 ( $\alpha$  coefficients were 0.85, 0.86, and 0.89, respectively). Additionally, participants rated their subjective social status in terms of income, education, and occupation “on a ladder of 1 (*lowest class*) to 9 (*highest class*)” ( $\alpha$  coefficient was 0.92).

### Intragroup Dominance Orientation

To examine individuals’ orientation and belief regarding the competition for dominant positions, we adapted the 16-item Social Dominance Orientation scale (Pratto et al., 1994). To emphasize dominance in intragroup situations, rather than intergroup situations, we replaced the word “groups” in the original SDO items with “individuals,” for example: “If certain *individuals* stayed in their place, we would have fewer problems” and “It’s OK if some *individuals* have more of a chance in life than others.” The sixteen items were rated from 1 (*strongly disagree*) to 6 (*strongly agree*), and the  $\alpha$  coefficient was 0.82.

### Procedure

Participants completed all tasks on a computer. They first went through the imagination priming task designed using the E-prime 2 software (Schneider et al., 2002). After this, they were told that there would be a memory test for the imagination cues (which never actually took place) after completing some additional measures on an online questionnaire. Specifically, participants completed (1) the Leadership Preference Scenarios Task, (2) the measure of life history–related traits, (3) measures of economic conditions and social status, and (4) the individual dominance orientation measure. Participants also reported their gender and age.

### Results

The means and standard deviations of all the variables and their correlations are presented in Table 4. We calculated the number of dominant candidates (0–4) that participants chose in the four leadership preference scenarios. Overall, participants were more likely to choose prestigious leaders than dominant leaders, given that the average choices



**Table 4** Experiment 2: Correlations among variables and their means and standard deviations

	(1)	(2)	(3)	(4)	(5)	(6)
Leader choices (1)	–					
Slow life history–related traits (2)	– 0.41***	–				
Individual dominance orientation (3)	– 0.04	0.12	–			
Childhood economic condition (4)	– 0.12	0.40***	0.10	–		
Current economic condition (5)	– 0.19	0.41***	0.09	0.70***	–	
Subjective social status (6)	– 0.14	0.24*	0.06	0.60***	0.48***	–
<i>M</i>	1.49	0.67	2.87	10.32	11.49	5.01
<i>SD</i>	1.14	0.09	0.67	3.15	3.51	1.43
Skewness	0.43	0.10	0.15	– 0.40	– 0.34	– 0.40
Kurtosis	– 0.58	– 0.18	0.17	– 0.16	– 0.15	– 0.19

\* $p < 0.05$ ; \*\*\* $p < 0.001$

score was 1.49 ( $SD = 1.14$ ). The choice score constituted the dependent variables in our subsequent multiple regression analyses. Experimental condition (dummy coded: danger = 1, control = 0), slow life history–related traits (SLH), and their interaction term were entered as predictors, along with participants' gender, age, SDO score, and childhood, and current economic conditions were also entered. Like in Experiment 1, continuous variables were mean-centered to prevent potential multicollinearity problems.

All the predictors accounted for 36% of variance in participants' dominant leadership choices,  $F(9, 85) = 5.33$ ,  $p < 0.001$ , effect size  $f^2 = 0.56$ . Both the experimental condition ( $\beta = 0.39$ ,  $p < 0.001$ ) and SLH ( $\beta = -0.28$ ,  $p = 0.017$ ) were significant, which were qualified by their significant interaction ( $\beta = -0.24$ ,  $p = 0.037$ ). None of the covariates was significant (all  $\beta$ s  $< 0.08$ ,  $p$ s  $> 0.05$ ; see Supplementary Material, Table S1). The same finding held after excluding the covariates (Supplementary Material, Table S2). The interaction indicates that participants lower on SLH, compared with participants higher on SLH, showed a greater increase in their preference for dominant leaders in the face of danger. As revealed by a simple slope analysis (Fig. 1), choices of dominant leaders were more prevalent in the danger condition than in the control condition (simple slope = 1.33,  $p < 0.001$ ) among low SLH individuals (1  $SD$  below the mean of SLH). This effect was not significant among high SLH individuals (1  $SD$  above the mean of SLH), simple slope = 0.46,  $p = 0.125$ .

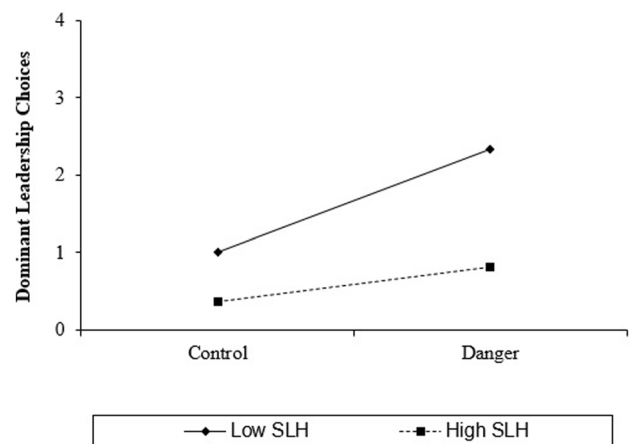
## Discussion

The results for leadership choices further corroborated our speculation that the prioritization of current fitness (as reflected by faster psychosocial traits) promotes a preference for dominance, and this effect is associated with dangerous situations that are uncontrollable with personal efforts. This also indicates that the association between life history–related traits and leadership preference is unlikely to be solely explained by

implicit extrapersonal associations (Olson and Fazio, 2004). In the face of dangers, it is conceivable that individuals might opt to sacrifice the opportunity to learn from accessible and prestigious social-learning models in exchange for safety and certainty under strong, dominant authorities. Conversely, a prioritization of future fitness was associated with a lower likelihood of choosing dominant leaders, and high SLH individuals' preferences seemed less affected by dangerous situations. Thus, the results of Experiment 2 also supported the environmentally contingent expression of the relation between life history–related traits and leadership evaluations, and this held even after controlling for participants' personal dominance orientation, resource conditions, and social status.

## General Discussion

Large-scale cooperation in modern societies depends greatly on efficient and effective leadership. Yet, there is a lack of research on what makes people follow certain leaders (Van Vugt et al., 2008). In this research, we identify two key



**Fig. 1** The simple slope result of the interaction between experimental condition and slow life history–related traits (SLH)

leader functions (i.e., protecting group integrity by force and punishment, and serving as social-learning models) assumed by dominant leaders and prestigious leaders, respectively. We argue that followers who prioritize current fitness (as measured by life history–related psychosocial traits) would find group integrity more important than social-learning opportunities, thus favoring dominant leaders. By contrast, followers who prioritize future fitness would have the opposite concern and favor prestigious leaders. This is supported by two experiments using both implicit and explicit methods to reflect leadership preference.

Our results provide additional evidence for the flexible manifestation of life history–related traits in different ecologies (Ellis et al., 2009) when it comes to the preference between dominant and prestigious leaders. Given that danger and unpredictability would enhance the current-oriented need for group integrity and diminish the future-oriented return from social learning, the hypothesized associations between life history–related traits and leadership preference should be strengthened in the face of danger. This is indeed what we observed in Experiment 2. From simple slope analysis, we also found that this was mainly due to a more prominent association between fast traits and the preference for dominance. This is understandable, given that individuals who prioritize future fitness (as reflected by their slow traits) should not be as sensitive to experimentally primed danger as their current-oriented counterparts.

Past research has shown that individuals with low childhood SES, compared with individuals growing up with high childhood SES, demonstrated fast life history–related traits such as impulsivity and current-oriented reproductive timing when exposed to cues of unpredictability and danger (Griskevicius et al., 2011a, 2011b, 2013). Our results, however, did not provide evidence that economic conditions and social status, whether past or present, predict participants' leadership preferences. Nor did economic conditions moderate the effect of danger cues on leadership preferences (Supplementary Material, Table S3). There are several possible explanations: (1) the association between childhood SES and life history–related traits might be culture- or society-specific, as suggested by one failed replication among British participants (Pepper et al., 2017), and (2) there might be a specific mechanism for the childhood SES effects, which does not affect leadership preferences. Overall, it is important to recognize that resource availability probably do not automatically contribute to LH outcomes, and psychosocial traits might be more direct and reliable indicators of the prioritization of current or future fitness.

Taken together, a key message from these results is that to the degree that followers' leadership preferences are tied to the relative importance of different leader functions, life history–related traits that reflect current or future orientation can be used to predict these preferences across different

circumstances (e.g., danger or safe). These findings, although limited to experimental settings, can be potentially extended to explain real-life phenomena of social structure formation and leadership selection. For example, growing up in impoverished neighborhoods with high crime rates might enact behavioral traits pertaining to fast life history among young persons, who seek status via participating in dominance displays and violence (Wilson and Daly, 1985). However, an association between danger and dominance might be more adaptive within large-scale, modern societies than in small-scale societies, which have little need for interventions of dominant authorities to coordinate collective actions (Glowacki and von Rueden, 2015). Anthropological studies suggested that many small-scale societies are egalitarian and rely on prestige-based, informal leadership, rather than dominant alphas imposing their will on others through force (Boehm, 1999; Kaplan et al., 2009; von Rueden et al., 2014). Therefore, the link between fast life history–related traits and a preference for dominant leaders might ultimately reflect a need for certainty and security through group actions (Little et al., 2007). The learning- and skill-intensive foraging niche and the slow LH of humans compared with other animals might have contributed to the prevalence of human social organizations based on prestige (Kaplan et al., 2009).

There are some limitations and unanswered questions of the current research, which can be addressed by future research. First, the distinction between dominant and prestigious leaders might be more nuanced than tested in the experiments. Both dominance- and prestige-related elements might be present in modern leadership and informal leadership in small-scale societies. For example, using naturalistic and experimental paradigms, von Rueden and colleagues found that in the relative egalitarian Tsimane' forager-horticultural tribes, physical dominance and prestigious traits (e.g., knowledgeable, trustworthy) both predicted individuals' chance to be elected as leaders (Glowacki and von Rueden, 2015; von Rueden et al., 2014). However, the mixture of dominant and prestigious characteristics in leaders does not mean that people cannot distinguish dominance from prestige. Past research has shown that even children as young as 5 years old can distinguish between these two qualities in different cultures (Kajanus et al., 2020). Rather, leadership preferences might reflect a quantitative balance between these two leader qualities given different environmental demands. To further understand such balance, future research is needed to simultaneously examine multiple leadership qualities.

Another limitation has to do with the methodology. In Experiment 1, whereas the stimuli words used to connote positive and negative evaluations allowed us confidence in interpreting the observed associations as indicating an implicit preference for dominant/prestigious leaders, some of them (e.g., respect, wise) appear to lean towards the meaning of prestige. Such a semantic connection might increase the IAT effect. This

can be mitigated by using more “neutral” positive and negative words in future research. Nevertheless, given the “default” preference for prestigious social-learning models in human societies as explained earlier, it would be difficult to eliminate the semantic connection between positive valence words and prestige.

We should also take caution while causally interpreting our findings regarding the relationship between life history–related traits and leadership preferences. Many scholars have pointed out that LH patterns described by evolutionary biology mainly apply to the levels of species or populations and are not necessarily generalizable to individual differences within human populations (Baldini, 2015; Stearns and Rodrigues, *in press*; Zietsch and Sidari, *in press*). Additionally, the items taken from K-SF-42 (Figueredo et al., 2017) should not be viewed as comprehensive measures of human life history. Recently, many scholars have criticized the use of a high-order latent variable to subsume all variances of human life history and the use of psychosocial traits to represent such constructs (e.g., Copping et al., 2017; Manson et al., 2020; Richardson et al., 2017). A psychometric measure of life history–related traits cannot replace a biological/demographic assessment of population- or species-level LH strategies. Nevertheless, for the purpose of this research, we measured fast (slow) psychosocial traits as intermediaries between personal environments and evolutionarily programmed outcomes, although these traits do not automatically lead to current (future) fitness. Future research, however, would benefit from employing physiological or biological measures of LH traits that more reliably reflect investment in current (future) fitness.

Despite these limitations, the current research point to several future directions that would accrue our understanding of individual differences in leadership preferences. For instance, participants’ leadership preference might be more intimately related to the speculated functions of dominant or prestigious leaders if participants feel their choices have a real impact on their own interests or performance subsequently (as opposed to hypothetical scenarios used in Experiment 2). Therefore, complementary to our current findings, consequential leadership choices can be examined in more realistic situations (e.g., collaboration tasks in a real-life context with a longitudinal design; Redhead et al., 2019).

## Conclusion

To conclude, dominant leaders seem to have a greater appeal among current-oriented individuals than prestigious leaders, especially in dangerous situations. This provides novel evolutionarily informed explanations for political phenomena and the evolution of social organization in human society, which is largely influenced by predictable individual differences in social preferences. Importantly, human evolution might not

only have shaped dominance and prestige as status-attaining strategies but also flexible leadership preferences in response to common environmental challenges.

## Appendix 1: Examples of the Leadership Preference Scenario Task (Experiment 2)

Example Scenario and Questions:

Students attending a natural science course are asked to elect a team leader for a group research assignment. Two students, A and T, were candidates for this role.

A is admired by others for being knowledgeable and skillful but is also shame and modest. He/she sometimes let go of rewards. However, when others encounter an academic problem and ask for his/her help, he/she would always answer it patiently. He/she would never demand others to do something and would not criticize or punish others for wrongdoing.

T is known to be assertive, proactive, and enjoys expression and controlling other individuals. He/she seeks opportunities aggressively regardless of what others may want. T is good at commanding other people and can pressure others into doing what he/she wants. T is arrogant toward those who are below him/her, and would not hesitate to criticize others for their wrongdoings.

Who would you choose to be the team leader?

A  T  Don’t Know.

Who would you expect to be the team leader, given your experience of similar situations?

A  T  Don’t Know.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s40806-020-00274-6>.

**Authors’ Contributions** Conceptualization: Nan Zhu, Binbin Chen, and Lei Chang; Methodology: Nan Zhu, Binbin Chen, and Hui Jing Lu; Formal analysis and investigation: Nan Zhu and Hui Jing Lu; Writing—original draft preparation: Nan Zhu; Writing—review and editing: Binbin Chen, Hui Jing Lu, and Lei Chang; Supervision: Lei Chang.

**Data Availability** Data for both experiments reported in the manuscript is available on Mendeley Data at <https://data.mendeley.com/datasets/zbgng5w7g/2>.

## Compliance with Ethical Standards

**Conflicts of Interest** The authors declare that they have no conflict of interest.

**Ethics Approval** The research was waived from ethical approval by the Institutional Review Board of Fudan University.

**Consent to Participate** All participants signed a written consent form indicating their understanding of the research and their rights, which was read to them by the researchers before participating in the experiments.

## References

- Ames, D. R., & Flynn, F. J. (2007). What breaks a leader: the curvilinear relation between assertiveness and leadership. *Journal of Personality and Social Psychology*, *92*(2), 307–324. <https://doi.org/10.1037/0022-3514.92.2.307>.
- Baldini, R. (2015). Harsh environments and “fast” human life histories: what does the theory say? *BioRxiv*, 014647. <https://doi.org/10.1101/014647>.
- Balliet, D., Mulder, L. B., & Van Lange, P. A. M. (2011). Reward, punishment, and cooperation: a meta-analysis. *Psychological Bulletin*, *137*(4), 594–615. <https://doi.org/10.1037/a0023489>.
- Barkow, J. H. (1975). Prestige and culture: a biosocial interpretation. *Current Anthropology*, *16*(4), 553–572. <https://doi.org/10.1086/201619>.
- Belsky, J., Schlomer, G. L., & Ellis, B. J. (2012). Beyond cumulative risk: distinguishing harshness and unpredictability as determinants of parenting and early life-history strategy. *Developmental Psychology*, *48*(3), 662–673. <https://doi.org/10.1037/a0024454>.
- Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: an evolutionary theory of socialization. *Child Development*, *62*(4), 647–670. <https://doi.org/10.1111/j.1467-8624.1991.tb01558.x>.
- Bendor, J. (1993). Uncertainty and the evolution of cooperation. *Journal of Conflict Resolution*, *37*(4), 709–734. <https://doi.org/10.1177/0022002793037004007>.
- Boehm, C. (1999). *Hierarchy in the forest*. London: Harvard University Press.
- Boyd, R., Gintis, H., & Bowles, S. (2010). Coordinated punishment of defectors sustains cooperation and can proliferate when rare. *Science*, *328*(5978), 617–620. <https://doi.org/10.1126/science.1183665>.
- Boyd, R., & Richerson, P. J. (1985). *Culture and the evolutionary process*. University of Chicago Press.
- Boyd, R., & Richerson, P. J. (1995). Why does culture increase adaptability? *Ethology & Sociobiology*, *16*(2), 125–143. [https://doi.org/10.1016/0162-3095\(94\)00073-G](https://doi.org/10.1016/0162-3095(94)00073-G).
- Boyd, R., & Richerson, P. J. (2005). *The origin and evolution of cultures*. New York: Oxford University Press.
- Brumbach, B. H., Figueredo, A. J., & Ellis, B. J. (2009). Effects of harsh and unpredictable environments in adolescence on development of life history strategies. *Human Nature*, *20*(1), 25–51. <https://doi.org/10.1007/s12110-009-9059-3>.
- Chagnon, N. A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, *239*(4843), 985–992. <https://doi.org/10.1126/science.239.4843.985>.
- Chance, M. R. A., & Jolly, C. J. (1970). *Social groups of monkeys, apes and men*. London: Jonathan Cape.
- Chang, L., & Lu, H. (2017). Environmental risks. In T. K. Shackelford & V. Weekes–Shackelford (Eds.), *Encyclopedia of evolutionary psychological sciences*. New York: Springer Meteor.
- Chang, L., Mak, M. C., Li, T., Wu, B. P., Chen, B. B., & Lu, H. J. (2011). Cultural adaptations to environmental variability: an evolutionary account of East-West differences. *Educational Psychology Review*, *23*(1), 99–129. <https://doi.org/10.1007/s10648-010-9149-0>.
- Cheng, J. T., Tracy, J. L., Foulsham, T., Kingstone, A., & Henrich, J. (2013). Two ways to the top: evidence that dominance and prestige are distinct yet viable avenues to social rank and influence. *Journal of Personality and Social Psychology*, *104*(1), 103–125. <https://doi.org/10.1037/a0030398>.
- Cheng, J. T., Tracy, J. L., & Henrich, J. (2010). Pride, personality, and the evolutionary foundations of human social status. *Evolution and Human Behavior*, *31*(5), 334–347. <https://doi.org/10.1016/j.evolhumbehav.2010.02.004>.
- Chudek, M., & Henrich, J. (2011). Culture–gene coevolution, norm-psychology and the emergence of human prosociality. *Trends in Cognitive Sciences*, *15*(5), 218–226. <https://doi.org/10.1016/j.tics.2011.03.003>.
- Copping, L. T., Campbell, A., Muncer, S., & Richardson, G. B. (2017). The psychometric evaluation of human life histories: a reply to Figueredo, Cabeza de Baca, Black, Garcia, Fernandes, Wolf, and Woodley (2015). *Evolutionary Psychology*, *15*(1). <https://doi.org/10.1177/1474704916663727>.
- Del Giudice, M. (in press). Rethinking the fast-slow continuum of individual differences. *Evolution and Human Behavior*. <https://doi.org/10.1016/j.evolhumbehav.2020.05.004>.
- Del Giudice, M., & Belsky, J. (2010). The development of life-history strategies: toward a multi-stage theory. In D. M. Buss & P. H. Hawley (Eds.), *The evolution of personality and individual differences* (pp. 154–176). New York, NY: Oxford University Press.
- Del Giudice, M. D., Gangestad, S. W., & Kaplan, H. S. (2015). Life history theory and evolutionary psychology. In D. M. Buss (ed.), *The handbook of evolutionary psychology* (pp. 88–114). Hoboken, NJ: Wiley. <https://doi.org/10.1002/9781119125563.evpsych102>.
- Ellis, B. J., Figueredo, A. J., Brumbach, B. H., & Schlomer, G. L. (2009). Fundamental dimensions of environmental risk. *Human Nature*, *20*(2), 204–268. <https://doi.org/10.1007/s12110-009-9063-7>.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. <https://doi.org/10.3758/BF03193146>.
- Figueredo, A. J., Garcia, R. A., Menke, J. M., Jacobs, W. J., Gladden, P. R., Bianchi, J., & Jiang, Y. (2017). The K-SF-42: a new short form of the Arizona Life History Battery. *Evolutionary Psychology*, *15*(1), 1474704916676276. <https://doi.org/10.1177/1474704916676276>.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., Schneider, S. M., Sefcek, J. A., Tal, I. R., & Jacobs, W. J. (2006). Consilience and life history theory: from genes to brain to reproductive strategy. *Developmental Review*, *26*(2), 243–275. <https://doi.org/10.1016/j.dr.2006.02.002>.
- Figueredo, A. J., Vásquez, G., Brumbach, B. H., Sefcek, J. A., Kirsner, B. R., & Jacobs, W. J. (2005). The K-factor: Individual differences in life history strategy. *Personality and Individual Differences*, *39*(8), 1349–1360. <https://doi.org/10.1016/j.paid.2005.06.009>.
- Flinn, M. V., Geary, D. C., & Ward, C. V. (2005). Ecological dominance, social competition, and coalitionary arms races: why humans evolved extraordinary intelligence. *Evolution and Human Behavior*, *26*(1), 10–46. <https://doi.org/10.1016/j.evolhumbehav.2004.08.005>.
- Gawronski, B. (2002). What does the Implicit Association Test measure? A test of the convergent and discriminant validity of prejudice-related IATs. *Experimental Psychology*, *49*(3), 171–180. <https://doi.org/10.1026/1618-3169.49.3.171>.
- Geary, D. C. (2002). Sexual selection and human life history. *Advances in Child Development and Behavior*, *30*, 41–101. [https://doi.org/10.1016/S0065-2407\(02\)80039-8](https://doi.org/10.1016/S0065-2407(02)80039-8).
- Glowacki, L., & von Rueden, C. (2015). Leadership solves collective action problems in small-scale societies. *Philosophical*

- Transactions of the Royal Society B: Biological Sciences*, 370(1683), 20150010. <https://doi.org/10.1098/rstb.2015.0010>.
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. *Psychological Review*, 102(1), 4–27. <https://doi.org/10.1037/0033-295X.102.1.4>.
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: the implicit association test. *Journal of Personality and Social Psychology*, 74(6), 1464–1480. <https://doi.org/10.1037/0022-3514.74.6.1464>.
- Griskevicius, V., Ackerman, J. A., Cantú, S. M., Delton, A. W., Robertson, T. E., Simpson, J. A., et al. (2013). When the economy falters do people spend or save? Responses to resource scarcity depend on childhood environment. *Psychological Science*, 24(2), 197–205. <https://doi.org/10.1177/0956797612451471>.
- Griskevicius, V., Delton, A. W., Robertson, T. E., & Tybur, J. M. (2011). Environmental contingency in life history strategies: the influence of mortality and socioeconomic status on reproductive timing. *Journal of Personality and Social Psychology*, 100(2), 241–254. <https://doi.org/10.1037/a0021082>.
- Griskevicius, V., Tybur, J. M., Delton, A. W., & Robertson, T. E. (2011). The influence of mortality and socioeconomic status on risk and delayed rewards: a life history theory approach. *Journal of Personality and Social Psychology*, 100(6), 1015–1026. <https://doi.org/10.1037/a0022403>.
- Henrich, J., Chudek, M., & Boyd, R. (2015). The Big Man Mechanism: how prestige fosters cooperation and creates prosocial leaders. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370(1683), 20150013. <https://doi.org/10.1098/rstb.2015.0013>.
- Henrich, J., Ensminger, J., McElreath, R., Barr, A., Barrett, C., Bolyanatz, A., & Lesorogol, C. (2010). Markets, religion, community size, and the evolution of fairness and punishment. *Science*, 327(5972), 1480–1484. <https://doi.org/10.1126/science.1182238>.
- Henrich, J., & Gil-White, F. J. (2001). The evolution of prestige: freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, 22(3), 165–196. [https://doi.org/10.1016/S1090-5138\(00\)00071-4](https://doi.org/10.1016/S1090-5138(00)00071-4).
- Hofmann, W., Gawronski, B., Gschwendner, T., Le, H., & Schmitt, M. (2005). A meta-analysis on the correlation between the Implicit Association Test and explicit self-report measures. *Personality and Social Psychology Bulletin*, 31(10), 1369–1385. <https://doi.org/10.1177/0146167205275613>.
- Hooper, P. L., Kaplan, H. S., & Boone, J. L. (2010). A theory of leadership in human cooperative groups. *Journal of Theoretical Biology*, 265(4), 633–646. <https://doi.org/10.1016/j.jtbi.2010.05.034>.
- Kajanus, A., Afshordi, N., & Warneken, F. (2020). Children's understanding of dominance and prestige in China and the UK. *Evolution and Human Behavior*, 41(1), 23–34. <https://doi.org/10.1016/j.evolhumbehav.2019.08.002>.
- Kaplan, H. S., Hooper, P. L., & Gurven, M. (2009). The evolutionary and ecological roots of human social organization. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1533), 3289–3299. <https://doi.org/10.1098/rstb.2009.0115>.
- Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology*, 74(3), 763–773. <https://doi.org/10.1037/0022-3514.74.3.763>.
- Little, A. C., Burriss, R. P., Jones, B. C., & Roberts, S. C. (2007). Facial appearance affects voting decisions. *Evolution and Human Behavior*, 28(1), 18–27. <https://doi.org/10.1016/j.evolhumbehav.2006.09.002>.
- Manson, J. H., Chua, K. J., & Lukaszewski, A. W. (2020). The Structure of the Mini-K and K-SF-42. *Human Nature*, 31(3), 322–340. <https://doi.org/10.1007/s12110-020-09373-6>.
- Mittal, C., & Griskevicius, V. (2014). Sense of control under uncertainty depends on people's childhood environment: A life history theory approach. *Journal of Personality and Social Psychology*, 107(4), 621–637. <https://doi.org/10.1037/a0037398>.
- Nesse, R. M. (2007). Runaway social selection for displays of partner value and altruism. *Biological Theory*, 2(2), 143–155. <https://doi.org/10.1162/biot.2007.2.2.143>.
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2005). Understanding and using the Implicit Association Test: II. Method variables and construct validity. *Personality and Social Psychology Bulletin*, 31(2), 166–180. <https://doi.org/10.1177/0146167204271418>.
- O'Gorman, R., Henrich, J., & Van Vugt, M. (2009). Constraining free riding in public goods games: designated solitary punishers can sustain human cooperation. *Proceedings of the Royal Society B: Biological Sciences*, 276(1655), 323–329. <https://doi.org/10.1098/rspb.2008.1082>.
- Olson, M. A., & Fazio, R. H. (2004). Reducing the influence of extrapersonal associations on the implicit association test: personalizing the IAT. *Journal of Personality and Social Psychology*, 86(5), 653–667. <https://doi.org/10.1037/0022-3514.86.5.653>.
- Panchanathan, K., & Boyd, R. (2003). A tale of two defectors: the importance of standing for evolution of indirect reciprocity. *Journal of Theoretical Biology*, 224(1), 115–126. [https://doi.org/10.1016/S0022-5193\(03\)00154-1](https://doi.org/10.1016/S0022-5193(03)00154-1).
- Pepper, G. V., Corby, D. H., Bamber, R., Smith, H., Wong, N., & Nettle, D. (2017). The influence of mortality and socioeconomic status on risk and delayed rewards: a replication with British participants. *PeerJ*, 5, e3580. <https://doi.org/10.7717/peerj.3580>.
- Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. F. (1994). Social dominance orientation: a personality variable predicting social and political attitudes. *Journal of Personality and Social Psychology*, 67(4), 741–763. <https://doi.org/10.1037/0022-3514.67.4.741>.
- Rapoport, A., Budescu, D. V., Suleiman, R., & Weg, E. (1992). Social dilemmas with uniformly distributed resources. In W. B. G. Liebrand, D. M. Messick, & H. A. M. Wilke (Eds.), *International series in experimental social psychology. Social dilemmas: Theoretical issues and research findings* (pp. 43–57). Elmsford, NY, US: Pergamon Press.
- Redhead, D., Cheng, J. T., Driver, C., Foulsham, T., & O'Gorman, R. (2019). On the dynamics of social hierarchy: a longitudinal investigation of the rise and fall of prestige, dominance, and social rank in naturalistic task groups. *Evolution and Human Behavior*, 40(2), 222–234. <https://doi.org/10.1016/j.evolhumbehav.2018.12.001>.
- Richardson, G. B., Sanning, B. K., Lai, M. H., Copping, L. T., Hardesty, P. H., & Kruger, D. J. (2017). On the psychometric study of human life history strategies: state of the science and evidence of two independent dimensions. *Evolutionary Psychology*, 15(1), 1474704916666840. <https://doi.org/10.1177/1474704916666840>.
- Ridgeway, C., & Diekema, D. (1989). Dominance and collective hierarchy formation in male and female task groups. *American Sociological Review*, 54(1), 79–93. <https://doi.org/10.2307/2095663>.
- Roff, D. A. (1992). *The evolution of life histories: theory and analysis*. New York: Chapman & Hall.
- Rudman, L. A., & Ashmore, R. D. (2007). Discrimination and the implicit association test. *Group Processes & Intergroup Relations*, 10(3), 359–372. <https://doi.org/10.1177/1368430207078696>.
- Sadalla, E. K., Kenrick, D. T., & Vershure, B. (1987). Dominance and heterosexual attraction. *Journal of Personality and Social Psychology*, 52(4), 730–738. <https://doi.org/10.1037/0022-3514.52.4.730>.
- Schaller, M., Park, J. H., & Mueller, A. (2003). Fear of the dark: Interactive effects of beliefs about danger and ambient darkness on ethnic stereotypes. *Personality and Social Psychology Bulletin*, 29(5), 637–649. <https://doi.org/10.1177/0146167203029005008>.

- Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-Prime reference guide*. Pittsburgh, PA: Psychology Software Tools Inc.
- Sidanius, J., & Pratto, F. (2001). *Social dominance: an intergroup theory of social hierarchy and oppression*. Cambridge University Press.
- Snyder, J. K., Kirkpatrick, L. A., & Barrett, H. C. (2008). The dominance dilemma: do women really prefer dominant mates? *Personal Relationships*, *15*(4), 425–444. <https://doi.org/10.1111/j.1475-6811.2008.00208.x>.
- Stearns, S. C., & Rodrigues, A. M. (in press). On the use of “life history theory” in evolutionary psychology. *Evolution and Human Behavior*. <https://doi.org/10.1016/j.evolhumbehav.2020.02.001>.
- Tracy, J. L., & Robins, R. W. (2007). The psychological structure of pride: a tale of two facets. *Journal of Personality and Social Psychology*, *92*(3), 506–525. <https://doi.org/10.1037/0022-3514.92.3.506>.
- Van Vugt, M., Hogan, R., & Kaiser, R. B. (2008). Leadership, followership, and evolution: some lessons from the past. *American Psychologist*, *63*(3), 182–196. <https://doi.org/10.1037/0003-066X.63.3.182>.
- von Rueden, C., Gurven, M., Kaplan, H., & Stieglitz, J. (2014). Leadership in an egalitarian society. *Human Nature*, *25*(4), 538–566. <https://doi.org/10.1007/s12110-014-9213-4>.
- Werner, D. (1982). Chiefs and presidents: A comparison of leadership traits in the United States and among the Mekranoti-Kayapo of Central Brazil. *Ethos*, *10*(2), 136–148. <https://doi.org/10.1525/eth.1982.10.2.02a00030>.
- Wilson, M., & Daly, M. (1985). Competitiveness, risk taking, and violence: The young male syndrome. *Ethology and Sociobiology*, *6*(1), 59–73. [https://doi.org/10.1016/0162-3095\(85\)90041-X](https://doi.org/10.1016/0162-3095(85)90041-X).
- Wit, A., & Wilke, H. (1998). Public good provision under environmental and social uncertainty. *European Journal of Social Psychology*, *28*(2), 249–256. [https://doi.org/10.1002/\(SICI\)1099-0992\(199803/04\)28:2249::AID-EJSP8683.0.CO;2-J](https://doi.org/10.1002/(SICI)1099-0992(199803/04)28:2249::AID-EJSP8683.0.CO;2-J).
- Zhu, N., Hawk, S. T., & Chang, L. (2018). Living slow and being moral. *Human Nature*, *29*(2), 186–209. <https://doi.org/10.1007/s12110-018-9313-7>.
- Zhu, N., Hawk, S. T., & Chang, L. (2019). Unpredictable and competitive cues affect prosocial behaviors and judgments. *Personality and Individual Differences*, *138*, 203–211. <https://doi.org/10.1016/j.paid.2018.10.006>.
- Zietsch, B. P., & Sidari, M. J. (in press). A critique of life history approaches to human trait covariation. *Evolution and Human Behavior*. <https://doi.org/10.1016/j.evolhumbehav.2019.05.007>.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## Terms and Conditions

Springer Nature journal content, brought to you courtesy of Springer Nature Customer Service Center GmbH (“Springer Nature”).

Springer Nature supports a reasonable amount of sharing of research papers by authors, subscribers and authorised users (“Users”), for small-scale personal, non-commercial use provided that all copyright, trade and service marks and other proprietary notices are maintained. By accessing, sharing, receiving or otherwise using the Springer Nature journal content you agree to these terms of use (“Terms”). For these purposes, Springer Nature considers academic use (by researchers and students) to be non-commercial.

These Terms are supplementary and will apply in addition to any applicable website terms and conditions, a relevant site licence or a personal subscription. These Terms will prevail over any conflict or ambiguity with regards to the relevant terms, a site licence or a personal subscription (to the extent of the conflict or ambiguity only). For Creative Commons-licensed articles, the terms of the Creative Commons license used will apply.

We collect and use personal data to provide access to the Springer Nature journal content. We may also use these personal data internally within ResearchGate and Springer Nature and as agreed share it, in an anonymised way, for purposes of tracking, analysis and reporting. We will not otherwise disclose your personal data outside the ResearchGate or the Springer Nature group of companies unless we have your permission as detailed in the Privacy Policy.

While Users may use the Springer Nature journal content for small scale, personal non-commercial use, it is important to note that Users may not:

1. use such content for the purpose of providing other users with access on a regular or large scale basis or as a means to circumvent access control;
2. use such content where to do so would be considered a criminal or statutory offence in any jurisdiction, or gives rise to civil liability, or is otherwise unlawful;
3. falsely or misleadingly imply or suggest endorsement, approval, sponsorship, or association unless explicitly agreed to by Springer Nature in writing;
4. use bots or other automated methods to access the content or redirect messages
5. override any security feature or exclusionary protocol; or
6. share the content in order to create substitute for Springer Nature products or services or a systematic database of Springer Nature journal content.

In line with the restriction against commercial use, Springer Nature does not permit the creation of a product or service that creates revenue, royalties, rent or income from our content or its inclusion as part of a paid for service or for other commercial gain. Springer Nature journal content cannot be used for inter-library loans and librarians may not upload Springer Nature journal content on a large scale into their, or any other, institutional repository.

These terms of use are reviewed regularly and may be amended at any time. Springer Nature is not obligated to publish any information or content on this website and may remove it or features or functionality at our sole discretion, at any time with or without notice. Springer Nature may revoke this licence to you at any time and remove access to any copies of the Springer Nature journal content which have been saved.

To the fullest extent permitted by law, Springer Nature makes no warranties, representations or guarantees to Users, either express or implied with respect to the Springer nature journal content and all parties disclaim and waive any implied warranties or warranties imposed by law, including merchantability or fitness for any particular purpose.

Please note that these rights do not automatically extend to content, data or other material published by Springer Nature that may be licensed from third parties.

If you would like to use or distribute our Springer Nature journal content to a wider audience or on a regular basis or in any other manner not expressly permitted by these Terms, please contact Springer Nature at

[onlineservice@springernature.com](mailto:onlineservice@springernature.com)