1 PRESTIGE AND DOMINANCE:
2 A REVIEW OF THE DUAL EVOLUTIONARY
3 MODEL OF SOCIAL HIERARCHY
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PRESTIGE AND DOMINANCE: A REVIEW OF THE DUAL EVOLUTIONARY MODEL OF SOCIAL HIERARCHY

Abstract

Twenty years ago, Joseph Henrich and Francisco Gil-White developed the *dual evolutionary model of social hierarchy*, which distinguishes between dominance and prestige as two different strategies to attain, maintain, and increase social rank and social influence. This model has stimulated research in various fields such as psychology, anthropology, and management science, has been useful in explaining contradictory findings in the literature, and has prompted new avenues for research. Here we review and critically evaluate the dominance-prestige model as applied to small groups without formal hierarchies. First, we outline Henrich and Gil-White's *dual evolutionary model of social hierarchy*. Second, we describe the evidence for and against dominance and prestige as two different strategies to acquire high social rank. Third, we discuss the long-term consequences of dominance-derived and prestige-derived social rank. Fourth, we examine the biological and social consequences of attaining dominance-based and prestige-based social rank. Finally, we conclude by discussing limitations of the current literature, and suggest new avenues for research.

Key Words: Prestige, Dominance, Social Rank, Status, Social Learning, Social Hierarchy, Cultural Evolution, Social Influence

1.- Introduction

Twenty years ago, Joseph Henrich and Francisco Gil-White (2001) published an influential article in *Evolution & Human Behaviour*, which to date has received more than 2000 citations. In their article, Henrich and Gil-White developed the *dual evolutionary model of social hierarchy*, which distinguishes between dominance and prestige as two different strategies to attain, maintain, and increase social rank and social influence. Briefly, the dominance strategy involves the use of force and coercion to elicit fear in other individuals, while the prestige strategy involves the display of competence to elicit admiration in other individuals (see below for a full description).

This distinction between dominance and prestige has stimulated research in cultural evolution (e.g. Brand & Mesoudi, 2019; Offord, Gill, & Kendal, 2019), social psychology (e.g. Cheng, Tracy, Foulsham, Kingstone & Henrich, 2013; Halevy, Chou, Cohen, & Livingston, 2012; Maner & Case, 2016), evolutionary psychology (e.g. Conlon, 2019; Snyder, Kirkpatrick, & Barrett, 2008), anthropology (e.g. Henrich & Broesch, 2011; Reyes-Garcia et al., 2008; von Rueden, Gurven, & Kaplan, 2010), and management science (McClanahan, 2019; Ronay, Maddux, & von Hippel, 2018), it has proved useful in explaining contradictory findings in the literature (e.g. Cheng & Tracy, 2014; Kakkar, Sivanathan, & Gobel, 2017), and has prompted several new avenues for research (e.g., Cheng, Tracy, & Henrich, 2010).

In this article, we review the literature on the dominance-prestige distinction. First, we outline Henrich and Gil-White's *dual evolutionary model of social hierarchy* (henceforth Dual Evolutionary Model or DEM). Second, we describe the evidence for and against dominance and prestige as two different strategies for acquiring high social rank. Third, we discuss the long-term consequences of social rank acquired via dominance versus prestige. Fourth, we examine the different biological and social consequences

of attaining dominance-based and prestige-based social rank. Finally, we identify limitations in the current literature and suggest new avenues for research.

In this article, we restrict our discussion of the DEM to small groups without formal, institutionalised social hierarchies such as bands of hunter-gatherers or school classes. Although dominance and prestige are still relevant in large groups with formal hierarchies, this goes beyond the scope of the current article. Consequently, it would be unwise to generalize the DEM beyond small groups without formal hierarchies. We have discussed some of the limitations of the application of the DEM to large scale societies with formal hierarchies in Jiménez, Flitton, & Mesoudi (2020) and we direct interested readers to that paper.

2.- The Dual Evolutionary Model of Social Hierarchy (DEM)

Figure 1 depicts the DEM as applied to small groups without formal social hierarchies (Cheng & Tracy, 2014; Cheng, Tracy, Foulsham, et al., 2013; Henrich, 2016; Henrich & Gil-White, 2001; Redhead, Cheng, Driver, Foulsham, & O'Gorman, 2018). We distinguish four levels of analysis: strategies to acquire high social rank (dominance strategy vs prestige strategy), dimensions of social rank (dominance dimension vs prestige dimension), proximate consequences of social rank (being socially influential, receiving attention and receiving deference for both the dominance and prestige dimension, and being copied only for the prestige dimension), and ultimate consequences of social rank (having higher fitness, which we define in evolutionary terms to mean increased relative reproductive success). Table 1 provides definitions of key terms in Figure 1, and other terms as we use them in this paper.

82

83 Figure 1. The Dual Evolutionary Model of Social Hierarchy (DEM) as applied to small groups without formal social
 84 hierarchies. Based on Henrich and Gil-White (2001). See text for details.

85

Social Hierarchy: The ordering of individuals by their influence within a group

Social Rank: the position of an individual within a social hierarchy. High social rank individuals occupy the top of the hierarchy, while low social rank individuals occupy the bottom.

Dominance Strategy: Strategy to acquire high social rank by inflicting, or threatening to inflict, costs on other individuals within a group

Prestige Strategy: Strategy to acquire high social rank by displaying traits such as competence within a valued domain that elicit admiration by other individuals within a group

Dominance Dimension: informal social rank maintained and attained through the use of force and intimidation

Prestige Dimension: informal social rank maintained and attained through the display of valued traits such as competence within valued domains

Social influence: change of the behaviour of an individual as a consequence of the actions of others or what this individual believes are the thoughts of others

Deference: manifestations of respect and submission to the wishes of another individual

Fitness: relative reproductive success of an individual within a population

Table 1. Definitions of the key terms used in this article.

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87 According to the DEM, dominance and prestige are two strategies that people use
88 (consciously or unconsciously) to acquire, maintain, and/or increase their social rank.
89 The *dominance strategy* entails the display of aggressive and coercive behaviours to
90 induce *fear* in other individuals. The successful use of this strategy leads to the
91 acquisition of coercively imposed high social rank (dominance social rank dimension
92 in Figure 1; Cheng, 2019; Redhead, Cheng, & O’Gorman, 2018a). In contrast, the
93 *prestige strategy* entails the display of knowledge/skill within valued domains to induce
94 *admiration* in other individuals. The successful use of this strategy leads to the
95 acquisition of voluntarily conferred high social rank (prestige social rank dimension in
96 Figure 1; Cheng, 2019; Redhead, Cheng, & O’Gorman, 2018a). In the DEM, having a
97 position of high dominance or high prestige within a social group confers social
98 benefits, labelled ‘proximate consequences’ in Figure 1. Both dominant and
99 prestigious individuals are socially influential, receive preferential attention, and
100 receive deference. While these consequences are similar, they result from eliciting
101 distinct emotions in subordinates: fear for dominance, and admiration for prestige.
102 Whereas dominant individuals receive deference due to fear of the potential costs of
103 failing to do so (*coerced deference*), prestigious individuals receive deference due to
104 the desire of others to access their valued knowledge/skills (*voluntary deference*).
105 Similarly, dominant individuals are preferentially attended to in order to monitor their
106 potentially threatening behaviour, while prestigious individuals are preferentially
107 attended to due to the admiration of their knowledge/skills. The same mechanism
108 indicates that dominant individuals are socially influential through *obedience*, while
109 prestigious individuals are influential through *persuasion*.

110 A clear difference between the proximate consequences of dominance and prestige
111 is that prestige leads to being copied by other individuals, while this is not the case for

112 dominance (see Figure 1). According to Henrich and Gil-White (2001), prestige
113 evolved in our lineage to select knowledgeable/skilful demonstrators from whom to
114 learn within valuable domains (e.g., hunting skill for a hunter-gatherer society) through
115 the use of prestige cues as a shortcut to identify competent individuals. Learning from
116 prestigious individuals would have led to the acquisition of superior knowledge/skills
117 and ultimately increased fitness. Some of these cues are *first-order prestige cues*, i.e.,
118 characteristics of the demonstrator such as their age and level of confidence, which
119 can be assessed directly by the observer to infer competence (Jiménez & Mesoudi,
120 2019). However, these cues might be unreliable if, for example, some individuals are
121 over-confident or if cues like age are not perfectly correlated with knowledge/skill. This
122 would have favoured the use of *second-order prestige cues*, i.e. how other individuals
123 behave towards the demonstrator, such as the amount of sustained attention,
124 voluntary deference, or copying that potential demonstrators receive (Henrich & Gil-
125 White, 2001; Jiménez & Mesoudi, 2019). In this sense, the relationship between
126 prestige and being copied, being paid attention, and receiving deference is
127 bidirectional (see bidirectional arrows connecting prestige to being copied, receiving
128 attention, and receiving deference in Figure 1) because prestige leads to being copied,
129 receiving attention, and receiving deference, and this copying, attention, and
130 deference serves to reinforce an individual's prestige. First-order (e.g., physical
131 formidability) and second-order (e.g., fear displayed towards the target individual) cues
132 are also used for identifying who is dominant (Jiménez & Mesoudi, 2020). The use of
133 these cues is predicted to be adaptive, as it helps to reduce potential costs by learning
134 (individually for first-order cues and socially for second-order cues) who is more likely
135 to impose those costs without having to directly suffer the dominant behaviour
136 themselves (Jiménez & Mesoudi, 2020).

Some of the proximate consequences of the dominance and prestige dimensions such as being influential and receiving deference often lead to higher fitness (labelled 'ultimate consequences' in Figure 1) due to the fact that these result in greater access to resources and mates (see arrows connecting social influence and receiving deference to high fitness).

Although not shown in the figure, it is important to note that there might be additional ways by which prestigious and dominant individuals attain higher fitness beyond the proximate consequences of having higher social rank. For example, prestigious individuals can acquire higher fitness directly through being highly competent in important domains such as food acquisition. Similarly, some of the traits associated with dominance such as physical strength in males can also lead to higher fitness if this makes them more attractive to potential mates.

3.- Key predictions, empirical evidence, and limitations of the DEM

In this section, we discuss the key predictions derived from the DEM (Table 2) as applied to small groups without formal social hierarchies, the associated empirical evidence, and its limitations.

Predictions about dominance and prestige strategies	
1)	Dominance and prestige strategies are independent from each other ^{1 2}
2)	Both dominance and prestige strategies lead to acquiring high social rank and social influence ^{1 2}
3)	Dominance and prestige strategies use different means to acquire high social rank and influence (fear vs admiration) ^{1 2}
Predictions about the dominance and prestige dimensions	
4)	The strength of the social influence attained by people high in dominance diminishes over time ³
5)	The strength of the social influence attained by people high in prestige strengthens over time ³
Predictions about the proximate consequences of dominance and prestige dimensions	
6)	Both dominant and prestigious individuals receive more attention than low social rank individuals ^{1 2}
7)	Prestigious individuals receive more sustained attention than dominant individuals ¹
8)	Dominant individuals receive more furtive glances than prestigious individuals ¹
9)	Both dominant and prestigious individuals receive more deference than low social rank individuals ¹
10)	The deference that prestigious individuals receive is voluntarily conferred, while the deference that dominant individuals receive is coercively attained ¹
11)	Prestigious individuals are preferentially selected as models from whom to socially learn valued knowledge/skills ¹
Predictions about the ultimate consequences of dominance and prestige dimensions/strategies	
12)	Both dominant and prestigious individuals have higher fitness than low social rank individuals ¹

160 ¹ (Henrich & Gil-White, 2001), ² (Cheng et al., 2013), ³ (Redhead et al, 2018)

161

162 3.1.- Strategies for attaining social rank and influence

163 3.1.1.- Are dominance and prestige two independent strategies to the top?

164 The DEM predicts that dominance and prestige are two strategies, which are
 165 independent from each other (prediction 1 in Table 2), that both lead to acquiring high
 166 social rank and influence (prediction 2 in Table 2) but through the use of different
 167 means (fear and admiration respectively, prediction 3 in Table 2).

168 The standard procedure to test whether dominance and prestige are two independent
 169 strategies (prediction 1) has been to ask subjects to rate the perceived prestige and

170 the perceived dominance of themselves or other individuals using the validated
171 Dominance-Prestige scales (Cheng, Tracy, & Henrich, 2010). Researchers then test
172 to what extent prestige and dominance ratings are correlated, with low or non-
173 significant correlations taken as evidence of the independence of the two strategies.
174 These scales include items for dominance such as “I (he/she) enjoy(s) having control
175 over others” and “Some people are afraid of me (him/her)”, and items for prestige such
176 as “Members of my (your) group respect and admire me (him/her)” and “Members of
177 my (your) group do not want to be like me (him/her)” (reverse coded). The results of
178 multiple studies using this scale, or another similar scale (Buttermore, 2006), have
179 supported the idea that prestige and dominance strategies are independent, as the
180 correlations have tended to be low (between $r=-0.06$ and $r=0.18$). These results have
181 been found in studies that asked participants to rate themselves (Cheng et al., 2010;
182 Conlon, 2019; Monge-López & Álvarez-Solas, 2017); unacquainted peers in a group
183 task conducted in the laboratory (Cheng, Tracy, Foulsham, et al., 2013); peer
184 members of an athletic team (Cheng et al., 2010) or of other naturally occurring groups
185 such as music bands and colleagues working in a small businesses (Brand & Mesoudi,
186 2019) . Furthermore, low correlations between prestige and dominance are maintained
187 over time among undergraduate classmates (Redhead, Cheng, Driver, et al., 2018).

188 The prediction that both dominance and prestige strategies lead to high social rank
189 and social influence (prediction 2) has been experimentally tested by Cheng, Tracy,
190 Foulsham, et al. (2013). Students were asked to rank, first individually and later in
191 groups, the potential usefulness of fifteen pieces of equipment (e.g., box of matches,
192 signal flares, food concentrates) for surviving on the Moon (Bottger, 1984; Branch,
193 1971). Next, participants rated each other’s perceived social influence, dominance,
194 prestige, and likability. Two external judges also rated each of the participants for

195 these traits. Behavioural social influence was measured by comparing the individual
196 decisions with the collective decisions in the task. The results showed that both
197 prestige and dominance positively predicted social influence in the three measures
198 (peer ratings, external judges' ratings, and the behavioural measure). Similarly, Brand
199 and Mesoudi (2019) showed that both dominance and prestige ratings of other
200 members of naturally occurring small groups were both positively associated with
201 influence ratings within those groups.

202 These two studies also provide tentative evidence that dominance and prestige
203 strategies resulted in social influence using different means: fear vs admiration
204 respectively (prediction 3). In Cheng et al.'s study, prestige was more strongly
205 associated with liking than was dominance, and in Brand and Mesoudi's study liking
206 was positively related to prestige and negatively related to dominance. These results
207 support the idea that the prestige strategy elicits admiration and the dominant strategy
208 fear. However, being liked cannot necessarily be equated to being admired, as
209 someone could like their friends without necessarily admiring them for their
210 knowledge/skills. Similarly, being disliked cannot necessarily be equated to being
211 feared as someone could dislike an acquaintance who they find boring rather than
212 intimidating. More direct evidence for the different mechanisms that lead to high social
213 rank and influence was found in an unpublished study by Cheng, Tracy, and Henrich
214 (2013; reviewed in Cheng & Tracy, 2014). In this study, the relationship between
215 dominance and social influence was mediated by fear, while the relationship between
216 prestige and social influence was mediated by contribution to the group.

217 Overall, the reviewed evidence supports the idea that dominance and prestige are two
218 independent strategies that lead to the acquisition of high social rank and social
219 influence through different means. These studies are high in external validity: they

220 were conducted with naturally occurring groups or they studied the emergence of
221 dominance-based and prestige-based hierarchies in interactions between
222 unacquainted individuals. However, the dominance-related and prestige-related
223 behaviours were measured through self and peer reports instead of being
224 manipulated. Consequently, the nature of the supporting evidence is correlational. As
225 a next step, we encourage experiments in which dominance and prestige are
226 manipulated by the researchers (as in, for example, Kakkar, Sivanathan, & Gobel,
227 2020), for instance by using confederates trained to use dominance and prestige cues.

228 3.1.2.- Is competence the only way to the top?

229 Our recommendation of manipulating dominance and prestige with confederates has
230 precedence in a series of studies conducted in the 1980s-90s. Contrary to prediction
231 2 in Table 2, these studies found that only prestige-related cues led to the attainment
232 of social influence, while dominance-related cues failed to lead to social influence
233 (Carli, LaFleur, & Loeber, 1995; Copeland, Driskell, & Salas, 1995; Driskell, Olmstead,
234 & Salas, 1993; Ridgeway, 1987; Ridgeway & Diekema, 1989), apparently challenging
235 the dual model. In the first of these experiments (Ridgeway, 1987), a confederate
236 argued with a second confederate about a financial reward in an insurance settlement
237 while displaying non-verbal cues that indicated either dominance (e.g., loud voice,
238 tense posture, staring eye contact), submissiveness (e.g., soft voice, cowering
239 posture, averted eye contact with sneaking glances), high competence (e.g., medium
240 voice, relaxed posture, high eye contact with normal break-offs), or low competence
241 (e.g., soft, slumped voice, slumped posture, low eye contact). The target confederate
242 argued for a low reward, while the other confederate argued for an average reward.
243 Participants had to decide the amount of the financial reward before and after being
244 exposed to the interaction. The difference between these amounts was used as the

245 measure of social influence. The results showed that the use of high competence cues
246 led to the highest level of influence, while there were no significant differences
247 between the uses of dominance, submissive, and low competence cues in predicting
248 influence.

249 However, according to Cheng and Tracy (2014), the failure of the dominance strategy
250 to attain influence in these studies was probably due to two reasons. First, the
251 dominant behaviour was not directed towards participants and, consequently, the
252 participants were unlikely to directly experience the fear which is necessary for the
253 successful use of the dominance strategy. Second, the measure of influence was
254 persuasion, which is a type of social influence characterized by convincing someone
255 who did not share a belief or idea about the superiority of such a belief/idea. The
256 change of belief through persuasion is a voluntary process and, consequently, is more
257 suited to the prestige strategy. Dominant individuals do not achieve social influence
258 through persuasion but through coercion. That is, people are submissive to the wishes
259 of dominant individuals and obey them due to fear, not because they are convinced
260 that a certain action or belief professed by the dominant individual is better.
261 Consequently, these studies only show that the dominance strategy is not useful for
262 attaining social influence through persuasion but they do not provide evidence
263 regarding whether the use of the dominance strategy is useful for attaining social
264 influence through fear and intimidation.

265 A “one-way to the top” approach has also been proposed by Chapais (2015) who
266 argues that both dominance and prestige require competence and, consequently,
267 competence is the only way to the top. For Chapais, the attainment of high social rank
268 via dominance requires competence in abilities such as controlling one’s own fear,
269 using weapons, formulating tactics to attack rivals, etc. Moreover, this competence in

270 imposing one's will, for Chapais, not only triggers fear but also admiration and,
271 consequently, the dominance-prestige distinction is not so clear-cut.

272 Although it is true that dominance goes together with competence within domains such
273 as the ones mentioned by Chapais, this is not incompatible with the DEM, which
274 focuses on the *causes* of acquiring high social rank and social influence through the
275 elicitation of different emotions in others. A dominant behaviour might elicit both fear
276 and admiration, but it is unlikely that these are triggered together at the same time in
277 the same individual. People suffering the dominant behaviour would defer to the
278 dominant individual due to fear. Other individuals might admire the dominant individual
279 for their dominance-related skills when they are used against other individuals,
280 especially members of rival out-groups, but not against themselves. Consistent with
281 this, Halevy et al. (2012) have shown that behaviours damaging an out-group and
282 benefitting the in-group elicit perceptions of greater prestige and lower dominance
283 amongst in-group members when there is no other way of benefitting the in-group
284 without damaging the out-group.

285 However, if the dominant behaviour were to be directed towards the in-group, it seems
286 implausible that this behaviour would elicit the admiration of in-group members or that,
287 if admiration is elicited somehow, the elicitation of admiration instead of fear would be
288 the pathway to the top. For example, terrorists might acquire social influence among
289 people with similar ideology through the prestige route due to their commitment to their
290 cause or their violence against those who they see as their enemy. However, the only
291 way they are going to acquire social influence among the people they are fighting
292 against is by imposing their will through violence and intimidation. Thus, the dual
293 pathways remain distinct. In this light, we do not think that Chapais' (2015) criticism

294 entails a major challenge to the DEM (for further discussion about the in-group vs out-
295 group distinction applied to the DEM, see Jiménez, Flitton, & Mesoudi, 2020).

296 3.1.3.- Are there more strategies to the top beyond dominance and prestige?

297 Numerous studies in social psychology (Flynn, 2003; Flynn, Reagans, Amanatullah,
298 & Ames, 2006; Hardy & Van Vugt, 2006; Willer, 2009) have shown that altruism or
299 generosity are associated with the attainment of high social rank and greater influence
300 within a social group. For instance, Hardy and Van Vugt (2006) conducted a study in
301 which participants had to decide how much of a monetary allocation to contribute to a
302 public fund rather than keep for themselves. The money in the public fund was
303 multiplied by a bonus factor and then divided equally among participants irrespective
304 of their contribution. The results showed that participants who contributed more to the
305 public fund did economically worse but were rated higher in prestige.

306 However, researchers do not agree whether altruism (or morality in general, which is
307 a broader concept) is an independent way to the top (Bai, 2016), or is part of or a
308 modifier of the prestige route (Cheng & Tracy, 2014; Henrich, 2016). Henrich and Gil
309 White (2001, p.180) argue that individuals who provide public goods at a cost to
310 themselves often acquire prestige but that the advantage of defecting (i.e., using the
311 goods without deferring to the provider) makes it difficult for prestige to evolve through
312 altruism. Nevertheless, they point out that for skilful/knowledgeable individuals, the
313 provision of public goods might be an excellent way to advertise their competence
314 and, consequently, obtain a greater number of followers who defer to them, which
315 might be translated into fitness gains. Similarly, Cheng and Tracy (2014) see altruism
316 as a way of signalling competence to acquire more followers. They argue that the
317 tendency to copy the prestigious is an incentive for prestigious individuals to behave
318 altruistically, as if they are followed, they would acquire more benefits through the

319 contribution of other individuals to the public good. This close link between being
320 altruistic and being copied has been proposed as one mechanism for the evolution of
321 human cooperation (Henrich, 2016, pp. 128-131; Henrich, Chudek, & Boyd, 2015).

322 In contrast to subsuming altruism within competence, Bai (2016) argues that altruism
323 and other forms of moral behaviour are an independent way to acquire high social
324 rank. By morality Bai means “a prescriptive system (...) that focuses on approach
325 motives to do something good” (pp.208-209), which is usually costly for the individual
326 behaving morally. To effectively acquire high social rank, the display of moral
327 behaviour should be tuned to the morality systems accepted within a specific culture,
328 as the display of competence should be tuned to the domains that the observers
329 regard as important.

330 According to Bai, competence is not a requirement for the moral route to high social
331 rank as many heroes and heroines often fail to achieve their goals and might be
332 punished for their virtues. Bai gives the example of Malala Yousafzai, a Pakistani
333 schoolgirl who defended the right of girls to attend school against the Taliban and was
334 shot for this. Although she failed in restoring access to education for girls in Pakistan,
335 she was awarded a Nobel Prize for her heroism, which led her to become a very
336 influential person worldwide.

337 According to Bai (2016), the psychological mechanism to acquire high social rank
338 through the morality route is the elicitation of admiration for virtue, which leads to
339 positive feelings and expectations of the morally praiseworthy individuals bearing
340 costs to benefit the group or benefit a particular moral view. Consequently, people
341 accept the influence of virtuous individuals and defer to them because they believe
342 this would benefit themselves. This is very similar to the mechanism of the

343 competence route, in which admiration for competence leads to people deferring to
344 the competent individual to attain benefits (e.g., social learning or private/public goods)
345 for themselves (Leary, Jongman-Sereno, & Diebels, 2014). This suggests that
346 displaying competence and/or displaying altruism (or other forms of morality) are ways
347 in which people can acquire prestige and voluntary deference, rather than constituting
348 a separate, third dimension of social rank.

349 Nevertheless, Bai argues that admiration is an “umbrella term” (p. 211), which refers
350 to similar but different emotions (Schindler, Zink, Windrich, & Menninghaus, 2013). For
351 instance, admiration for morality leads to more intense physical sensations (e.g.,
352 warmth in the chest) and higher desire for imitating others than admiration for skill
353 (Algoe & Haidt, 2009). Similarly, admiration for morality and admiration for skill activate
354 different cortical areas in the brain (Immordino-Yang, McColl, Damasio, & Damasio,
355 2009). However, this does not change the fact that people admired for their
356 competence or for their virtue are conferred voluntary deference because people
357 expect to benefit from them, and that this contrasts with the coerced deference
358 attained by dominant individuals.

359 Bai seems to have found cases in which competence is not necessary to acquire
360 prestige. Another such case is when people who have acquired wealth through
361 inheritance rather than competence behave altruistically. However, competence and
362 altruism seem to be tightly linked together in many empirical contexts. For example,
363 altruism is positively correlated with prestige (Cheng et al., 2010) and morality with
364 competence-respect in some of Bai’s own studies (Bai, Ho, & Yan, 2019). Similarly,
365 competence (e.g., hunting skill and gardening knowledge) and altruism (e.g., sharing
366 meat and helping others with work) clustered together in a study with a foraging society
367 using data reduction techniques (Konečná & Urlacher, 2017). Furthermore,

368 competence within a domain (e.g., hunting) is normally necessary to gain the surplus
369 wealth to act altruistically. For example, sharing turtle meat among the Meriam of
370 Torres Strait (Australia) requires being a skilful hunter, which demands hard work
371 (Smith & Bird, 2000). Moreover, if an individual is very competent in a domain, they
372 are likely to elicit resentment and jealousy in less competent individuals. However, if
373 this very competent individual acts generously by contributing to a group task or
374 providing advice, they can overcome this threat to their attainment of voluntarily
375 conferred high social rank (Grant, 2013).

376 All in all, the reviewed evidence suggests that altruism/generosity (or moral behaviour
377 in general) is a way in which individuals might attain high prestige. However, further
378 research is necessary to understand how altruism/generosity interacts with
379 competence in the attainment of prestige.

380 3.1.4.- Are there multiple ways to display the dominance and prestige strategies?

381 The concept of dominance in the animal literature has been found problematic.
382 Dominance usually refers to the use of force or the threat of the use of force,
383 sometimes with the help of coalitional support (Lewis, 2002). This is also the way that
384 dominance is frequently understood in the human literature, which is associated with
385 physical and non-verbal cues that signal the capacity of an individual to inflict costs
386 via physical aggression such as physical formidability, masculine facial characteristics,
387 or deeper voices, as well as behavioural displays such as risk-taking behaviour (Hill,
388 Bailey, & Puts, 2017; Redhead, Cheng, & O’Gorman, 2018b). However, this is not the
389 only way humans and other animals can impose costs on other individuals. Lewis
390 (2002) has restricted the concept of dominance to physical dominance and has used
391 the term ‘leverage’ to refer to the way individuals can attain social influence through
392 the possession of resources that cannot be taken by force. For example, female

393 chimpanzees have an advantageous social position when they are in oestrus,
394 although the ability to win fights does not change. In humans, expert knowledge/skills
395 and wealth can be used to inflict costs or threaten to inflict costs on others to attain
396 social influence. For example, a shaman can attain influence in others by threatening
397 to withhold his services when they are needed (Chapais, 2015).

398 Apart from the display of competence and altruism/generosity, other individual
399 behaviours and characteristics such as demographic characteristics (Berger, Cohen,
400 & Zelditch, 1972), assertiveness (Anderson & Kilduff, 2009b), confidence (Anderson,
401 Brion, Moore, & Kennedy, 2012) and social connectedness (Anderson & Shirako,
402 2008) have been associated with the attainment of prestige. We posit that
403 demographic characteristics, assertiveness, and confidence are first-order cues that
404 people use to infer competence and, therefore, prestige (Jiménez & Mesoudi, 2019).
405 In contrast, social connectedness is a way to *broadcast* competence and/or generosity
406 (Anderson & Kilduff, 2009a).

407 Anderson and Shirako (2008) demonstrated the importance of social connectedness
408 for acquiring prestige through generosity in a study with business students enrolled in
409 a negotiation class. The researchers used peer reports to measure the level of
410 connectedness of each student prior to the start of the class and the students'
411 reputations after engaging in dyadic negotiation exercises. The results show that the
412 more connected individuals' reputation for cooperativeness or selfishness was more
413 strongly linked to their history of behaviour during negotiations than the reputation of
414 less connected individuals.

415 It could be argued that social connectedness is also necessary to attain prestige
416 through competence. For example, scientific publications and scientific prestige

417 culturally evolved to encourage scientists to share their knowledge, so that others can
418 build on it (Hull, 1988/2010). If Darwin and Wallace had kept their ideas to themselves,
419 they would not be celebrated, and natural selection would have taken longer to
420 discover.

421 **3.1.5.- Conclusion on dominance and prestige strategies**

422 Taking all these pieces of evidence together, we propose talking about dominance
423 and prestige strategies *in the plural*, instead of assuming a single dominance strategy
424 and a single prestige strategy. Within dominance strategies, we include physical
425 dominance and leverage (Lewis, 2002). Within prestige strategies, we include displays
426 of (apparent) competence, displays of (apparent) generosity, and the development of
427 social connections (Anderson & Kilduff, 2009a).

428 Future research will need to determine to what extent the different strategies for
429 attaining dominance and prestige are independent from each other. We predict that
430 the two strategies to rank high in the dominance dimension, physical dominance and
431 leverage, are independent because their induction of fear rest on different
432 mechanisms: the capacity to win fights vs the possession of valued
433 knowledge/skills/resources (prediction 1 in Table 3). In contrast, we predict that the
434 three strategies to rank high in the prestige dimension, displaying competence,
435 displaying generosity, and developing more social connections, are more dependent
436 on each other (prediction 2 in Table 3).

1)	Physical dominance and leverage are two independent strategies to induce fear in others and attain/maintain/increase social rank and social influence
2)	Displaying competence, displaying generosity, and developing more social connections are not independent strategies to induce admiration and attain/maintain/increase social rank and social influence

Table 3. Predictions derived from the present review.

3.2.- Dimensions of Social Rank

3.2.1.- The long-term consequences of the dominance and prestige dimensions

The DEM was initially developed to explain rank differentiation within small groups that possess informal hierarchies, such as hunter-gatherer bands or groups of school peers (Henrich & Gil-White, 2001). In such groups where members know each other and interact face-to-face, the use of either dominance strategies or prestige strategies is an effective means to attain coercively imposed or freely conferred social rank respectively (see Section 3.1). However, dominance and prestige are likely to have different dynamics over time within this type of small-scale group.

Redhead, Cheng, Driver, et al. (2018) studied this in a longitudinal study with naturally occurring small groups without formal hierarchies. They predicted that the social influence attained by people initially rated as high in dominance diminishes over time (prediction 4 in our Table 2), while the social influence attained by people initially rated as high in prestige strengthens over time (prediction 5 in our Table 2). The rationale for these predictions is a consequence of the different mechanisms by which dominance and prestige operate. The elicitation of fear by dominant individuals does not require prolonged observation. If a schoolchild is threatened by a bully in his first day at a new school, fear is going to be elicited immediately. This makes dominance effective for acquiring social influence and social rank in transient encounters or in the initial stages when a group is forming. However, people dislike attacks on their autonomy and being coerced to do things against their will (Boehm et al., 1993; Price & Van Vugt, 2014). Consequently, less dominant individuals often fight back against dominant individuals by forming coalitions (e.g. Ridgeway & Diekema, 1989) and, in doing so, resist or diminish their influence over time.

461 In contrast, prestige strategies need more prolonged observation to be effective. The
462 schoolchild in the example above might see one of their classmates scoring a couple
463 of goals in their first day at a new school but this might have been due to luck or the
464 incompetence of the rival players. Consequently, our schoolchild is going to need
465 further observation to develop admiration for the football skills of the classmate.

466 Redhead, Cheng, Driver, et al. (2018) conducted their study with newly formed student
467 project groups of 3-5 individuals at an American university. The students within each
468 group interacted during four hours per week for 16 weeks. Each student rated the
469 dominance, prestige, and social influence of the other students in their group on four
470 occasions during this period using the validated scales (Cheng, Tracy, Foulsham, et
471 al., 2013; Cheng et al., 2010) described in Section 3.1.1.

472 Contrary to prediction 4 in Table 2, the relationship between the initial ratings of
473 dominance and the ratings of social influence did not diminish or change over time.
474 This might have been because the groups were formed by only 3 to 5 individuals and
475 the interactions only lasted 16 weeks. It is possible that within larger groups or over
476 longer periods of time, less dominant individuals might be able to diminish the
477 influence of dominant individuals by forming larger or better organised coalitions.
478 Nevertheless, dominant individuals can also form coalitions with other individuals and,
479 if these coalitions are effective using coercion, it is not clear why dominant individuals
480 could not increase their influence over time.

481 Redhead et al. (2018) found that the relationship between the initial ratings of prestige
482 and the ratings of social influence did increase over time, which supports prediction 5
483 in Table 2. Furthermore, the authors found a bidirectional relationship between
484 prestige and social influence over time. This is congruent with the DEM as some of

the consequence of prestige, such as being copied and receiving deference, make the prestige of an individual and consequently their social influence increase over time (see bidirectional arrows connecting being copied and receiving deference with the prestige dimension in Figure 1, and Cheng, 2019 for a review).

Nevertheless, this longitudinal study only lasted 16 weeks. It is possible that the relationship between prestige and social influence are different over longer periods of time. For example, it is known that hunting performance in hunter-gatherers peaks around 40 years of age (Stibbard-Hawkes, Attenborough & Marlowe, 2018; Walker, Kill, Kaplan & McMillan, 2002). Because prestige is thought to be positively correlated with competence within valued domains (Henrich & Gil-White, 2001; Jiménez & Mesoudi, 2019), the relationship between prestige and social influence is likely to strengthen over the first 30 years of hunting. However, hunting skill diminishes over time after this age, and, therefore, the strength of this relationship is also likely to diminish (Jiménez & Mesoudi, 2019).

Little research has been conducted on the relationship between dominance or prestige and social influence over time. Therefore, we cannot reach strong conclusions. We have pointed out that other factors such as the size of the group, the length of time, and the ability of high and low dominance individuals to form effective coalitions might influence the long-term trajectories of the social influence of dominant and prestigious individuals.

3.3.- Proximate Consequences of Dominance and Prestige

According to the DEM, attaining a dominance- or prestige-derived high social rank leads to individuals becoming socially influential (prediction 2 in Table 2), receiving attention (prediction 6 in Table 2) and receiving deference (prediction 9 in Table 2). Nevertheless, these similar consequences of dominance and prestige are achieved

510 through different means, i.e., the induction in subordinates of fear (dominance) vs
511 admiration (prestige).

512 3.3.1.- Attention

513 Although the DEM predicts that both dominant and prestigious individuals receive
514 preferential attention from subordinates (prediction 6 in Table 2), it also predicts that
515 the type of attention they receive is different. Prestigious individuals are expected to
516 receive sustained attention, which is assumed to facilitate the acquisition of high
517 quality knowledge/skills through social learning from competent individuals (prediction
518 7 in Table 2, Henrich & Gil-White, 2001). Dominant individuals are expected to receive
519 furtive glances, which functions to monitor the behaviour of the dominant individual to
520 prevent potential costs, while not being seen to be a threat to the dominant individual
521 or attracting negative behaviours (prediction 8 in Table 2; Henrich & Gil-White, 2001).

522 While the evidence showing that high social rank individuals are paid more attention
523 is robust (Dalmaso, Pavan, Castelli, & Galfano, 2012; DeWall & Maner, 2008;
524 Foulsham, Cheng, Tracy, Henrich, & Kingstone, 2010; Gerpott, Lehmann-Willenbrock,
525 Silvis, & Van Vugt, 2017; Jones et al., 2010), few studies have distinguished between
526 dominant and prestigious individuals. One exception is a recent study conducted by
527 Roberts, Palermo, and Visser (2019). These researchers manipulated dominance and
528 prestige through the use of first-order cues (Jiménez & Mesoudi, 2019; Jiménez &
529 Mesoudi, 2020): faces rated as high or low in dominance and CVs considered to be
530 high (e.g., succeeding in a career in medicine) or low (e.g., having dropped out of
531 university) in prestige. The attentional blink task was used, which entails the rapid
532 presentation of a series of stimuli including two targets and a few distractors
533 (scrambled human faces and dog faces). This task is used to study biases affecting
534 the allocation of attentional resources to competing stimuli. In this study, participants

identified the faces by answering positively to the question “did you see an unscrambled face?” Contrary to prediction 6 in Table 2, there were no significant differences between the high and low prestige stimuli, and the accuracy was higher for low dominance stimuli than for high dominance stimuli. It is not clear why the low dominance faces were more accurately identified, but a possibility suggested by the authors is that the low dominance faces attracted attention because they did not meet the stereotypical expectations of what male faces look like. Nevertheless, the procedure involved 10 milliseconds to process each stimulus with an interval of 80 milliseconds between stimuli. This is very different from the way people interact with dominant and prestigious individuals in real life and it is difficult to compare with other attention experiments using more realistic experimental materials.

Another exception is the study by Cheng, Tracy, Foulsham, et al. (2013) reviewed in Section 2.1, in which dominance and prestige-based hierarchies emerged in small groups of unacquainted individuals completing the *Moon Task*. After running this task, external raters wearing fixed eye-trackers viewed clips of these interactions and rated the individuals in the clips for dominance and prestige. In support of prediction 6 in Table 2, the dominance and prestige ratings received by the individuals in the clips were positively related to the amount of perceptual attention they received by these external raters.

Cheng et al. did not directly test whether the type of attention that dominant and prestigious individuals received was different. However, they took two different measures of attention: total fixation duration and proportion of fixations. These measures can be used as proxies for sustained attention and furtive glances, respectively. According to the standardized coefficients, dominance ratings ($\beta = .56$) positively predict sustained attention to a greater extent than prestigious ratings ($\beta =$

.23), which contradicts the prediction of greater sustained attention towards prestigious individuals than dominant individuals (prediction 7 in Table 2). Dominance ratings ($\beta = .56$) also positively predict furtive glances to a greater extent than prestige ratings ($\beta = .24$), which supports the prediction of a greater number of furtive glances towards dominant individuals than towards prestigious individuals (prediction 8 in Table 2).

Another relevant study was conducted by Holland, Wolf, Looser, and Cuddy (2017), although there was no comparison between dominance and prestige. The authors used static images of one man and one woman displaying either dominant poses (e.g., greater occupation of the space and open limbs) or submissive poses (e.g., smaller occupation of the space and closed limbs), while participants' attention was recorded with eye-tracking devices. As the authors predicted, people fixated less and spent less time looking at dominant posers than at submissive posers, fixated less and spent less time looking at the faces and upper bodies, and more at the lower bodies of dominant posers than submissive posers. This is congruent with the assumption that dominant individuals are feared and monitored. The authors conclude their article emphasizing the importance of distinguishing between prestige and dominance to assess attention in line with Henrich and Gil-White's (2001) predictions. They point out that, while experiments using prestige through manipulations of targets' uniforms (DeWall & Maner, 2008; Maner, DeWall, & Gailliot, 2008) or CVs (Dalmaso et al., 2014; Dalmaso et al., 2012) indicate that people pay sustained attention to high prestige individuals, their manipulations of the target's dominance through non-verbal displays indicate that people avert their gaze from high dominance individuals.

In summary, it is unclear whether prestigious and dominant individuals receive similar or different types of attention. The study by Cheng et al. (2013) found that both

prestigious and dominant individuals received similar types of attention and that dominance has a stronger effect than prestige in predicting both sustained attention and furtive glances. However, Holland et al. (2017) showed that people avert their gaze from people displaying dominant poses, which suggests that people do show different types of attention towards dominant individuals. Unfortunately, this study did not compare dominance with prestige. Moreover, these eye-tracking experiments have the limitation that they measure the attention paid to individuals differing in social rank *by external observers* to the group interactions. The DEM predicts that dominant individuals should only encourage furtive glances when the dominant individuals can react to the observer. Similarly, prestigious individuals should only encourage sustained attention when it is possible to learn something valuable (e.g., knowledge, skill) from them. Neither of these were possible in these experiments. The introduction of expectations about encountering these high social rank individuals or being watched by them later (e.g., Gobel, Kim, & Richardson, 2015) might help to clarify this question. Furthermore, the development of mobile eye-tracking devices that allow the measurement of attentional biases of participants interacting together is promising. Future studies using mobile eye-trackers in group interactions might help to tell apart the effects of prestige and dominance on social attention.

3.3.2.- Deference

The DEM predicts that both dominant and prestigious individuals should receive more deference than low social rank individuals (prediction 9 in Table 2). It also predicts that the deference received by dominant individuals is coercively attained due to the fear of potential costs (e.g., physical aggression) of failing to do so in subordinates, while the deference received by prestigious individuals is voluntarily conferred due to the wish of subordinates to benefit from the prestigious individual's knowledge/skill

(prediction 10 in Table 2). Unfortunately, to our knowledge, there are no studies comparing the deference received by dominant and prestigious individuals.

Deference towards dominant men has been shown in an experiment about mate competition (Gambacorta & Ketelaar, 2013). In this experiment, male participants were made to believe that they were competing with another man for a date with an attractive woman. Dominance was manipulated via a photo of a shirtless man who was either physically strong (high dominance) or weak (low dominance). Participants were prompted to tell stories and jokes to the attractive woman. Gambacorta and Ketelaar assumed that dominant men have used violence to prevent other men mate through human evolutionary history. Consequently, men competing for mates with a dominant man would inhibit creative displays to avoid the potential costs inflicted by dominant individuals. As predicted, men competing with the high dominance man told fewer stories and jokes than the men competing with the low dominance man. Moreover, the quality of the stories and jokes of the men who told them was lower when competing with the high dominance man than when competing with the low dominance man.

Deference towards prestigious individuals has been shown by van der Vegt, Bunderson, and Oosterhof (2006), who found that participants with low expertise in a group task showed more deference (i.e., were more committed and showed more help) towards experts than towards less competent individuals. This could be interpreted as a way to incentivise experts to provide more contributions, advice and help (Jiménez & Mesoudi, 2019).

632

3.3.3.- Social learning

A clear difference between the proximate consequences of dominance and prestige is that prestige leads to being preferentially selected as a demonstrator from whom to socially learn valuable knowledge/skills (prediction 11). This is not the case for dominance except perhaps when the knowledge/skill that is socially learned is the dominance strategy itself. This prediction is derived from Henrich and Gil-White's (2001) theory of the evolution of prestige, which was reviewed in Section 2.

This preferential selection of prestigious individuals as demonstrators from whom to socially learn has been demonstrated by laboratory and online experiments (Atkisson, O'Brien, & Mesoudi, 2012; Brand, Heap, Morgan, & Mesoudi, 2020; Chudek, Heller, Birch, & Henrich, 2012) and by ethnographic studies of small-scale societies (Henrich & Broesch, 2011; Henrich & Henrich, 2010). Although the experimental evidence generally supports the use of prestige-biased social learning, there is little supporting evidence in the ethnographic record (Garfield, Garfield, & Hewlett, 2016; Garfield, Hubbard, & Hagen, 2019). Similarly, Chudek, Baron, and Birch (2016) did not find that children aged 2-7 preferentially copied high prestige individuals over low prestige individuals. See Jiménez and Mesoudi (2019) for a full review of prestige-biased social learning.

3.4. Ultimate Consequences of Dominance and Prestige

3.4.1.- Higher Fitness

The DEM predicts that both dominant and prestigious individuals have higher fitness than lower social rank individuals (prediction 12 in Table 2). We define fitness in evolutionary terms as the relative reproductive success of individuals within a social group. The predicted higher reproductive success of dominance and prestige individuals can either be a consequence of a direct link between genetic predispositions towards prestige/dominance psychology and reproductive success, or

659 a human behavioural ecology approach where it is assumed that people generally
660 maximise their fitness, and prestige and dominance are two ways in which this is done
661 without needing to necessarily assume genetic predispositions for prestige-dominance
662 specifically.

663 von Rueden et al. (2010) studied whether this prediction holds for Tsimane men. The
664 ability to win a dyadic physical confrontation was used as a proxy for dominance, while
665 community-wide influence was used as a proxy for prestige. Both dominance and
666 prestige were positively related to number of in-pair surviving offspring and extra-
667 marital affairs. Both correlations were stronger for prestige. Dominance was positively
668 related to marrying younger women and prestige to having wives with earlier age of
669 birth. The relationship between determinants of social rank (physical formidability,
670 political influence, and hunting ability) and positive fertility outcomes is robust in the
671 literature regarding small-scale foraging societies (Von Rueden, 2014). Nevertheless,
672 it is less clear how dominant and prestigious individuals attain higher fertility. Von
673 Rueden (2014) suggests that it could be through having more access to mates and/or
674 higher quality mates, as well as receiving more support from allies and deference from
675 others. It is also possible that the characteristics that lead to attaining high social rank
676 within these societies (e.g., hunting ability) are the important factors in determining
677 offspring survivorship (Von Rueden, 2014). Moreover, it could also be the case that
678 having more offspring is what leads to attaining higher social rank and not the other
679 way round (Von Rueden, 2014).

680 Sexual preferences for dominant and prestigious men have also been found in studies
681 with WEIRD (acronym for Western, Educated, Industrialized, Rich and Democratic;
682 Henrich, Heine, & Norenzayan, 2010) samples. Snyder et al. (2008) argue that high
683 dominance men could cause costs to their partners if they behave aggressively

684 towards them. Consequently, they hypothesized that women generally prefer
685 prestigious men over dominant men. They independently manipulated dominance
686 (high vs low) and prestige (high vs low) in a 2 x 2 between-subjects design using
687 descriptions of individuals competing for leadership within a student fraternity. They
688 found support for their hypothesis: high prestige individuals were rated as more
689 attractive and desirable as short-term and long-term partners than low prestige
690 individuals. Low dominance individuals were also more desirable as long-term
691 partners than high dominance individuals. In a subsequent study using the context of
692 an athletic competition, high dominance men were considered more attractive and
693 desirable as both short-term and long-term partners than low dominance men. A
694 potential explanation for this finding is that using the dominance strategy in athletic
695 male to male competition is socially sanctioned (Snyder et al., 2008) and, therefore, it
696 could be difficult to disentangle it from the prestige strategy of displaying high
697 competence. Unfortunately, there was no comparison between prestige and
698 dominance in the athletic context in this study.

699 From our point of view, the prediction that dominant and prestigious individuals have
700 higher fitness than lower social rank individuals might depend on the time over which
701 dominant and prestigious individuals are able to maintain their high social rank. If
702 dominant individuals are not able to maintain high social rank over longer periods of
703 time as predicted in prediction 4 in Table 2, their short-term dominance is unlikely to
704 pay off in terms of fitness. Similarly, if the prestige of an individual does not last for
705 long, or it is in a domain that is not widely appreciated by members of the other sex,
706 high prestige might not be translated into higher fitness.

4.- Conclusions, Limitations, and Further Directions

In this article we have reviewed the literature regarding key predictions derived from Henrich and Gil-White's Dual Evolutionary Model of Social Hierarchy as applied to human social groups without formal hierarchies (see predictions 1-12 in Table 2) and suggested new predictions for research (see predictions (1-2) in Table 3). The literature is largely supportive of the model, but the DEM has generated some controversies regarding whether a dual model of social hierarchy is the most appropriate way to capture social rank acquisition processes (see Section 3.1.), and there are considerable gaps in the literature regarding the different proximate and ultimate consequences of dominance and prestige (see Sections. 3.3. and 3.4.)

The evidence is generally supportive of the idea that dominance and prestige are two independent strategies that lead to the acquisition of high social rank and influence (predictions 1-2 in Table 2). The different mechanisms that supposedly explain the acquisition of social rank using dominance and prestige strategies are the elicitation of fear and admiration in other individuals, respectively (prediction 3 in Table 2). Although this is a central component of the DEM, this is an area of research that has been largely neglected. Furthermore, the debates on whether there are two pathways to the top as the DEM posits, or only one, or more than two, could be solved if further scrutiny is dedicated to the similar or different mechanisms that lead to the acquisition of higher social rank through different strategies.

In our view, there are more than two strategies for attaining high social rank (see Section 3.1.3), but these strategies can nevertheless be classified into dominance strategies and prestige strategies in the plural depending on the emotions that they elicit in other individuals. If they elicit fear, they are dominance strategies. If they elicit admiration, they are prestige strategies. We posit that dominance strategies, i.e.

732 physical dominance and leverage, are two independent strategies to induce fear in
733 others based on different mechanisms: the capacity to win contests vs the possession
734 of valued knowledge/skills/resources (dominance strategies, prediction 1 in table 2).
735 We posit that the prestige strategies, i.e. displaying competence, displaying
736 generosity/morality, and developing social connections, are more dependent on each
737 other (prediction 2 in Table 3). For example, individuals would need certain level of
738 generosity to be admired for their competence, and competent individuals would
739 require social connections to be seen, which is a prerequisite for gathering admiration.
740 The dependence / independence of different dominance and prestige strategies are
741 important areas of research that require further attention by researchers of social rank
742 acquisition.

743 The DEM states that both dominant and prestigious individuals receive more attention
744 (prediction 5 in Table 2) and deference (prediction 7 in Table 2) than low social rank
745 individuals. There is little controversy over the fact that this is the case. The DEM also
746 states that the types of attention (predictions 6-7 in Table 2) and deference (predictions
747 8-9 in Table 2) that dominant and prestigious individuals receive are different and are
748 the consequence of the different emotions they supposedly elicit in other individuals:
749 fear vs admiration (prediction 3 in Table 2). Unfortunately, there is no research directly
750 comparing the different types of attention and deference that dominant and prestigious
751 individuals receive. Research in this area would benefit from studying simultaneously
752 the emotions elicited in other individuals (see above in this section) and their
753 behavioural manifestations: sustained attention and voluntary deference in prestigious
754 individuals vs furtive glances and coerced deference in dominant individuals,
755 respectively.

756 Given the fact that Henrich and Gil-White (2001) consider that social learning is the
757 selective pressure that led to the evolution of prestige in humans, it is not surprising
758 that social learning from prestigious individuals is one of the most studied
759 consequences of having high prestige (Jiménez & Mesoudi, 2019). Unfortunately,
760 studies comparing social learning from dominant and prestigious individuals has not
761 yet been conducted. We encourage researchers to study the conditions under which
762 people preferentially copy dominant individuals. For example, people might copy
763 elements of the dominance strategy itself from dominant individuals if they have
764 previously seen that dominant individuals attain what they want and that this has no
765 negative consequences for them.

766 In conclusion, the DEM has become one of the most influential evolutionary theories
767 of social hierarchies in humans. Nevertheless, many important predictions of the
768 model still need to be appropriately tested. We hope that this article stimulates
769 research on the missing pieces of this puzzle.

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5.- Acknowledgements

This research was supported by the Leverhulme Trust (grant RPG-2016-122658 awarded to AM). We thank Thomas Currie, Rick O’Gorman, Matt Gobel, and Alice Williams for their comments in earlier versions of this manuscript.

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