Title: Childhood harshness predicts long-lasting leader preferences

Safra, L.¹, Algan, Y.², Tecu, T.³, Grèzes, J.¹, Baumard, N.⁴, Chevallier, C.¹

¹ *Ecole Normale Supérieure, PSL Research University, Département d'études cognitives, Inserm, U960, Laboratoire de Neurosciences Cognitives (LNC), F-75005 Paris, France*

² *SciencesPo, Department of Economics, Paris, France*

³ *University of Bucharest, Faculty of Philosophy, Bucharest, Romania*

⁴ *Ecole Normale Supérieure, PSL Research University, Département d'études cognitives, CNRS, UMR8129, Institut Jean-Nicod, F-75005 Paris, France*

Corresponding authors: Lou Safra & Coralie Chevallier

Address: Ecole Normale Supérieure, PSL Research University, Département d'études cognitives, Inserm, U960, Laboratoire de Neurosciences Cognitives (LNC), F-75005 Paris, France

Telephone number: +33 679 812 74

Email: lou.safra@gmail.com, coralie.chevallier@gmail.com

Word count: 4 745

1 **Abstract:**

2 Understanding the origins of political authoritarianism is of key importance for modern
3 democracies. Recent works in evolutionary psychology suggest that human cognitive
4 preferences may be the output of a biological response to early stressful environments. In this
5 paper, we hypothesized that people's leader preferences are partly driven by early signals of
6 harshness perceived during childhood. We experimentally elicited children's (Study 1) and
7 adults' (Study 2) political preferences using faces controlled for dominance and trustworthiness
8 and showed that early childhood harshness has an enduring effect on adult political attitudes.
9 Importantly, this impact was further confirmed using self-reported extreme authoritarianism
10 (Study 2) and by the analysis of the large database of the European Value Survey (Study 3). We
11 discuss the potential political implications of this early calibration of leader preferences.

12
13 **Keywords:**

14 Authoritarianism; poverty; childhood; social perception; dominance; politics
15
16

Main Text:

For decades, empirical works have demonstrated that environmental harshness systematically impacts political preferences. Perceived threat to safety and dangerous worldviews indeed correlates with right-wing authoritarianism (Onraet, Dhont, & Hiel, 2014; Sibley, Wilson, & Duckitt, 2007), and threatening or war scenarios systematically induce a preference for taller, more masculine, more dominant and less trustworthy leaders (Laustsen & Petersen, 2015; Little, Roberts, Jones, & DeBruine, 2012; Re, DeBruine, Jones, & Perrett, 2013). Importantly, this authoritarianism shift also appears in response to non-political threats. For instance, pathogen- and disease-avoidance, a major issue in human evolution, correlate with the degree of authoritarianism at the country level (Murray, Schaller, & Suedfeld, 2013; Thornhill, Fincher, & Aran, 2009) and at the individual level (see Terrizzi Jr., Shook, & McDaniel, 2013 for a meta-analysis). Taken together, these studies suggest that the preference for strong leaders is a deeply rooted evolutionary response to external stressors.

However, cues from individuals' current environment are not the only signals impacting behavior. Signals perceived during childhood are indeed crucial to calibrate current and future behaviors (Bateson et al., 2004; Nettle, Frankenhuys, & Rickard, 2013). Environmental childhood provides cues about the kind of environment individuals will likely face as adults or the kind of somatic resources they can rely on for their development (Nettle et al., 2013). In line with this idea, empirical research shows that phenotypes are adjusted to early conditions through multiple developmental mechanisms (Frankenhuis, Panchanathan, & Nettle, 2016). For instance, non-human animals who experience a period of high stress in the juvenile period go on to be more present-orientated, and to prioritize immediate survival and reproduction over

long-term benefits (Bateson et al., 2004). Similarly, people born with low birth-weight or who experience psychosocial stress and family disruption in childhood mature earlier and have their first child sooner than control populations (Adair, 2001; Nettle, Coall, & Dickins, 2011; Sloboda, Hart, Doherty, Pennell, & Hickey, 2007). Harshness in early stages of development also induces important changes in social cognition. For example, independently of their socioeconomic status later in life, adults who grew up in stressful environments are more sensitive to social threats and negative emotions, which may be adaptive in more competitive and violent environments (Javanbakht et al., 2015; Kim et al., 2013). The goal of the present paper is to study whether leader preferences are also influenced by cues of childhood harshness, independently of individuals' current circumstances. To test this hypothesis, we relied on a robust measure of harshness in childhood: resource deprivation. Childhood resource deprivation indeed reflects both lower levels of resources and increased instability and exposure to adverse events (Evans, 2004). In other words, resource deprivation constitutes an interesting proxy for the level of external stress experienced during childhood. Therefore, we assess the impact of deprivation during childhood on children's leader preferences (Study 1) and then evaluate their lasting effect in adulthood (Studies 2 & 3).

To measure leader preferences consistently in children and in adults, we relied on participants' perception of faces. Extensive research in psychology has indeed shown that facial cues are used for leader choice both in adults and children, and that their use reliably predicts election outcomes (Antonakis & Dalgas, 2009; Olivola & Todorov, 2010; Todorov, Mandisodza, Goren, & Hall, 2005). In addition, cross-national studies and experimental manipulations have shown that the importance granted to specific facial cues such as trustworthiness or dominance

is sensitive to environmental factors (Laustsen & Petersen, 2015; Little et al., 2012). Similarly, real-life political differences between Democrats and Republicans have been linked with stable differences in facial preferences when choosing a leader (Laustsen & Petersen, 2015; Olivola, Sussman, Tsetsos, Kang, & Todorov, 2012). These results suggest that people's reliance on specific facial cues to choose a leader is a reliable proxy of their actual political preferences.

In the present project, we exploited the differential impact of dominance and trustworthiness in social judgments (Oosterhof & Todorov, 2008) to investigate the impact of childhood deprivation on the preference for authoritarian leaders. More precisely, we used faces controlled for both dominance and trustworthiness to measure how early adverse experience may shape the use these two facial cues for choosing a leader. Finally, we confirmed the association between leader preferences and childhood deprivation by analyzing the impact of self-reported extreme authoritarianism in a nationally representative sample of French adults (Study 2) and in a large-scale survey on 46 European countries (Study 3, European Values Study Longitudinal Data File 1981-2008 (EVS 1981-2008), 2015).

1. Study 1

The aim of this first study was to investigate the immediate effect of childhood poverty on children's preference for strong leaders. To do so, we adapted an existing experimental design that successfully elicits political preferences in children (Antonakis & Dalgas, 2009).

1. 1. Materials and Methods

1. 1. 1. Participants

41 children from the city of Slatina, Romania, aged 6 to 8 years ($M = 6.85 \pm 0.13$ years; results are given in the standard form: mean $\pm$ 95% confidence intervals) were recruited in two schools situated in a deprived neighborhood and in a working-class neighborhood, about 1 km away from the city center. A minimum target of 20 participants per group was pre-planned based on the number of 6 to 8 year-olds in the lower-SES school; the exact number was determined by scheduling constraints and by the number of parental consent forms we received. The study was approved by the schools' management team and by the School Inspectorate. Parents signed a written informed consent form and children provided verbal assent at the start of the procedure. All study procedures complied with the Declaration of Helsinki. Children received a small gift to thank them for their participation.

Two *Childhood Deprivation Groups (Deprived and Not Deprived)* were formed based on children's neighborhood. Because neighborhood status may interact with children's status, we excluded children whose parental income did not match their neighborhood's status. With this goal in mind, we asked parents whether their income was above or below the legal minimum wage in Romania (i.e. 850 lei per month, which corresponds approximately to 216\$). One participant was excluded in the *Deprived Group* and one was excluded in the *Not Deprived Group* resulting in 20 participants in the *Deprived Group* and 19 in the *Not Deprived Group*. The two groups were further characterized by lack of material possessions and lower access to cultural activities, they had younger and less educated parents, more siblings and more crowded houses and more unstable families (all $ps < .035$; Table S1). Children in the *Deprived*

and Not Deprived Childhood Groups were matched on age ($t(37) = 0.19, p > .250$) and gender ratio ($\chi^2(1, N = 39) = 0.62, p > .250$; Table S1).

1. 1. 2. Procedure and analysis

Following Antonakis & Dalgas (Antonakis & Dalgas, 2009), we asked children to choose the individual they would prefer as the captain of their team to go on a mountain trip. They had to repeat this choice five times, on five different pairs of faces. Each pair included two versions of a single avatar identity: a more dominant one and a more trustworthy one (Figure 1A). The identities were selected by a native Romanian to match the most common types of faces in Romania. Morphs were created with the XxMorphs freeware and using the Facegen 3.1 open database (Oosterhof & Todorov, 2008). The more dominant faces corresponded to a 50% morph between a 3-point dominant and a 1-point trustworthy face. Theoretically, the obtained average faces were 1.5-point dominant and 0.5-point Trustworthy. Symmetrically, the more trustworthy faces corresponded to a morph between a 1-point dominant and a 3-point trustworthy face, resulting in 0.5-point dominant and 1.5-point trustworthy faces.

Validation of the stimuli by 60 Amazon MTurkers (MTurk, <http://www.mturk.com>) confirmed that the more dominant faces were judged as more dominant and less trustworthy than the more trustworthy faces (mean of participants' correct identification rate: most dominant face: $86\% \pm 6\%$; most trustworthy face: $79\% \pm 6\%$; mean percentage of correct identification for each face: most dominant face: $86\% \pm 4\%$; most trustworthy face: $79\% \pm 13\%$). The pairs were presented in a random order and the position of the more dominant face (on the right or on the

left of the more trustworthy face) was counterbalanced between pairs. The task lasted approximately 5 minutes.

The impact of *Childhood Deprivation* on the probability of choosing the more dominant face was investigated using a logistic regression taking *Childhood Deprivation* as a predictor. All the results obtained with this model were confirmed using *Parental income status* instead of *Childhood Deprivation* as the predictor (See Supplementary Information).

1. 2. Results

In line with our hypotheses, children experiencing deprivation were more likely to choose the more dominant and less trustworthy face as the captain for their team (logistic regression: $b = 0.68 \pm 0.57$, $z = 2.33$, $p = .020$). This difference was explained by a preference for strong leaders in the, most deprived group only ($M = 0.62 \pm .11$, $t(19) = 2.30$, $p = .033$; Least deprived group: $M = 0.45 \pm .10$, $t(18) = -0.99$, $p = .337$).

1. 3. Conclusions

This first study demonstrates that children's leader preferences are sensitive to their environment and deprivation biased these preferences towards strong leaders. Thus, in a second study, we investigate the long-lasting impact of early exposure to stressors on a nationally representative sample of adults with diverse socio-economic backgrounds.

143

144 **2. Study 2**

145 Adult participants had to choose who they would vote for in a national election between avatar
146 faces parametrically varying on trustworthiness and dominance. Participants also reported their
147 preference for authoritarian leaders to investigate the relationship between childhood
148 deprivation and explicit authoritarian attitudes.

149

150 **2. 1. Materials and Methods**

151 *2. 1. 1. Participants*

152 The number of subjects was fixed a priori with IPSOS polling institute to constitute a sample
153 that was representative of the French population for age, gender, geographical region, urban
154 vs. rural and occupation (quota method). 1006 French participants (544 women) aged 16 to 83
155 years old (47.42 ± 1.01 years) participated in this online study. Each participant received a
156 description of the study and provided their informed consent before starting the experiment.
157 Following IPSOS' policy, participants were not paid to take part in the study. The experiment
158 lasted around 15 minutes.

159

160 *2. 1. 2. Procedure*

The procedure for this experiment was a standard discrete choice task (McFadden, 1980, see Figure 1A). This methodology was validated in two pre-test experiments, see Supplementary Information Study S1 & S2 for details.

The experiment was programmed in Javascript. Eight avatar faces, generated via FaceGen 3.1 software and controlled for their level of trustworthiness and dominance were used for this experiment. These faces have already been successfully demonstrated to elicit dominance and trustworthiness judgments both at the explicit and implicit level (Stewart et al., 2012). These faces spanned every possible combination of dominance and trustworthiness in a range of -2 to +2 points with an increment of 2 points (Oosterhof & Todorov, 2008) and were regularly spaced on both dominance and trustworthiness. In each presented pair, the faces were 2 to 4 points different from each other on at least one dimension (dominance or trustworthiness). This resulted in 36 pairs of faces.

Each trial began with a central fixation cross presented for 300 ms. The two faces were then presented simultaneously. Participants had to select who they would vote for in a national election, and had up to 2 seconds to answer by pressing “e” for the face on the left and “p” for the face on the right. If they failed to answer within 2 seconds, the next trial was automatically presented. A blank page was presented for around 100 ms after each trial. The 36 possible pairs of faces were presented in a random order. The presentation position of the faces (the more trustworthy face on the left or on the right) of each pair was randomized.

At the beginning of the experiment, participants filled a questionnaire designed to measure their subjective level of resources in childhood and adulthood on 100-point scales (Griskevicius, Tybur, Delton, & Robertson, 2011). This questionnaire has been used in multiple studies

demonstrating a link between childhood poverty and adult behaviors, independently of participants' current level of resources (e.g., Griskevicius et al., 2013). Following the literature, we used participants' current level of resources as a control variable to investigate the independent effect of childhood poverty. In addition, participants also completed two other validated questionnaires: one on negative household affect (Bernstein et al., 1994) and one on parental care (Mikach & Bailey, 1999). At the end of the experiment, participants had to indicate their agreement with the sentence "I think having a strong leader who does not have to bother with parliament and elections is a good thing" on a 4-point scale. This self-reported measure of participants' preference for a strong leader was used to assess the link between our experimental measure and explicit political attitudes. Extreme authoritarianism was defined as strong agreement with this sentence.

Eighty-six participants were excluded for not meeting basic quality checks such as indicating their gender consistently at two different times of the procedure. Reaction times inferior to 200 ms were discarded (mean reaction time of the included participants before filtering: 1.16 ± 0.02 s). Thirty-six participants were excluded for pressing the same key on more than 90% of the trials, thirty-five participants were excluded for having given responses with a reaction time superior to 200 ms in less than half the trials and one participant was excluded for not having given any response with a reaction time superior to 200 ms. Twenty-four participants were excluded for not having given any response. The analyses were performed on 818 participants.

2. 1. 3. Childhood Deprivation Measure

In economics, poverty is defined as an income below 50% of the median income of the population (e.g., Alesina, Glaeser, & Sacerdote, 2001). We applied this definition to participants' subjective levels of resources. The subjective poverty line was computed on a sample constituted of the 1006 participants from Study 2 and 685 additional participants drawn from the same population ($N = 1691$ in total). Poverty thresholds were set at a score of 65.5 for *Childhood Deprivation (Deprived or Not Deprived Childhood Groups)* and 76.5 for *Current Resources (Low or Middle Current Resources Groups)*. 163 participants were included in the *Deprived Childhood Group* and 649 in the *Not Deprived Childhood Group*. In the older subsample (662 participants), 138 participants were included in the *Deprived Childhood Group* and 524 in the *Not Deprived Childhood Group*.

2. 1. 4. Subjective Maltreatment and Parental Care

Two categories, similar to those for Childhood and Current Deprivation were created for Subjective Maltreatment and Parental Care. The *Negative Household Affect* threshold was set to a score of 115 resulting in 95 participants included in the *Negative Household Affect Group* and 723 included in the *Not Negative Household Affect Group*. For Parental Care, the threshold was set to a score of 125 and 81 participants were included in the *Low Parental Care Group* and 737 in the *Middle Parent Care Group*.

2. 1. 5. Pre-analyses

We first checked that participants from the two Childhood Deprivation Groups did not differ in their performance to the task. As no objective measure of accuracy was available for this preference task, we used mean reaction times and number of valid trials as measures of task performance. Importantly, the two groups did not differ on these basic performance measures (Reaction times - *Not Deprived Childhood Group*: $M = 1164.65 \pm 18.93$; *Deprived Childhood Group*: $M = 1159.69 \pm 37.95$; $t(816) = 0.23$, $p > .250$; number of valid trials - *Not Deprived Childhood Group*: $M = 33.25 \pm 0.25$; *Deprived Childhood Group*: $M = 33.75 \pm 0.47$; $t(816) = -0.12$, $p > .250$). Therefore, it appears that the two groups differed neither on their attention to or in their comprehension of the task.

2. 1. 6. Analyses

As recommended by McFadden in his seminal paper on choice experiments (McFadden, 1980), choices were analysed using mixed logit logistic regression for each subject, taking trial number and face position as random factors and faces' levels of trustworthiness and dominance as regressors. We measured the impact of *Childhood Deprivation* on the probability of choosing a strong leader (a more dominant and less trustworthy leader) by computing this probability for each individual based on her individual coefficients. Importantly, this computed probability corresponds to the probability of choosing the strong leader in any pair of faces, i.e., independently of the levels of dominance and trustworthiness of the faces. In other words, this measure reflects participants' general preference for a strong leader. The impact of *Childhood Deprivation* and the controlling factors was assessed using logistic regressions on the probability of choosing a strong leader. Finally, we used similar logistic regressions on extreme

authoritarianism to assess the impact of *Childhood Deprivation* on self-reported authoritarianism.

2. 2. Results

Strong leaders (defined, as in Study 1, as a more dominant and less trustworthy leader) had a lower chance of being chosen than more trustworthy and less dominant leaders in general (probability of choosing a strong leader: $M = 0.36 \pm 0.01$, $t(817) = -35.39$, $p < .001$). As expected, childhood deprivation impacted these choices. Participants who had experienced childhood poverty were more likely to choose a strong leader ($b_{ChildDep} = 0.10 \pm 0.08$, $z = 2.49$, $p = .013$; Fig. 1A-B).

Finally, genetic studies have shown that family environment has far less influence on political attitudes after the individual has left the family house (see Hatemi & McDermott, 2012 for a review on this topic). To confirm the existence of a long-term effect of childhood poverty, we ran our analyses after excluding participants who were younger than 30 years old at the time of testing. The impact of childhood poverty on leader preferences was also present in these older participants ($b_{ChildDep} = 0.11 \pm 0.09$, $z = 2.52$, $p = .012$), which confirms the long-term impact of childhood adversity. Importantly, this effect was preserved after controlling for participants' current level of resources both in the complete sample ($b_{ChildDep} = 0.09 \pm 0.08$, $z = 2.25$, $p = .025$) and in the older subsample ($b_{ChildDep} = 0.11 \pm 0.09$, $z = 2.34$, $p = .019$).

To assess the role of potential confounds, we tested the impact of childhood deprivation after controlling for participants' current poverty and level of education as well as variables assessing

participants' childhood affective environment (parental care or negative household affect). The impact of childhood deprivation was maintained after the inclusion of these variables both in the complete sample ($b_{ChildDep} = 0.09 \pm 0.08, z = 2.17, p = .030$) and in the older subsample ($b_{ChildDep} = 0.09 \pm 0.09, z = 2.08, p = .038$).

We then further tested the link between childhood deprivation, our experimental measure of preference for strong leaders and participants' self-reported extreme authoritarianism. As expected, participants with a higher probability of choosing a strong leader during the task were more likely to endorse extreme authoritarianism ($b_{Prob} = 2.06 \pm 1.59, z = 2.55, p = .011$). As for facial preferences, childhood poverty predicted extreme authoritarianism both before (complete sample: $b_{ChildDep} = 0.56 \pm 0.42, z = 2.62, p = .009$; older subsample: $b_{ChildDep} = 0.50 \pm 0.46, z = 2.14, p = .033$) and after including the control variables (complete sample: $b_{ChildDep} = 0.59 \pm 0.43, z = 2.65, p = .008$; older subsample: $b_{ChildDep} = 0.47 \pm 0.46, z = 1.97, p = .048$).

2. 3. Conclusions

This study revealed a long-term impact of childhood deprivation on adult leader preferences using both facial preferences and self-reported extreme authoritarianism. Importantly, the impact of childhood deprivation was still present after controlling for potential confounding factors such as parental care and level of education. To assess the robustness of the link between extreme authoritarianism and childhood deprivation, we analysed responses from an independent large-scale sociological survey.

Insert Figure 1 here

3. Study 3

The impact of childhood deprivation on the preference for strong leaders was analysed using a large scale sociological survey conducted on 66281 respondents living in 46 European countries (the European value survey, Wave 4, European Values Study Longitudinal Data File 1981-2008 (EVS 1981-2008), 2015).

3. 1. Material and Methods

3. 1. 1. Dataset and measures

We analysed Wave 4 (collected between 2008 and 2010) of the European Value Survey (European Values Study Longitudinal Data File 1981-2008 (EVS 1981-2008), 2015). The analyses were performed on 66281 respondents (mean number of respondents per country: 1440.89 ± 94.21) from 46 European countries. Extreme authoritarianism was measured exactly as in Study 2. Childhood Deprivation was measured using the question: “Parent(s) had problems to make ends meet” in the European Value Survey. A childhood poverty threshold was computed using the same method as in Study 2. Because responses to the childhood deprivation question may have different values for different countries, the poverty threshold was computed for each country separately. This method was also applied to three other subjective childhood measures (parental political involvement, parental interest for the news and parental interest for books)

and to three subjective adulthood measures (current level of religiosity, life satisfaction and confidence in political institutions).

3. 1. 2. Analyses

The impact of Childhood Deprivation on extreme authoritarianism was computed using two-level analyses: logistic regressions were run for each country separately and coefficient significance was assessed using t-tests at the group level. Countries for which R identified fitting errors were excluded ($N = 2$ in the main analysis and $N = 3$ in the older sample analysis).

3. 2. Results

Our analyses confirmed the significant impact of childhood deprivation on extreme authoritarianism (All respondents: $M = 0.21 \pm 0.10$, $t(45) = 4.07$, $p < .001$; Figure 1C; Respondents older than 30 years old: $M = 0.18 \pm 0.12$, $t(45) = 2.78$, $p = .008$). As in Study 2, we further tested the impact of childhood deprivation after controlling for participants' level of education, income level as well as childhood measures assessing parents' cultural capital (interest in books, news and politics as well as their level of education). In addition, we also included additional variables about participants' current level of stress and resources (recent experiences of unemployment and subjective life satisfaction) as well as variables on participants' attitudes that could potentially mediate the link between childhood deprivation and extreme authoritarianism (religiosity, Altemeyer & Hunsberger, 1992, and confidence in political institutions, Knigge, 1998). These analyses confirmed a specific effect of childhood

deprivation on adults' political attitudes (All respondents: $M = 0.11 \pm 0.10$, $t(43) = 2.11$, $p = .040$; Older respondents: $M = 0.13 \pm 0.11$, $t(42) = 2.25$, $p = .029$).

4. Discussion

With the present experiments, we aimed to understand the impact of childhood environment on political preferences. In line with our hypothesis, we found that experiencing poverty during childhood biases preferences towards dominant leaders. These results are consistent with the literature on the effect of external threats on political preferences (Laustsen & Petersen, 2015; Perrin, 2005; Sales, 1973; Vyver, Houston, Abrams, & Vasiljevic, 2015). For example, analyses of historical records have revealed increased authoritarianism during periods of social and economic threat (such as the Great Depression, the late 1960s and the late 1970s in the US, Sales, 1973). Similarly, the acute threats of 09/11/2001 in the US (Perrin, 2005) and of the 2005 London bombings (Vyver et al., 2015) have been robustly associated with increased conservatism and authoritarianism.

However, the present studies suggest that the effect of external threats is much more pervasive than previously thought. Our results indeed reveal an immediate effect of early adverse experiences on children's preferences (Study 1) as well as a postponed effect on adults' political preferences (Studies 2 - 3). This postponed effect was evidenced both in the experimental task and in self-reports and suggest the existence of a direct impact of childhood environmental harshness on political attitudes. Yet, we cannot exclude the existence of unobserved variable that could impact both adult political attitudes and childhood environmental harshness

independently. In addition, it is worth noting that even though our finding was replicated over 46 different European countries, genetic factors may also be partly responsible for our results. Indeed, it has been demonstrated that authoritarianism is partly genetically determined (see Hatemi & McDermott, 2012 for a review on this topic). The present findings would thus be strengthened by future research involving external shocks in experimental settings or natural experiments. Nevertheless, to control for confounding factors, we included various controls in our models and demonstrated that the effect of childhood environmental harshness on political attitudes was independent of current status, recent life events, education level, parenting style, as well as participants' confidence in political institutions. This robustness check suggests a limited impact of omitted observable variables in our context.

The idea that leader preferences emerge relatively early in childhood and orient individuals' behavior throughout their lifespan is consistent with longitudinal studies showing that right-wing authoritarianism orientation is stable across months (Sibley et al., 2007; Onraet et al., 2014) and years (Mirisola et al., 2014). Moreover, brain imaging research has shown substantial differences between adults who experienced stressful environments as children in brain areas involved in face evaluations (Javanbakht et al., 2015; Kim et al., 2013; Mende-Siedlecki, Said, & Todorov, 2012). Therefore, the impact of childhood poverty evidenced in our study may rely on deep changes in brain functioning.

In addition, our studies may also shed light on the ecological basis of political attitudes such as authoritarianism and their adaptive value. Indeed, it has been demonstrated that leader choices are mainly determined by competence judgments (see Olivola & Todorov, 2010 for a review). This association between perceived competence and leader choice may explain why

dominant leaders are perceived as more appealing in stressful environments. From an ecological point of view, stressful environments are more competitive and less cooperative (Evans, 2004). In these environments, dominant individuals, seeking to outperform others, are naturally able to acquire larger amounts of resources and thus appear more competent.

Finally, these studies may offer a new way of explaining long-term changes in political attitudes. The early calibration of social preferences indeed suggests that political life is not only influenced by current circumstances (recessions, wars, acts of terrorism, etc.) but also by the circumstances experienced by voters when they were young. This may have a protective effect against aggravating circumstances when voters experienced favorable situations as children, but it can also hinder the beneficial effects of current improvements in people's environment. For instance, in the early 1970's, after 30 years of rising prosperity, more and more people started to embrace 'post-materialist values' such as emphasized autonomy and self-expression (Inglehart, 2015). Yet, cohorts born and raised before World War II, who had experienced the recession of the 30's and wartime restrictions, continued to adhere to 'materialist values', emphasizing economic security and authoritarianism (Inglehart, 2015). Conversely, since the 1970's, Western countries have experienced more than 30 years of economic stagnation and rising inequalities (Twenge & Kasser, 2013). The effect of stress on people's political attitudes may have been mitigated for a while by the presence of large cohorts of individuals brought up during times of rising prosperity (1945-1975) and whose political attitudes were still influenced by a favorable childhood. But as the younger generations (generations X and Y) are coming of age, and starting to vote, authoritarian candidates may become increasingly popular.

5. Acknowledgments:

This study was supported by the Institut d'Études Cognitives (ANR-10-LABX-0087 IEC and ANR-10-IDEX-0001-02 PSL*), the Institut national de la santé et de la recherche médicale (Inserm), the Fondation Roger de Spoelberch, an ERC consolidator grant (n°8657) and an "Action Incitative" funding from the École Normale Supérieure. We are grateful to Anne L'Hôte for programming Study 2 and to Dr Bahador Bahrami for providing us the stimuli.

References:

- Adair, L. S. (2001). Size at Birth Predicts Age at Menarche. *Pediatrics*, 107(4), e59–e59.
- Alesina, A., Glaeser, E., & Sacerdote, B. (2001). Why Doesn't the United States Have a European-Style Welfare State? *Brookings Papers on Economic Activity*, 187.
- Altemeyer, B., & Hunsberger, B. (1992). Authoritarianism, Religious Fundamentalism, Quest, and Prejudice. *The International Journal for the Psychology of Religion*, 2(2), 113–133. https://doi.org/10.1207/s15327582ijpr0202_5
- Antonakis, J., & Dalgas, O. (2009). Predicting Elections: Child's Play! *Science*, 323(5918), 1183–1183. <https://doi.org/10.1126/science.1167748>
- Bateson, P., Barker, D., Clutton-Brock, T., Deb, D., D'Udine, B., Foley, R. A., ... Sultan, S. E. (2004). Developmental plasticity and human health. *Nature*, 430(6998), 419–421. <https://doi.org/10.1038/nature02725>
- Bernstein, D. P., Fink, L., Handelsman, L., Foote, J., Lovejoy, M., Wenzel, K., ... Ruggiero, J. (1994). Initial reliability and validity of a new retrospective measure of child abuse and

neglect. *The American Journal of Psychiatry*, 151(8), 1132–1136.
<https://doi.org/10.1176/ajp.151.8.1132>

European Values Study Longitudinal Data File 1981-2008 (EVS 1981-2008). (2015). EVS. *GESIS Data Archive, Cologne. ZA4804 Data File Version 3.0.0*.
<https://doi.org/doi:10.4232/1.12253>

Evans, G. W. (2004). The Environment of Childhood Poverty. *American Psychologist*, 59(2), 77–92. <https://doi.org/10.1037/0003-066X.59.2.77>

Frankenhuis, W. E., Panchanathan, K., & Nettle, D. (2016). Cognition in harsh and unpredictable environments. *Current Opinion in Psychology*, 7, 76–80.
<https://doi.org/10.1016/j.copsyc.2015.08.011>

Griskevicius, V., Ackerman, J. M., Cantú, S. M., Delton, A. W., Robertson, T. E., Simpson, J. A., ... Tybur, J. M. (2013). When the Economy Falters, Do People Spend or Save? Responses to Resource Scarcity Depend on Childhood Environments. *Psychological Science*, 0956797612451471. <https://doi.org/10.1177/0956797612451471>

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>

Hatemi, P. K., & McDermott, R. (2012). The genetics of politics: discovery, challenges, and progress. *Trends in Genetics*, 28(10), 525–533. <https://doi.org/10.1016/j.tig.2012.07.004>

Inglehart, R. (2015). *The Silent Revolution: Changing Values and Political Styles Among Western Publics*. Princeton University Press.

- Javanbakht, A., King, A. P., Evans, G. W., Swain, J. E., Angstadt, M., Phan, K. L., & Liberzon, I. (2015). Childhood Poverty Predicts Adult Amygdala and Frontal Activity and Connectivity in Response to Emotional Faces. *Frontiers in Behavioral Neuroscience*, 9. <https://doi.org/10.3389/fnbeh.2015.00154>
- Kim, P., Evans, G. W., Angstadt, M., Ho, S. S., Sripada, C. S., Swain, J. E., ... Phan, K. L. (2013). Effects of childhood poverty and chronic stress on emotion regulatory brain function in adulthood. *Proceedings of the National Academy of Sciences*, 110(46), 18442–18447. <https://doi.org/10.1073/pnas.1308240110>
- Knigge, P. (1998). The ecological correlates of right-wing extremism in Western Europe. *European Journal of Political Research*, 34(2), 249–279. <https://doi.org/10.1023/A:1006953714624>
- Laustsen, L., & Petersen, M. B. (2015). Does a competent leader make a good friend? Conflict, ideology and the psychologies of friendship and followership. *Evolution and Human Behavior*, 36(4), 286–293. <https://doi.org/10.1016/j.evolhumbehav.2015.01.001>
- Little, A. C., Roberts, S. C., Jones, B. C., & DeBruine, L. M. (2012). The perception of attractiveness and trustworthiness in male faces affects hypothetical voting decisions differently in wartime and peacetime scenarios. *The Quarterly Journal of Experimental Psychology*, 65(10), 2018–2032. <https://doi.org/10.1080/17470218.2012.677048>
- McFadden, D. (1980). Econometric Models for Probabilistic Choice Among Products. *The Journal of Business*, 53(3), S13–S29.

- Mende-Siedlecki, P., Said, C. P., & Todorov, A. (2012). The social evaluation of faces: a meta-analysis of functional neuroimaging studies. *Social Cognitive and Affective Neuroscience*, nsr090. <https://doi.org/10.1093/scan/nsr090>
- Mikach, S. M., & Bailey, J. M. (1999). What Distinguishes Women with Unusually High Numbers of Sex Partners? *Evolution and Human Behavior*, 20(3), 141–150. [https://doi.org/10.1016/S1090-5138\(98\)00045-2](https://doi.org/10.1016/S1090-5138(98)00045-2)
- Murray, D. R., Schaller, M., & Suedfeld, P. (2013). Pathogens and Politics: Further Evidence That Parasite Prevalence Predicts Authoritarianism. *PLOS ONE*, 8(5), e62275. <https://doi.org/10.1371/journal.pone.0062275>
- Nettle, D., Coall, D. A., & Dickins, T. E. (2011). Early-life conditions and age at first pregnancy in British women. *Proceedings of the Royal Society of London B: Biological Sciences*, 278(1712), 1721–1727. <https://doi.org/10.1098/rspb.2010.1726>
- Nettle, D., Frankenhuys, W. E., & Rickard, I. J. (2013). The evolution of predictive adaptive responses in human life history. *Proc. R. Soc. B*, 280(1766), 20131343. <https://doi.org/10.1098/rspb.2013.1343>
- Olivola, C. Y., Sussman, A. B., Tsetsos, K., Kang, O. E., & Todorov, A. (2012). Republicans Prefer Republican-Looking Leaders Political Facial Stereotypes Predict Candidate Electoral Success Among Right-Leaning Voters. *Social Psychological and Personality Science*, 3(5), 605–613. <https://doi.org/10.1177/1948550611432770>
- Olivola, C. Y., & Todorov, A. (2010). Elected in 100 milliseconds: Appearance-Based Trait Inferences and Voting. *Journal of Nonverbal Behavior*, 34(2), 83–110. <https://doi.org/10.1007/s10919-009-0082-1>

- Onraet, E., Dhont, K., & Hiel, A. V. (2014). The Relationships Between Internal and External Threats and Right-Wing Attitudes A Three-Wave Longitudinal Study. *Personality and Social Psychology Bulletin*, 40(6), 712–725. <https://doi.org/10.1177/0146167214524256>
- Oosterhof, N. N., & Todorov, A. (2008). The functional basis of face evaluation. *Proceedings of the National Academy of Sciences*, 105(32), 11087–11092. <https://doi.org/10.1073/pnas.0805664105>
- Paál, T., Carpenter, T., & Nettle, D. (2015). Childhood socioeconomic deprivation, but not current mood, is associated with behavioural disinhibition in adults. *PeerJ*, 3, e964. <https://doi.org/10.7717/peerj.964>
- Perrin, A. J. (2005). National Threat and Political Culture: Authoritarianism, Antiauthoritarianism, and the September 11 Attacks. *Political Psychology*, 26(2), 167–194. <https://doi.org/10.1111/j.1467-9221.2005.00414.x>
- Re, D. E., DeBruine, L. M., Jones, B. C., & Perrett, D. I. (2013). Facial Cues to Perceived Height Influence Leadership Choices in Simulated War and Peace Contexts. *Evolutionary Psychology*, 11(1), 147470491301100109. <https://doi.org/10.1177/147470491301100109>
- Sales, S. M. (1973). Threat as a factor in authoritarianism: An analysis of archival data. *Journal of Personality and Social Psychology*, 28(1), 44–57. <https://doi.org/10.1037/h0035588>
- Schroeder, K. B., Pepper, G. V., & Nettle, D. (2014). Local norms of cheating and the cultural evolution of crime and punishment: a study of two urban neighborhoods. *PeerJ*, 2, e450. <https://doi.org/10.7717/peerj.450>

500 Sibley, C. G., Wilson, M. S., & Duckitt, J. (2007). Effects of Dangerous and Competitive
501 Worldviews on Right-Wing Authoritarianism and Social Dominance Orientation over a
502 Five-Month Period. *Political Psychology*, 28(3), 357–371.
503 <https://doi.org/10.1111/j.1467-9221.2007.00572.x>

504 Sloboda, D. M., Hart, R., Doherty, D. A., Pennell, C. E., & Hickey, M. (2007). Age at Menarche:
505 Influences of Prenatal and Postnatal Growth. *The Journal of Clinical Endocrinology &*
506 *Metabolism*, 92(1), 46–50. <https://doi.org/10.1210/jc.2006-1378>

507 Stewart, L. H., Ajina, S., Getov, S., Bahrami, B., Todorov, A., & Rees, G. (2012). Unconscious
508 evaluation of faces on social dimensions. *Journal of Experimental Psychology: General*,
509 141(4), 715–727. <https://doi.org/10.1037/a0027950>

510 Terrizzi Jr., J. A., Shook, N. J., & McDaniel, M. A. (2013). The behavioral immune system and
511 social conservatism: a meta-analysis. *Evolution and Human Behavior*, 34(2), 99–108.
512 <https://doi.org/10.1016/j.evolhumbehav.2012.10.003>

513 Thornhill, R., Fincher, C. L., & Aran, D. (2009). Parasites, democratization, and the liberalization
514 of values across contemporary countries. *Biological Reviews*, 84(1), 113–131.
515 <https://doi.org/10.1111/j.1469-185X.2008.00062.x>

516 Todorov, A., Mandisodza, A. N., Goren, A., & Hall, C. C. (2005). Inferences of Competence from
517 Faces Predict Election Outcomes. *Science*, 308(5728), 1623–1626.
518 <https://doi.org/10.1126/science.1110589>

519 Twenge, J. M., & Kasser, T. (2013). Generational Changes in Materialism and Work Centrality,
520 1976-2007 Associations With Temporal Changes in Societal Insecurity and Materialistic

521 Role Modeling. *Personality and Social Psychology Bulletin*, 39(7), 883–897.
522 <https://doi.org/10.1177/0146167213484586>

523 Vyver, J. V. de, Houston, D. M., Abrams, D., & Vasiljevic, M. (2015). Boosting Belligerence How
524 the July 7, 2005, London Bombings Affected Liberals' Moral Foundations and Prejudice.
525 *Psychological Science*, 0956797615615584. <https://doi.org/10.1177/0956797615615584>

526

527

A.

Who would choose as the captain of your team

Who would you vote for in a national election

B.

C.

Figure 1. Influence of childhood deprivation on leader preferences

A. Facial preferences experiment design. Children had to choose, for 5 pairs of faces, the individual they would prefer as the captain of their team. The faces of each pair corresponded to the same identity varying in the level of dominance (1.5 or 2.5 points) and trustworthiness (2.5 or 1.5 points; top). Adults had to choose the individual they would vote for in a national election for 36 pairs of faces varying parametrically on dominance and trustworthiness (bottom).

B. Differences between choice probabilities for the different face combinations in *Deprived* and *Not Deprived Childhood* participants in Study 2. Difference in choice probability is represented from red for a higher probability for the *Deprived* ($N = 649$) than for the *Not Deprived Childhood Group* ($N = 163$) to blue for a lower probability of choice for the *Deprived Childhood Group*. The pixelized figure corresponds to the averaged data for each combination of Δ Dominance and Δ Trustworthiness and the smoothed figure to the models' predictions. Participants who experienced poverty during their childhood had a higher probability of choosing more dominant and less trustworthy leaders than those who did not experience poverty.

C. Impact of Childhood Deprivation on extreme authoritarianism for 46 European countries. Two-level analyses revealed that having experienced deprivation during childhood increased the probability of reporting extreme authoritarianism. Importantly, this effect

548 was also significant after controlling for parents' cultural capital as well as current status
549 and confidence in politics.

550

Supplementary Information

Impact of gender on facial features preferences

As it has been shown that individuals are more likely to vote for candidates that look similar to them (Bailenson, Iyengar, Yee, & Collins, 2009) and because dominant and less trustworthy faces have been demonstrated to be more masculine (Oosterhof & Todorov, 2008), we checked the robustness of our results by adding gender as a covariable. Confirming the impact of childhood deprivation on leader preferences, adding gender as a regressor did not significantly impact the effect of childhood deprivation on leader preferences either in children ($z = -0.24, p > .250$; $b_{ChildDep} = 0.58 \pm 0.29, z = 1.95, p = .052$), adults ($z = -0.10, p > .250$; $b_{ChildDep} = 0.11 \pm 0.08, z = 2.66, p = .008$) or older adults ($z = -0.11, p > .250$; $b_{ChildDep} = 0.16 \pm 0.09, z = 2.69, p = .007$).

Study 1 – Parental income analysis

We ran a logistic regression analysis on children's leader choices taking parental income as a regressor. This analysis confirmed the impact of childhood deprivation on individuals' preference for strong leader: experiencing childhood deprivation increased by 25.54% the probability of choosing a strong leader ($b = 0.69 \pm 0.56, z = 2.41, p = .016$).

Study S1 - Experiment design validation

In order to assess whether a discrete choice experiment would replicate the well-documented impact of exposure to external threats on leader preferences (Laustsen & Petersen, 2015; Little,

Burriss, Jones, & Roberts, 2007; Little, Roberts, Jones, & DeBruine, 2012; Re, DeBruine, Jones, & Perrett, 2013), we first ran a replication of Little et al.'s studies (Little et al., 2007, 2012) showing that war scenarios induce a preference for more dominant and less trustworthy leaders.

Participants

60 participants (25 women), aged 20 to 60 years old (mean age: 32.58 ± 2.57 years) were recruited via MTurk to participate in this online study. Each participant received a description of the study, provided their informed consent before starting the experiment, and received \$2 for this 30-minute experiment (which corresponds to the \$6.00 hourly wage of MTurk).

Procedure

The experiment was programmed on Qualtrics and was similar to Study 2 except that the set of pairs was presented twice, in two separate blocks, one in a war-time scenario and one in a peace-time scenario ("Who would you vote for in a time of war/peace?"). These scenarios were similar to those used in (Little et al., 2007, 2012), and the order of the two blocks was randomized between participants.

Reaction times inferior to 200 ms were discarded (mean reaction time of the included participants before filtering: 0.50 ± 0.01 s). Four participants were excluded from the analysis for

pressing the same key in more than 90% of the trials, two participants were excluded for having no response with a reaction time superior to 200ms and one participant was excluded for not having given any response. The analyses were performed on 53 participants.

Analyses & Results

As in Study 2, choices were analysed using two-level analyses. First, mixed logit logistic regressions, taking trial number and face position as random factors, were ran for each participant. Levels of trustworthiness (Trustworthiness) and dominance (Dominance) as well as the Scenario (war-time or peace-time) were used as regressors. The coefficients from these regressions were then used to compute the probability of choosing a strong leader (i.e., a 1-point more dominant and 1-point less trustworthy leader). A beta regression was then run on these probabilities to assess the impact of the experimental manipulation.

The analysis of the coefficients revealed that in times of peace, strong leaders had a lower probability of being chosen than more trustworthy and less dominant faces (Probability of choosing a strong leader: $M = 0.34 \pm 0.04$, $t(52) = -8.79$, $p < .001$). As expected, the scenario impacted these choices: in times of war, strong leaders were more likely to be chosen ($b_{War} = 2.72 \pm 0.99$, $z = 5.39$, $p < .001$). Indeed, strong leaders were chosen significantly above chance in the war scenario ($M = 0.59 \pm 0.06$, $t(52) = 3.62$, $p < .001$). Interestingly, in wartime, both dominance and untrustworthiness were valued in leaders ($b_T = -0.30 \pm 0.18$, $t(52) = -3.35$, $p = .002$; $b_D = 0.15 \pm 0.11$, $t(52) = 2.76$, $p = .008$) while it was the opposite in peace time ($b_T = 0.57 \pm$

0.11, $t(52) = 10.12$, $p < .001$; $b_D = -0.13 \pm 0.09$, $t(52) = -2.81$, $p = .007$). In other words, in wartime, stronger leaders were preferred, which replicates Little et al.'s 2007 and 2012 findings (Little et al., 2007, 2012).

Conclusions

Our new methodology replicates a robust result of the leader choice literature: participants are biased towards strong leaders after war primes (Little et al., 2007, 2012). This finding demonstrates that our online experiment is sensitive to changes in leader preferences after exposure to an external threat.

Study S2 – The impact of childhood environment: pilot study

Participants

The number of subjects was fixed *a priori* to 200 based on our past experience with between-subjects social choice experiments on MTurk. 200 American participants (66 women) aged 19 to 74 years old (33.31 ± 1.63 years), were recruited via Amazon Mechanical Turk to participate in this online study. Each participant received a description of the study, provided their informed consent before starting the experiment, and received \$1.5 for this 15-minute experiment.

Procedure

The same experiment as in Study 2 was programmed on Qualtrics. However, in this experiment, participants filled the subjective level of resources questionnaires on 9-point scales (Griskevicius, Tybur, Delton, & Robertson, 2011) and at the end of the experiment. As in Study 2, reaction times inferior to 200 ms were discarded (mean reaction time of the included participants before filtering: 0.49 ± 0.02 s). Four participants were excluded for pressing the same key in more than 90% of the trials, four participants were excluded for having responses with a reaction time superior to 200 ms on less than half the trials, six participants were excluded for not having given any responses with a reaction time superior to 200 ms and one participant was excluded for not having given any response. The analyses were performed on 183 participants.

Childhood Deprivation Measure

The subjective poverty line was defined as in Study 2. We used previously collected responses on 522 MTurkers in addition to the 200 participants to the study to determine the threshold value for the MTurk population. Poverty thresholds were set at a score of 7 for both *Childhood (Deprived or Not Deprived Childhood Groups)* and *Current Resources (Low or Middle Current Resources Groups)*. 35 participants were included in the *Deprived Childhood Group* and 148 in the *Not Deprived Childhood Group*. In the older subsample (99 participants), 24 were included in the *Deprived Childhood Group* and 75 in the *Not Deprived Childhood Group*.

Pre-analyses and Analyses

As in Study 2, the two *Childhood Deprivation Groups* did not differ on the number of the analysable trials ($t(181) = 0.35, p > .250$) or on their mean reaction times ($t(181) = 1.34, p = .183$), indicating that the two groups performed the task similarly. The same models and analyses as in Study 2 were run in this study. As in Study 2, the probability of choosing a more dominant and less trustworthy leader was computed using the model's logit coefficients for each participant and beta regressions were used to assess the impact of childhood deprivation.

Results

As in Study 2, strong leaders were generally less chosen than more trustworthy and less dominant leaders ($M = 0.42 \pm 0.02, t(182) = -7.39, p < .001$). After controlling for Current Resources, the effect of Childhood Deprivation was found as a trend in the total sample ($N = 183; b_{ChildDep} = 0.19 \pm 0.23, z = 1.66, p = .098$) and as a significant effect in the older subsample ($N = 94; b_{ChildDep} = 0.38 \pm 0.28, z = 2.66, p = .008$) such that participants who suffered from poverty during their childhood were more likely to choose a strong leader.

Conclusions

This pilot study revealed that experimentally measured leader preferences using facial features are not only sensitive to experimental manipulations (Study S1, Laustsen & Petersen, 2015; Little et al., 2007, 2012) and explicit political affiliations (Laustsen & Petersen, 2015; Olivola, Sussman, Tsetsos, Kang, & Todorov, 2012) but also to the real environment experienced by

122 participants. Moreover, in line with our hypotheses, childhood deprivation induced a long-term
123 preference for stronger leaders.

124

125 **Table S1 Demographic characteristics of the *Deprived* and *Not Deprived Childhood Groups***

	Deprived Childhood Group	Not Deprived Childhood Group	Difference statistical significance
Number of Children	20	19	
Age	6.88 ± 0.23	6.85 ± 0.18	$p > .250$
Gender ratio (% of Female)	35 %	53 %	$p > .250$
Access to running water	25 %	100 %	$p < .001$
Possession of a washing machine	25 %	100 %	$p < .001$
Possession of a car	0 %	74 %	$p < .001$
Meat consumption	Monthly	Daily	$p < .001$
Cinema outings	Never	Monthly	$p < .001$
Museum outings	Never	Weakly	$p = .009$
Mean age of the parents	29.65 ± 1.93	34.74 ± 2.17	$p < .001$
Maximum education level of the parents	High School	Post High School	$p = .002$
Number of siblings	1.80 ± 0.47	0.47 ± 0.29	$p < .001$
Number of people/number of rooms ratio	2.33 ± 0.21	1.84 ± 0.32	$p = .010$
Separation of the parents	30 %	0 %	$p = .031$

References:

- Bailenson, J. N., Iyengar, S., Yee, N., & Collins, N. A. (2009). Facial Similarity Between Voters and Candidates Causes Influence. *Public Opinion Quarterly*, nfn064.
<https://doi.org/10.1093/poq/nfn064>
- 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>
- Laustsen, L., & Petersen, M. B. (2015). Does a competent leader make a good friend? Conflict, ideology and the psychologies of friendship and followership. *Evolution and Human Behavior*, 36(4), 286–293. <https://doi.org/10.1016/j.evolhumbehav.2015.01.001>
- 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>
- Little, A. C., Roberts, S. C., Jones, B. C., & DeBruine, L. M. (2012). The perception of attractiveness and trustworthiness in male faces affects hypothetical voting decisions differently in wartime and peacetime scenarios. *The Quarterly Journal of Experimental Psychology*, 65(10), 2018–2032. <https://doi.org/10.1080/17470218.2012.677048>
- Olivola, C. Y., Sussman, A. B., Tsetsos, K., Kang, O. E., & Todorov, A. (2012). Republicans Prefer Republican-Looking Leaders Political Facial Stereotypes Predict Candidate Electoral Success Among Right-Leaning Voters. *Social Psychological and Personality Science*, 3(5), 605–613. <https://doi.org/10.1177/1948550611432770>

149 Oosterhof, N. N., & Todorov, A. (2008). The functional basis of face evaluation. *Proceedings of*
150 *the National Academy of Sciences*, 105(32), 11087–11092.
151 <https://doi.org/10.1073/pnas.0805664105>

152 Re, D. E., DeBruine, L. M., Jones, B. C., & Perrett, D. I. (2013). Facial Cues to Perceived Height
153 Influence Leadership Choices in Simulated War and Peace Contexts. *Evolutionary*
154 *Psychology*, 11(1), 147470491301100109.
155 <https://doi.org/10.1177/147470491301100109>
156