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Confidence does not equal competence: Socially dominant individuals are more confident in their decisions without being more accurate

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ABSTRACT

High status within social hierarchies is often the reserve of socially dominant individuals. Faster responses have been identified as a cognitive predisposition of socially dominant individuals, thought to confer an advantage by allowing them to act first in social contexts. Response speed is also thought to reflect decision confidence, but this has not been directly investigated in relation to social dominance. Moreover, personality traits, such as extraversion, may show a similar relationship with decision-making speed and confidence and may explain any relationship with social dominance. Confidence is thought to be domain specific and it is therefore important to assess whether any association between decision confidence and social dominance, is also observed in other cognitive domains. Across three studies, we assessed performance on a two-choice statistical learning decision-making task and a self-referential memory task. To measure metacognitive bias, we included confidence for both decisions and memory traces. We also included a measure of extraversion to investigate whether these two related personality traits explain overlapping or unique variance in task performance. Across three studies, social dominance and extraversion were positively correlated. Both social dominance and extraversion independently predicted variance on confidence for decisions, with stronger evidence for a unique role for social dominance, but no relationship was identified for confidence in memory traces.

Social hierarchies often emerge within the societies of social animals, including human societies (Cheng & Tracy, 2014; Zink et al., 2008). Acquiring social status within such hierarchies has benefits within a group related to access to resources and protection from others. Prestige and dominance are considered the two main strategies to navigate social hierarchies and acquire social rank (Cheng & Tracy, 2014; Maner, 2017). While prestige requires a reputation based on previous success, socially dominant individuals may acquire rank by convincing others of their ability in the absence of explicit evidence of previous success. How this is achieved has been a recent focus of social cognitive research. For example, previous research has shown that social dominance is associated with faster response times for decisions (da Cruz et al., 2018). Speed of response may communicate to others that they are particularly confident in their decision and encourage others to follow. However, it is not known whether socially dominant individuals are more confident in their decisions. Moreover, it is unknown whether other personality factors such as extraversion can explain the relationship between social dominance and decision making parameters or whether socially dominant individuals are confident in all aspects of cognitive performance or whether this is unique to decision-making.

The prestige strategy for navigating social hierarchies focuses on the display of knowledge, skill and pro-social behaviours to garner the respect of others. Alternatively, dominance relates to the use of coercion, intimidation, and power (Cheng et al., 2010; Maner, 2017) to navigate these hierarchies. Social dominance (or trait dominance), as measured by the Personality Research Form (Jackson, 1974), measures self-reported motivation geared towards social influence within groups. It has been used to assess those who wish to attain positions of power and influence in groups (Mehrabian, 1996). And is associated with assertive personality qualities and elevated desire to influence or control others (Hall et al., 2005). Although competence is often attributed to those with prestige (Cheng et al., 2010; Cheng et al., 2013), it has also been observed that individuals scoring high on the social dominance trait were more likely to be perceived as competent by peers, even if competence was lacking (Anderson & Kilduff, 2009). Moreover, social dominance was found to predict leadership choice in groups (Bateman & Crant, 1993; Guinote, 2017), and has been noted to be prioritized over perceived intelligence (Judge et al., 2002). Unsurprisingly, social

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dominance expression in leadership positions has also been linked to undesirable outcomes for the groups that were lead (e.g. Kakkar & Sivanathan, 2021). Studies observed that dominant individuals can prefer sociable, as opposed to competent subordinates (Operario & Fiske, 2001), or even discourage bonding and ostracise talented members (Maner, 2017), which may be related to having a power maintenance strategy, as opposed to the prosperity of the group as the main objective. Therefore, understanding how personality factors such as social dominance influence decision-making has real-world application, especially in the field of management and leadership.

Previous research has focused predominantly on personality and behavioural correlates of social dominance (Cheng et al., 2010; Cheng & Tracy, 2014; Hall et al., 2005; Maner, 2017). However, more recent evidence also suggests cognitive differences in socially dominant individuals. Specifically, social dominance has been associated with faster response times during decision-making within competitive settings (Santamaría-García et al., 2013; Santamaria-Garcia et al., 2015; Balconi & Vanutelli, 2016). Building on this research, da Cruz et al. (2018) investigated whether social dominance was associated with a distinct cognitive style regardless of social context. They demonstrated that socially dominant males make cognitively demanding decisions faster, whilst maintaining similar levels of accuracy to non-socially dominant males. The authors justified focusing on males as sex differences in social dominance have been well-documented (Dykiert et al., 2012; Helgeson & Fritz, 1999). However, even if social dominance is expressed to a lesser extent in women, similar cognitive biases may be apparent. It is also important to assess the relationship across different decision-making tasks to determine if dominance related effects are unique to specific decision-making tasks. For example, in da Cruz et al. (2018), the decision-making tasks used were limited to facial discrimination and recognition, and a working memory map-based route-learning task. Therefore, in the first study we include women and use a statistical learning paradigm whereby participants are required to learn across sequential trials and arrive at a decision that is most likely to produce the desired outcome in both stable and volatile environments (Behrens et al., 2007).

In addition to accuracy and response time analyses, metacognitive aspects of decision-making can also be assessed. Following a decision, the participant is asked to reflect on their decision, and report their confidence in their choice. A metacognitive bias is defined as the confidence in a choice, irrespective of whether it was correct or incorrect within given conditions (Fleming & Lau, 2014). A positive metacognitive bias (i.e. greater confidence) is associated with faster response times (Kiani et al., 2014; Weidemann & Kahana, 2016). Therefore, greater social dominance may also be associated with greater confidence in a decision, regardless of whether the decision is optimal. A greater confidence, communicated explicitly or via faster response times, may be the means by which socially dominant individuals establish influence and power over others (Zarnoth & Sniezek, 1997).

Extraversion refers to a personality style characterized by a greater external focus and increased sociability (Ashton et al., 2002), but also is associated with a greater motivation to socially dominate others (Volk et al., 2021). Within the Big Five personality structure, social dominance is generally understood to be a dimension of extraversion, although considered a distinct dimension in alternate models of personality (Zuckerman, 1991). Extraversion has been associated with faster responses across cognitive domains (Brebner, 1985; Brebner, 1990; Sočan & Bucik, 1998; Wickett & Vernon, 2000). For example, in relation to decision-making, extraverts show enhanced sensory reactivity and faster reaction times (Doucet & Stelmack, 2000). Therefore, it is important to assess whether the relationship between social dominance and decision-making performance is better captured by extraversion, rather than reflect a unique relationship.

In study one, we investigated the association between social dominance, extraversion and decision-making using a statistical learning paradigm. It was hypothesized that social dominance and extraversion would negatively correlate with response times and positively correlate with metacognitive bias. We expected no association with accuracy. Second, we predicted that the relationship between social dominance and decision making parameters, would remain significant after controlling for extraversion. In the second study, we explored whether the association between social dominance, extraversion, and metacognitive bias extended beyond the domain of decision-making, to the domain of memory, using a self-referential memory task. Although confidence in memory traces was of primary interest, we used a socially relevant task that required encoding adjectives in relation to either the self, a close friend, or a well-known politician, Boris Johnson, to study self-referential biases within episodic memory. Since social dominance has previously been associated with greater self-reliance and self-sufficiency, coupled with a tendency to ignore information related to others (Lord et al., 1986), we sought to explore whether socially dominant individuals may bias encoding information in relation to themselves at the detriment to the information relating to others, resulting in a larger self-referential bias. Finally, in study three, we replicated study one in a more representative and gender-balanced sample.

1. Study 1

1.1. Method

1.1.1. Participants

The study included 143 (113:30 F/M) undergraduate students recruited through the Research Participation Scheme at [Redacted for purposes of anonymous review]. All participants were between 18 and 40 years of age ($M = 19.6$, $SD = 2.6$), had normal/corrected-to-normal vision and reported no neurological or psychiatric diagnoses. All participants were awarded course credits for their participation. Informed consent was collected prior to the study commencing. Our goal was to obtain 0.90 power to detect a medium effect size (critical r of ± 0.20) at 0.016 alpha error probability (Bonferroni corrected for 3 correlation analyses – decision response time, accuracy, and confidence). This returned a required sample size of 140. We collected additional data to ensure that any exclusions due to non-task compliance or extreme scores, did not result in a reduced cohort, resulting in a sample of 143. There were no exclusions. We were unsure on effect size as the relationship between social dominance and decision-making parameters was unknown. We selected a medium effect size as it was deemed appropriate to balance both the feasibility of sample recruitment and the statistical power needed to detect meaningful effects.

1.1.2. Procedure

The study information sheet, consent form and questionnaires were presented to participants using the Qualtrics software (Qualtrics, Provo, UT). Following this, participants completed the statistical learning task using the Pavlovia platform (pavlovia.org). Participants were then directed back to Qualtrics to be debriefed. In order to encourage engagement with the task, participants were instructed that if they performed in the top 25 %, they would receive an extra credit. However, at the end of the study, all participants were awarded the extra credit regardless of performance.

1.2. Questionnaires

1.2.1. Demographics

The demographic survey collected information on age, ethnicity, and gender strictly for descriptive purposes.

1.2.2. Social dominance

Social dominance was measured using the Personality Research Form dominance subscale (PRF-d) taken from the Personality Research Form (Jackson, 1974). The 16-item inventory consisted of statements

such as "I feel confident when directing the activities of others" and "The ability to be a leader is very important to me". All statements required a "True" or "False" response. Any reverse scored items in this questionnaire were recalculated for final scoring. Total scores were calculated, ranging from 0 to 16, with the higher the score, the stronger the expression of social dominance. The questionnaire has good construct validity and is positively correlated with traits such as organizing groups (Buss & Craik, 1980) and with peer nominations for positions of leadership (Bateman & Crant, 1993). The questionnaire has high internal consistency (α = 0.81).

1.2.3. Introversion/Extraversion

Introversion/Extraversion was measured using the Introversion scale (Sallinen-Kuparinen et al., 1991) developed from the original introversion-extraversion scale (Eysenck, 1971), which had 18 items in total. Twelve items measure introversion/extraversion and include items such as "Are you inclined to keep in the background on social occasions?" and "Do you derive more satisfaction from social activities than from anything else?", with 5 response options ranging from "Strongly Disagree" to "Strongly Agree". Six items are filler items measuring neuroticism and are not scored in the total score. The measure has high internal consistency (α = 0.81). Using the questionnaire administration guidance, the items were totaled up with scores ranging between 12 and 60 - the higher the score, the stronger the expression of introversion. As we expected social dominance to be positively correlated to extraversion, we reverse coded the introversion scale for ease of interpretation. Therefore, higher scores reflect greater extraversion.

1.2.4. Statistical learning task

We employed a statistical learning task whereby participants were instructed to decide which of two birds (see Fig. 1) would appear next and how confident they were in their decision on a scale of 1–10. The bird was presented on the screen for 100msecs followed by the prompt to decide which bird would appear next. Participants selected the bird using a mouse. The proportion of each bird was fixed at either 60:40, 70:30, 80:20, or 90:10. The task consisted of 480 trials divided into 8 blocks of 60 trials plus 10 practice trials at the beginning. The blocks were either stable or volatile. In stable blocks the likelihood for each bird remained consistent. In volatile blocks, the proportion would switch (e.g., 80:20 to 20:80), requiring the participant to adapt their responses accordingly. Participants were informed of their accuracy at the end of each block. There was a stable and volatile block for each of the four possible proportions. The volatility aspect was included for the purposes of another study and is not considered in the current study. For purposes of analysis, mean scores of accuracy, response time and confidence for both correct and incorrect responses (metacognitive bias) were calculated for each participant.

1.3. Statistical analyses

Analyses were conducted in JASP version 0.17.1 (http://jasp-stats.org; JASP Team, 2023). To explore the relationship between social dominance, extraversion, and decision-making performance (accuracy, response time, and metacognitive bias), we conducted Pearson's correlations followed by a linear regression to follow up significant results. With large samples, bivariate normality is often violated and as we were primarily interested in linear relationships, report only Pearson's correlations in the main manuscript. However, we provide non-parametric Spearman's Rho correlation estimates alongside bivariate normality assumption checks in Appendix A. All conclusions are comparable regardless of the statistical measure used.

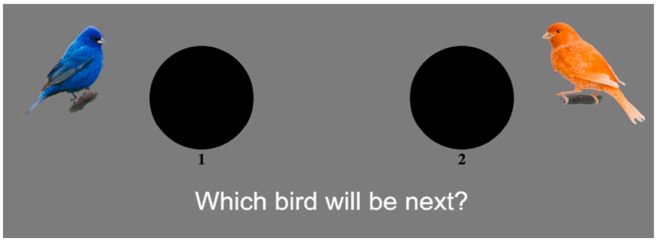

Fig. 1. Two bird statistical learning task.
Note. Participants were required to select which of two birds would be presented next.

1.4. Ethical considerations

The study was conducted in compliance with the ethical standards outlined in the Declaration of Helsinki. All procedures involving human participants were reviewed and approved by the [redacted for anonymity] Research Ethics Committee [ID: 202016044838416698], and informed consent was obtained from all participants prior to their participation. The study was not preregistered.

1.5. Results

Men responded faster than women, $t(141) = 2.00$, $p = .047$, Cohen's $d = 0.41$. However, there was no gender difference in accuracy, $t(141) = 1.07$, $p = .29$, Cohen's $d = 0.22$, or confidence, $t(141) = -0.66$, $p = .51$, Cohen's $d = -0.14$. There was also no gender difference in levels of social dominance, $t(141) = 0.04$, $p = .97$, Cohen's $d = 0.01$.

We assessed the association between decision-making performance (accuracy, response time, and confidence) and both the social dominance and extraversion personality scales. Neither social dominance nor extraversion was associated with decision-making accuracy, $r(141) = -0.14$, $p = .10$, and $r(141) = -0.13$, $p = .13$, respectively. Likewise, average response time was not associated with social dominance, $r(141) = -0.04$, $p = .62$, or extraversion, $r(141) = -0.02$, $p = .80$.

However, confidence in decisions was associated with both social dominance, $r(141) = 0.25$, $p = .003$, and extraversion, $r(141) = 0.32$, $p < .001$. The positive correlations provide evidence that individuals who report being more socially dominant or more extraverted have higher metacognitive bias on a statistical learning decision-making task, despite showing no advantage in accuracy.

Since social dominance and extraversion were also positively correlated, $r(141) = 0.23$, $p = .005$, (see Fig. 2), we next computed a regression model to assess the independent contributions of both personality scales to metacognitive bias. A regression model with both social dominance and extraversion significantly predicted metacognitive bias, $F(2, 140) = 10.85$, $p < .001$. Both social dominance, $\beta = 0.18$, $t = 2.25$, $p = .03$, and extraversion, $\beta = 0.28$, $t = 3.41$, $p < .001$, remained significant predictors of metacognitive bias (Fig. 3 and Table 1).

1.6. Conclusion

Individuals who self-reported greater social dominance and extraversion were observed to be more confident in their decisions without being more accurate. Furthermore, despite the positive relationship between social dominance and extraversion, both personality traits explained independent variance in decision-making confidence. We found no relationship between social dominance or extraversion with response time.

2. Study 2

In study two, we follow-up the positive correlation between both social dominance and extraversion with confidence, and assess whether this is domain specific or extends to the domain of episodic memory.

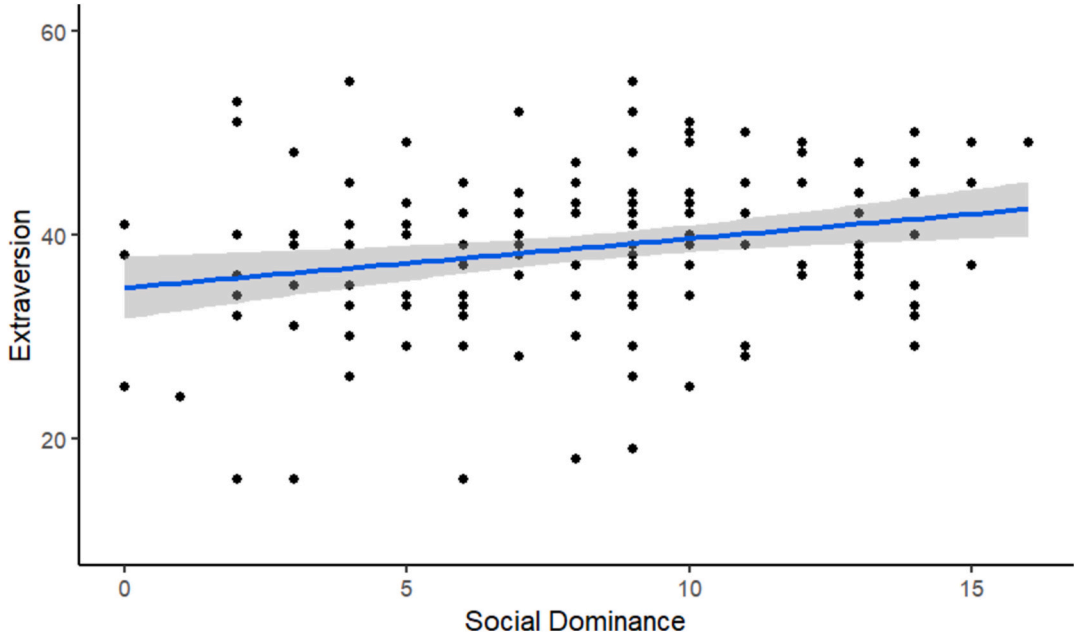

Fig. 2. Correlation between social dominance and extraversion.
Note. A positive correlation between social dominance and extraversion was identified.

2.1. Method

2.1.1. Participants

The study included 150 (110:39:1 F/M/Non-binary) undergraduate students recruited through the Research Participation Scheme at [Redacted for the purposes of anonymous review]. All participants were between 18 and 32 years of age ($M = 19.3$, $SD = 1.8$), had normal/corrected-to-normal vision and reported no neurological or psychiatric diagnoses. All participants were awarded course credits for their participation. Informed consent was collected prior to the study commencing. Our goal was to collect a similar sized cohort as study one, we collected additional data to ensure any incomplete data would not result in a reduced sample size, hence the slightly larger sample size. However, all data was included and there were no exclusions.

2.1.2. Procedure

Testing was completed online using Qualtrics (http://qualtrics.com) for all questionnaire and demographic information and Pavlovia (http://pavlovia.org) was used for the encoding and recognition stages of the self-referential episodic memory task. We measured incidental memory encoding as participants were unaware the study contained a memory test. All participants nominated a close friend and their first name was used as a prompt throughout the study. Between the encoding and recognition memory tasks, participants completed a visual perspective-taking task lasting approximately 5 min (results not reported in the present study). At the completion of the study, participants were debriefed and awarded course credits.

2.1.2.1. Questionnaires. As per study one, participants completed the demographic survey and both the PRF-d as a measure of social dominance and the introversion scale (Sallinen-Kuparinen et al., 1991) to measure introversion/extraversion (see study one for further details).

2.1.2.2. Self-referential episodic memory task. In the encoding phase, participants were presented with 60 adjectives and asked to respond on a 9-point scale from 1 (very inaccurate) to 9 (very accurate), how well the adjective described either themselves, a close friend, or the current British Prime Minister, at the time of testing, Boris Johnson. This resulted in 20 adjectives per condition, consisting of 10 positive and 10 negative words. Words were presented in a pseudo-random order to avoid order effects in the subsequent memory task. All words were selected from the word lists provided in Warriner et al. (2013). Sixty unseen distractor words were included in the surprise memory test, consisting of 30 positive and 30 negative words. Observed and distractor word lists were balanced across valence and arousal as per Warriner et al. (2013). To ensure other properties of the word lists did not influence the study conclusions, each word list was rotated throughout the study to be encoded in relation to each of the three conditions (self, friend, celebrity). Words used are provided elsewhere - see Kokici et al. (2023).

In the recognition phase, the 60 encoded and 60 distractor words were presented in a pseudo-random order. Each word appeared in the centre of the screen and participants were asked "Do you remember seeing this word?" and were instructed to select either "Yes" or "No". Subsequently they were asked how confident they were in their memory, from 1 (not at all confident) to 9 (very confident). For both the encoding and recognition phases, participants were instructed to proceed at their own pace and that response time was not important.

2.2. Statistical analyses

All analyses were completed in JASP version 0.17.1 (http://jasp-stats.org; JASP Team, 2023). In addition to correlational analyses between confidence for memory overall, we also explored whether this varied according to the agent for which an adjective was encoded. A 1×3 repeated-measures ANOVA was conducted to demonstrate self and friend-referential biases in episodic memory. Subsequently, difference scores between self and celebrity (SRE celebrity), self and close friend (SRE friend), and friend and celebrity (FRE) were calculated and correlated against both social dominance and extraversion.

2.3. Ethical considerations

The study was conducted in compliance with the ethical standards outlined in the Declaration of Helsinki. All procedures involving human participants were reviewed and approved by the [redacted for anonymity] Research Ethics Committee [ID: 202216640460557910], and informed consent was obtained from all participants prior to their

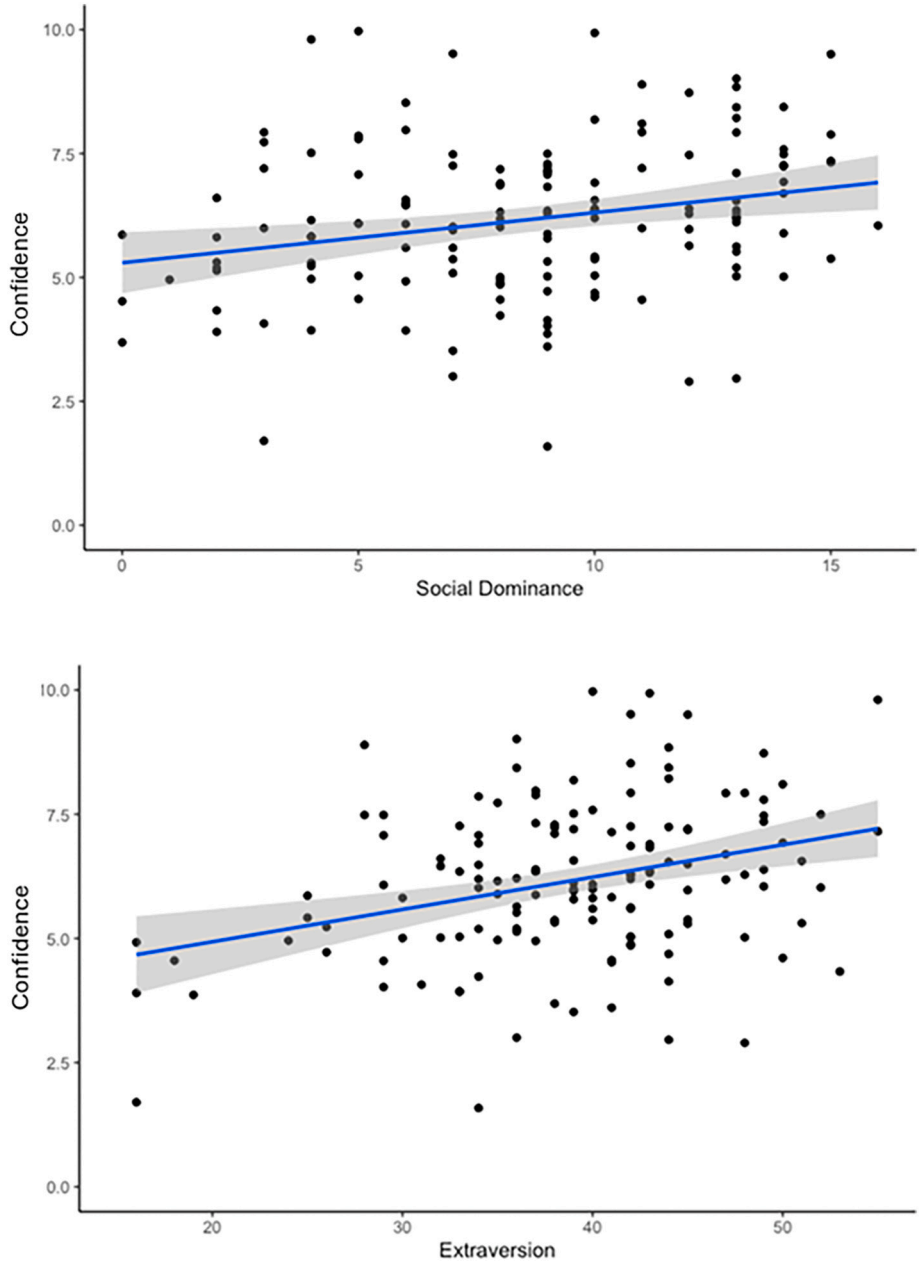

Fig. 3. Correlation between social dominance, extraversion, and confidence (metacognitive bias).
Note. Both social dominance and extraversion were positively correlated with metacognitive bias in the decision-making task.

Table 1
Correlation matrix for study variables ($N = 143$).

Variable*	1	2	3	4	5
1. Accuracy	–				
2. Reaction time	−0.04	–			
3. Confidence	0.05	−0.02	–		
4. Social dominance	−0.14	−0.04	0.25**	–	
5. Extraversion	−0.13	−0.02	0.32***	0.23**	–

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

participation. The study was not preregistered.

2.4. Results

The association between social dominance and extraversion was replicated, $r(148) = 0.33$, $p < .001$, (see Fig. 4).

The correlations between total memory performance and both social dominance, $r(148) = -0.10$, $p = .21$, and extraversion, $r(148) = 0.02$, $p = .79$, were not supported. Similarly, a correlation was not supported between metacognitive bias and either social dominance, $r(148) = 0.05$, $p = .55$, or extraversion, $r(148) = -0.10$, $p = .23$. All correlations are provided in Table 2.

A 1 × 3 repeated-measures ANOVA was significant, $F(2, 149) = 128.62$, $p < .001$, $\eta_p^2 = 0.46$. Simple effects analysis demonstrated self-encoded words ($M = 65.9$ %, $SD = 20.73$) were recognized better than celebrity-encoded words ($M = 46.5$ %, $SD = 18.39$), $t(150) =$

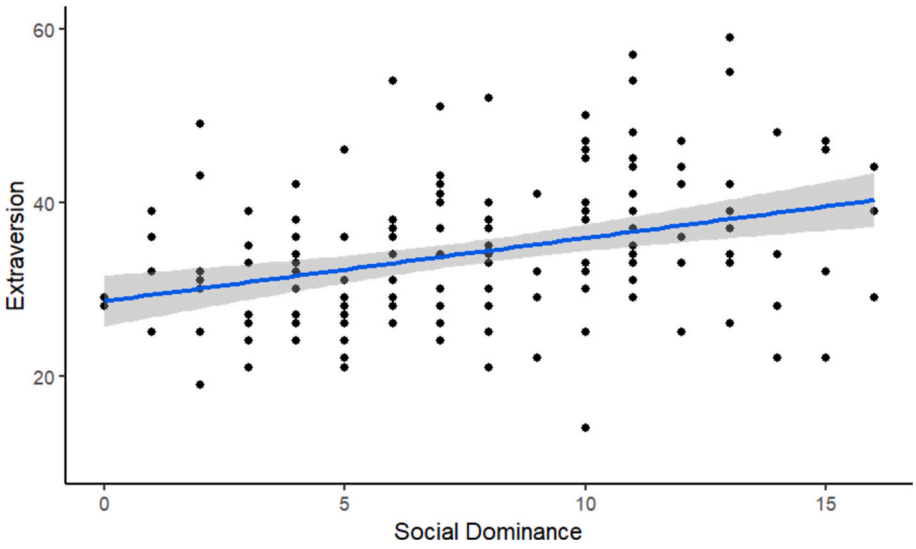

Fig. 4. *Correlation between social dominance and extraversion.*
Note. A positive correlation between social dominance and extraversion was replicated.

Table 2
Correlation matrix for study 2 ($N = 150$).

	1	2	3	4	5	6	7	8	9
1. Memory total	–								
2. Confidence	0.34***	–							
3. SRE friend	0.06	0.13	–						
4. SRE celeb	0.22**	0.16*	0.35***	–					
5. FRE	0.14	0.04	−0.53***	0.61***	–				
6. SRE (friend) Confidence	0.09	−0.14	0.32***	0.05	−0.23**	–			
7. SRE (celeb) Confidence	0.16*	−0.20*	0.08	0.35***	0.26**	0.46***	–		
8. FRE Confidence	0.09	−0.08	−0.20*	0.32***	0.47***	−0.41***	0.62***	–	
9. Social Dominance	0.10	−0.05	0.15	−0.03	−0.15	0.04	0.08	0.05	–
10. Extraversion	0.02	−0.10	−0.01	−0.07	−0.05	0.12	−0.06	−0.16*	0.33***

SRE = Self-reference effect; FRE = Friend-reference effect; .
* $p < .05$.
** $p < .01$.
*** $p < .001$.

15.46, $p < .001$, Cohen's $d = 0.98$, and close friend-encoded words ($M = 60.8$ %, $SD = 20.34$), $t(150) = 4.05$, $p < .001$, Cohen's $d = 0.26$. Friend-encoded memories were recognized better than celebrity-encoded memories, $t(150) = 11.42$, $p < .001$, Cohen's $d = 0.72$.

We then conducted exploratory analyses to assess whether social dominance or extraversion correlated with self- and friend-referential biases in memory. We calculated difference scores between self and celebrity, self and close friend, and friend and celebrity. The evidence favoured the null model for social dominance and the self-reference effect compared against celebrity, $r(148) = 0.02$, $p = .80$, with weak evidence supporting the null model for both the self-reference effect compared against a close friend, $r(148) = -0.14$, $p = .10$, and the friend-reference effect (difference between friend and celebrity), $r(148) = 0.17$, $p = .04$. Extraversion did not correlate with SRE celebrity, $r(148) = -0.10$, $p = .24$, SRE friend, $r(148) = -0.04$, $p = .61$, or FRE, $r(148) = -0.06$, $p = .43$.

Similarly, we calculated whether confidence differed depending upon the encoding condition. A 1 × 3 RM-ANOVA was significant, $F(2, 149) = 22.96$, $p < .001$, $\eta_p^2 = 0.13$. Simple effects analysis demonstrated greater confidence in memory for self-encoded words ($M = 7.33$, $SD = 0.94$) compared with celebrity-encoded words ($M = 7.00$, $SD = 1.07$), $t(150) = 6.57$, $p < .001$, Cohen's $d = 0.33$, but no difference with close friend-encoded words ($M = 7.24$, $SD = 1.01$), $t(150) = 1.83$, $p = .07$, Cohen's $d = 0.26$. Confidence for friend-encoded memories was greater than confidence for celebrity-encoded memories, $t(150) = 4.73$, $p < .001$, Cohen's $d = 0.24$.

We then conducted exploratory analyses to assess whether social dominance or extraversion correlated with self- and friend-referential biases in metacognitive bias for memory. The evidence favoured the null model for social dominance and the self-reference effect compared against celebrity, $r(148) = 0.08$, $p = .32$, self-reference effect compared against close friend, $r(148) = 0.04$, $p = .67$, and friend-reference effect, $r(148) = 0.05$, $p = .53$. Likewise, extraversion did not correlate with the self-reference effect compared against celebrity, $r(148) = -0.06$, $p = .49$, or compared against close friend, $r(148) = 0.12$, $p = .16$. There was marginal support for an effect on friend-reference effect, $r(148) = -0.16$, $p = .05$.

2.5. Conclusion

We replicated the positive correlation between extraversion and social dominance, but unlike with confidence for decision-making, there was no relationship between either social dominance or extraversion and confidence for episodic memory traces. Similarly, neither social dominance, nor extraversion had an effect on self or friend-referential biases in episodic memory, regarding either accuracy or confidence.

3. Study 3

In study three we replicated the design of study one, aiming to test

the robustness and generalizability of the original findings. Although study one provided valuable insights into the relationship between social dominance, extraversion, and decision-making parameters, it was limited by the reliance on predominantly female university students. To address this, study three replicated the methods of study one, but in a more representative and gender-balanced sample, ensuring broader applicability of the results.

3.1. Method

3.1.1. Participants

The study included 140 (70/70 women/men) adults recruited through the online platform Prolific ©. Participants were aged between 18 and 77 years of age ($M = 36.86$, $SD = 14.74$), had normal/corrected-to-normal vision and reported no neurological or psychiatric diagnoses, and were resident of [redacted for anonymity]. All participants were awarded monetary compensation for their participation. Informed consent was collected prior to the study commencing. Our goal was to collect a similar sized cohort as study one.

3.1.2. Procedure

Study three was conducted online using the Prolific © platform. The study information sheet, consent form and questionnaires were presented to participants using the Qualtrics software (Qualtrics, Provo, UT). Following this, participants completed the statistical learning task using the Pavlovia platform (pavlovia.org). Participants were then directed back to Qualtrics to be debriefed. In order to encourage engagement with the task, participants were instructed that if they performed in the top 25 %, they would receive a bonus payment. However, at the end of the study, all participants were awarded the extra payment regardless of performance.

All other methods were identical to study 1.

3.2. Results

The association between social dominance and extraversion was replicated, $r(138) = 0.277$, $p < .001$ (see Fig. 6).

Male and female participants were comparable in age, $t(138) = -0.86$, $p = .39$, $d = -0.15$, social dominance, $t(138) = -0.55$, $p = .58$, $d = -0.09$, and extraversion, $t(138) = 0.51$, $p = .61$, $d = 0.09$. Likewise, no differences were identified for response time, $t(138) = 0.78$, $p = .44$, $d = 0.13$, or confidence, $t(138) = -1.67$, $p = .10$, $d = -0.28$. However, men performed slightly better than women (60 % vs. 58 % correct) on decision accuracy, $t(138) = -2.37$, $p = .02$, $d = -0.40$.

We assessed the association between decision-making performance (accuracy, response time, and confidence) and both the social dominance and extraversion personality scales. Neither social dominance nor extraversion was associated with decision-making accuracy, $r(138) = -0.01$, $p = .94$, and $r(138) = -0.04$, $p = .65$, respectively. Average response time positively correlated with social dominance, $r(138) = 0.17$, $p = .05$, but not extraversion, $r(138) = 0.13$, $p = .11$.

Confidence in decisions was associated with both social dominance, $r(138) = 0.39$, $p < .001$, and extraversion, $r(138) = 0.16$, $p = .049$, see Fig. 7. The positive correlations provide evidence that individuals who report being more socially dominant or more extraverted have higher metacognitive bias on a statistical learning decision-making task, despite showing no advantage in accuracy. All correlations are presented in Fig. 8.

Since social dominance and extraversion were correlated, we next computed a regression model to assess the independent contributions of both personality scales to metacognitive bias. A regression model with both social dominance and extraversion significantly predicted metacognitive bias, $F(2, 137) = 12.51$, $p < .001$. Only social dominance, $\beta = 0.37$, $t = 4.53$, $p < .001$, was a significant predictor of metacognitive bias, whereas extraversion, $\beta = 0.06$, $t = 0.78$, $p = .44$, was not significant.

3.3. Conclusion

In a more representative, gender balanced sample, we replicated the positive associations between both social dominance and extraversion on decision confidence. We again show that both social dominance and extraversion are positively correlated, but unlike in study one, here only social dominance remained a significant predictor of metacognitive bias in the regression model. We demonstrate weak evidence for a positive correlation between decision response time and social dominance, but otherwise we replicate study one in showing that the relationship between social dominance and extraversion with decision-making, is limited to decision confidence. We find some support that males make more accurate decisions on a statistical learning paradigm, but further research is required to replicate this effect.

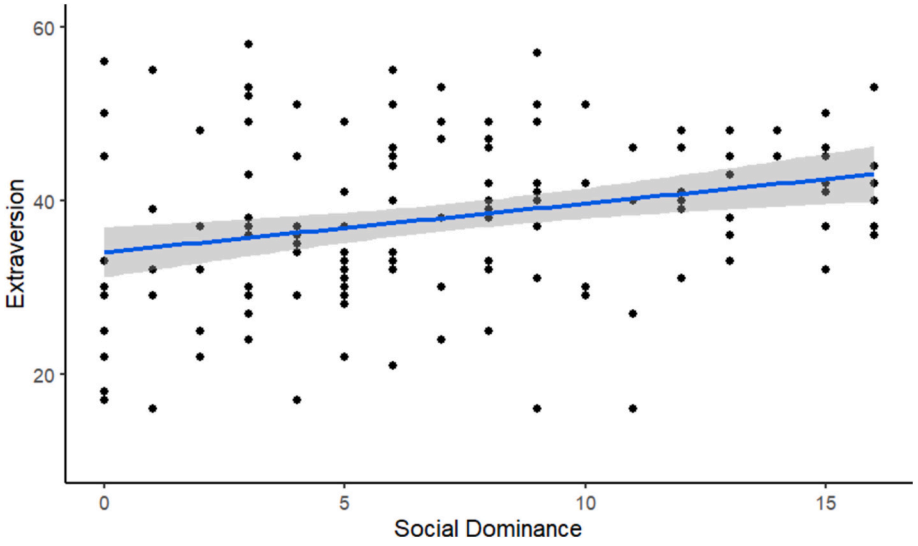

Fig. 6. Positive correlation between social dominance and extraversion.
Note. The positive correlation between social dominance and extraversion was replicated in the more representative sample.

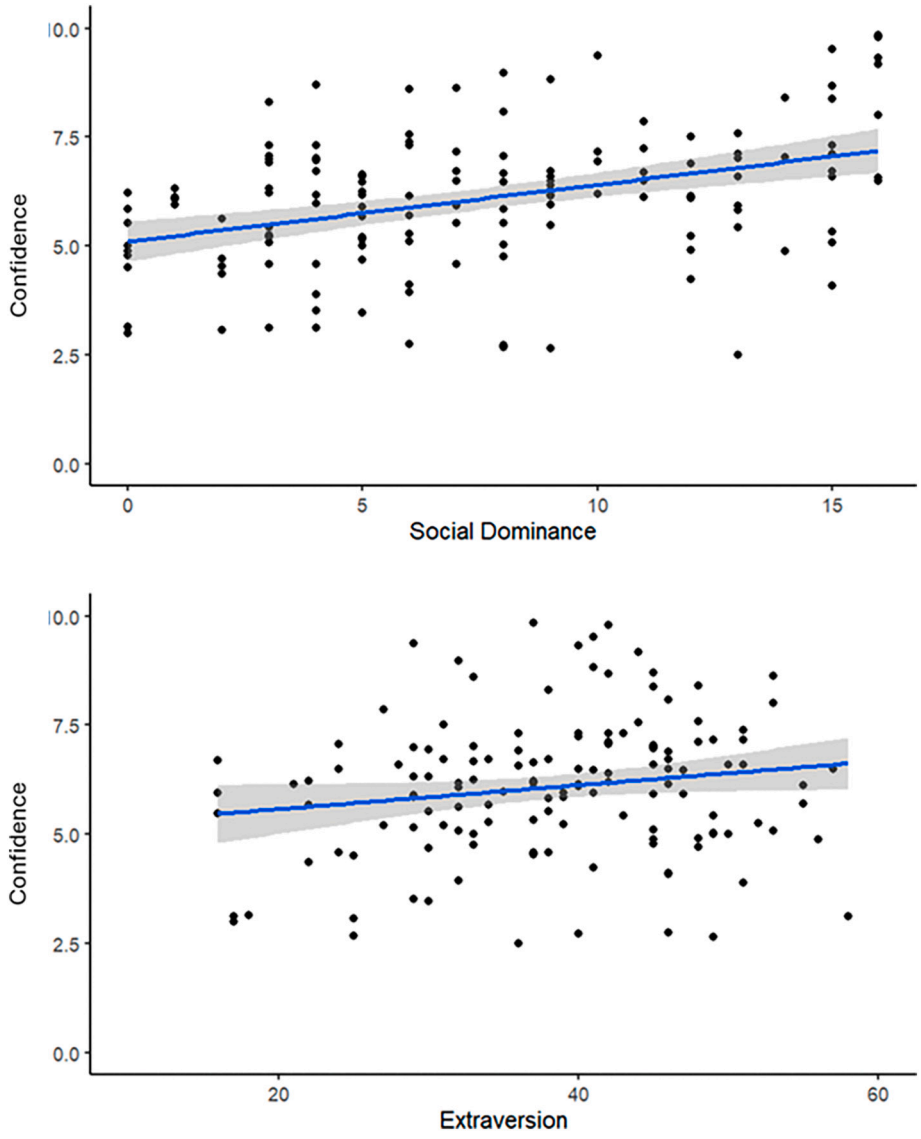

Fig. 7. Correlation between social dominance, extraversion, and confidence (metacognitive bias).
Note. Both social dominance and extraversion were positively correlated with metacognitive bias in the decision-making task. In the regression model, only social dominance remained a significant predictor of metacognitive bias.

Correlation Matrix for Study 3 (N = 140)

Variable	1	2	3	4	5
1. Accuracy	—				
2. Response Time	-0.18*	—			
3. Confidence	0.07	-0.06	—		
4. Social Dominance	-0.01	0.14	0.39***	—	
5. Extraversion	-0.12	0.04	0.17*	0.28***	—

Fig. 8. Correlation Matrix for Study 3 ($N = 140$).
*$p < .05$.
**$p < .01$.
***$p < .001$.

4. General discussion

Our aim was to identify whether socially dominant individuals are more confident in their decisions and whether this relationship can be explained by extraversion. Within the first study, we show a positive correlation between social dominance and decision confidence. Furthermore, although extraversion was positively related to both social dominance and confidence in decisions, the relationship between social dominance and decision confidence was not explained by extraversion. In the second study, the positive correlation between social dominance and extraversion was replicated but no relationship between either social dominance or extraversion with confidence for memory traces was observed. In study three, we replicate the findings from study one in a more representative, gender-balanced study across a wider age-range, although in this study extraversion was not related to decision confidence. Therefore, socially dominant individuals are more confident in their decisions without being more accurate. The effect does not extend to confidence for memory traces and is not explained by higher levels of extraversion.

Socially dominant individuals are perceived as more likely to

become leaders, and as leaders are perceived as more effective and charismatic. Greater decision confidence in socially dominant individuals provides one potential explanation for how socially dominant individuals are more likely to attain positions of power. One factor is that socially dominant individuals may seek out such positions and are more likely to strive to attain power or influence over others (Duriez et al., 2007). However, confidence is a trait that increases the perception of leadership potential (Ronay et al., 2019), or increases perceived social status (Kim et al., 2020). Therefore, displays of confidence may offer a cognitive heuristic for others to assume competency in the absence of evidence of previous success, resulting in easier acquisition of positions of influence and social power. For example, socially dominant individuals are perceived as more competent by their peers, even when the individual lacks competence (Anderson & Kilduff, 2009; Buss & Craik, 1980). As we did not identify greater accuracy in decision-making, the increased confidence provides a discrepancy between performance and metacognitive insight that may result in undesirable outcomes experienced by teams led by socially dominant individuals, especially when creative input from others is required or beneficial (Cheng, 2020).

Despite the depth of research within the domain of organisational psychology, there is a paucity of research adopting a cognitive perspective to social dominance. One previous study (da Cruz et al., 2018), identified faster response times in dominant males for perceptual discrimination tasks. Although response time is often considered a proxy for decision confidence, the relationship between confidence and response time has been observed to be weaker in learning tasks compared with perceptual tasks (Hertz et al., 2018), potentially explaining the discrepancy. A further consideration is that simply measuring confidence may alter performance on a task (Double & Birney, 2019) and consequently may diminish or remove response time effects. As da Cruz et al. (2018) did not include a confidence measure, reactivity for the two tasks was different, possibly explaining the inconsistent results. Nevertheless, our results support a cognitive style associated with social dominance and decision-making, building on the work by da Cruz et al. (2018) by expanding the evidence to a statistical learning paradigm and increased metacognitive bias.

A similar relationship between extraversion and decision confidence was also demonstrated. Like social dominance, extraversion has previously been associated with faster response times (Brebner, 1985; Brebner, 1990; Sočan & Bucik, 1998; Wickett & Vernon, 2000), a finding not supported in the present study, which may again be explained as a consequence of using a statistical learning paradigm (Hertz et al., 2018). As with social dominance, we found that extroverts were more likely to express greater confidence in their decisions in the absence of any differences in decision accuracy. It is interesting that, in contrast to social dominance, extraversion is generally discussed as a positive trait for leaders. For example, Green et al. (2018) stated that Extraversion in Chief Executive Officers (CEOs) was related to beneficial firm outcomes such as investor recognition and sales growth, while Hu et al. (2019) found that the assertiveness and warmth expressed by extraverts facilitated peer advice seeking and liking, which in turn promoted leadership emergence. Future research is required to understand whether confidence in decisions mediates the relationship between extraversion and positive leadership and the interaction with other personality traits, such as social dominance, which in turn could help better inform team, business and political decision-making across the world.

We demonstrate that greater confidence in socially dominant individuals does not extend to greater confidence in episodic memory traces. Moreover, social dominance did not correlate with differences in self-reference effects, either in memory accuracy or confidence. Domain specificity has been demonstrated for metacognitive judgments (Fitzgerald et al., 2017), and the results of the present study show a dissociation between metacognitive bias for decisions and memory in relation to social dominance. Despite evidence for greater self-sufficiency and tendency to ignore information related to others in socially dominant individuals (Lord et al., 1986), we did not identify a greater self-reference in episodic memory.

The results from this study should also encourage future research in more ecologically valid contexts such as large organizations or other professions tasked with making decisions in uncertain and volatile environments, such as stockbrokers. The decision-making task used in the present study represents learning statistical regularities within an abstract environment and future research could benefit from expanding to include other decision-making tasks and situations. For example, decisions are often made in social contexts, and it would be of interest to assess how social dominance and extraversion affects social decision-making. Social dominance focuses on the individual, but it is important to remember that social dominance may arise through membership of a group (Fiske et al., 2007, 2016). Future research could investigate how the personal interacts with the societal to influence cognitive aspects of social dominance, especially in social scenarios requiring intergroup interaction. The use of online testing has increased due to the Covid-19 pandemic, but future laboratory-based research could provide greater scrutiny and ensure greater adherence to study conditions.

In sum, we show that socially dominant and extraverted individuals are both more confident in their decisions without showing any superiority in decision performance. The results have ramifications for understanding how socially dominant and extraverted individuals traverse society, acquire and possibly retain positions of social power and influence.

CRediT authorship contribution statement

A. Belotelova: Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft. **A.K. Martin:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing.

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Declaration of competing interest

The authors declare no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2024.113037.

Data availability

Data will be provided upon request

References

Anderson, C., & Kilduff, G. (2009). Why do dominant personalities attain influence in face-to-face groups? The competence-signaling effects of trait dominance. *Journal of Personality and Social Psychology, 96*(2), 491–503. https://doi.org/10.1037/a0014201

Ashton, M. C., Lee, K., & Paunonen, S. V. (2002). What is the central feature of extraversion? Social attention versus reward sensitivity. *Journal of Personality and Social Psychology, 83*, 245–252. https://doi.org/10.1037/0022-3514.83.1.245

Balconi, M., & Vanutelli, M. (2016). Competition in the brain. The contribution of EEG and fNIRS modulation and personality effects in social ranking. *Frontiers in Psychology, 7*. https://doi.org/10.3389/fpsyg.2016.01587

Bateman, T., & Crant, J. (1993). The proactive component of organizational behavior: A measure and correlates. *Journal of Organizational Behavior, 14*(2), 103–118. https://doi.org/10.1002/job.4030140202

Behrens, T. E. J., Woolrich, M. W., Walton, M. E., & Rushworth, M. F. S. (2007). Learning the value of information in an uncertain world. *Nature Neuroscience, 10*(9), 1214–1221. https://doi.org/10.1038/nn1954

Brebner, J. (1985). Personality theory and movement. *Individual Differences In Movement, 27-41*. https://doi.org/10.1007/978-94-009-4912-6_2

Brebner, J. (1990). Psychological and neurophysiological factors in stimulus-response compatibility. *Advances in Psychology, 241-260*. https://doi.org/10.1016/s0166-4115(08)61225-x

Buss, D. M., & Craik, K. H. (1980). The frequency concept of disposition: Dominance and prototypically dominant acts1. *Journal of Personality, 48*(3), 379–392. https://doi.org/10.1111/j.1467-6494.1980.tb00840.x

Cheng, J., & Tracy, J. (2014). Toward a unified science of hierarchy: Dominance and prestige are two fundamental pathways to human social rank. *The Psychology Of Social Status, 3-27*. https://doi.org/10.1007/978-1-4939-0867-7_1

Cheng, J., Tracy, J., & Henrich, J. (2010). Pride, personality, and the evolutionary foundations of human social status. *Evolution and Human Behavior, 31*(5), 334–347. https://doi.org/10.1016/j.evolhumbehav.2010.02.004

Cheng, J. T. (2020). Dominance, prestige, and the role of leveling in human social hierarchy and equality. *Current Opinion in Psychology, 33*, 238–244. https://doi.org/10.1016/j.copsyc.2019.10.004

Cheng, J. T., Tracy, J. L., Foulsham, T., Kingstone, A., & Henrich, J. (2013). Two ways to the top: Evidence that dominance and prestige are distinct yet viable avenues to social rank and influence. *Journal of Personality and Social Psychology, 104*(1), 103–125. https://doi.org/10.1037/a0030398

da Cruz, J., Rodrigues, J., Thoresen, J. C., Chicherov, V., Figueiredo, P., Herzog, M. H., & Sandi, C. (2018). Dominant men are faster in decision-making situations and exhibit a distinct neural signal for promptness. *Cerebral Cortex, 28*(10), 3740–3751. https://doi.org/10.1093/cercor/bhy195

Double, K. S., & Birney, D. P. (2019). Reactivity to measures of metacognition. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.02755

Doucet, C., & Stelmack, R. M. (2000). An event-related potential analysis of extraversion and individual differences in cognitive processing speed and response execution. *Journal of Personality and Social Psychology, 78*(5), 956–964. https://doi.org/10.1037/0022-3514.78.5.956

Duriez, B., Vansteenkiste, M., Soenens, B., & De Witte, H. (2007). The social costs of extrinsic relative to intrinsic goal pursuits: Their relation with social dominance and racial and ethnic prejudice. *Journal of Personality, 75*(4), 757–782. https://doi.org/10.1111/j.1467-6494.2007.00456.x

Dykiert, D., Der, G., Starr, J. M., & Deary, I. J. (2012). Sex differences in reaction time mean and intraindividual variability across the life span. *Developmental Psychology, 48*(5), 1262–1276. https://doi.org/10.1037/a0027550

Eysenck, H. J. (1971). *Readings in extraversion-introversion*. Wiley-Interscience.

Fiske, S., Cuddy, A., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in Cognitive Sciences, 11*(2), 77–83. https://doi.org/10.1016/j.tics.2006.11.005

Fiske, T. F., Dupree, C. H., Nicolas, G., & Swencionis, J. K. (2016). Status, power, and intergroup relations: The personal is the societal. *Current Opinions in Psychology, 11*, 44–48. https://doi.org/10.1016/j.copsyc.2016.05.012

Fitzgerald, L. M., Arvaneh, M., & Dockree, P. M. (2017). Domain-specific and domain-general processes underlying metacognitive judgments. *Consciousness and Cognition, 49*, 264–277. https://doi.org/10.1016/j.concog.2017.01.011

Fleming, S., & Lau, H. (2014). How to measure metacognition. *Frontiers in Human Neuroscience, 8*. https://doi.org/10.3389/fnhum.2014.00443

Green, T., Jame, R., & Lock, B. (2018). Executive extraversion: Career and firm outcomes. *The Accounting Review, 94*(3), 177–204. https://doi.org/10.2308/accr-52208

Guinote, A. (2017). How power affects people: Activating, wanting, and goal seeking. *Annual Review of Psychology, 68*(1), 353–381. https://doi.org/10.1146/annurev-psych-010416-044153

Hall, J., Coats, E., & LeBeau, L. (2005). Nonverbal behavior and the vertical dimension of social relations: A meta-analysis. *Psychological Bulletin, 131*(6), 898–924. https://doi.org/10.1037/0033-2909.131.6.898

Helgeson, V. S., & Fritz, H. L. (1999). Unmitigated agency and unmitigated communion: Distinctions from agency and communion. *Journal of Research in Personality, 33*(2), 131–158. https://doi.org/10.1006/jrpe.1999.2241

Hertz, U., Bahrami, B., & Keramati, M. (2018). Stochastic satisficing account of confidence in uncertain value-based decisions. *PLoS One, 13*(4), Article e0195399. https://doi.org/10.1371/journal.pone.0195399

Hu, J., Zhang, Z., Jiang, K., & Chen, W. (2019). Getting ahead, getting along, and getting prosocial: Examining extraversion facets, peer reactions, and leadership emergence. *Journal of Applied Psychology, 104*(11), 1369–1386. https://doi.org/10.1037/apl0000413

Jackson, D. N. (1974). *Personality research form manual*. Goshen (NY): Research Psychologists Press.

JASP Team. (2023). *JASP (Version 0.17.1)[Computer software]*.

Judge, T., Bono, J., Ilies, R., & Gerhardt, M. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology, 87*(4), 765–780. https://doi.org/10.1037/0021-9010.87.4.765

Kakkar, H., & Sivanathan, N. (2021). The impact of leader dominance on employees' zero-sum mindset and helping behavior. *Journal of Applied Psychology*. https://doi.org/10.1037/apl0000980 (No Pagination Specified-No Pagination Specified).

Kiani, R., Corthell, L., & Shadlen, M. N. (2014). Choice certainty is informed by both evidence and decision time. *Neuron, 84*(6), 1329–1342. https://doi.org/10.1016/j.neuron.2014.12.015

Kim, J.-Y., Hsu, N., Newman, D. A., Harms, P. D., & Wood, D. (2020). Leadership perceptions, gender, and dominant personality: The role of normality evaluations. *Journal of Research in Personality, 87*, Article 103984. https://doi.org/10.1016/j.jrp.2020.103984

Kokici, L., Chirtop, G., Ferguson, H. J., & Martin, A. K. (2023). Loneliness is associated with a greater self-reference effect in episodic memory when compared against a close friend. *British Journal of Psychology (London, England: 1953)*. https://doi.org/10.1111/bjop.12646

Lord, R. G., de Vader, C. L., & Alliger, G. M. (1986). A meta-analysis of the relation between personality traits and leadership perceptions: An application of validity generalization procedures. *Journal of Applied Psychology, 71*(3), 402–410.

Maner, J. (2017). Dominance and prestige: A tale of two hierarchies. *Current Directions in Psychological Science, 26*(6), 526–531. https://doi.org/10.1177/0963721417714323

Mehrabian, A. (1996). Pleasure-arousal-dominance: A general framework for describing and measuring individual differences in temperament. *Current Psychology, 14*(4), 261–292. https://doi.org/10.1007/BF02686918

Operario, D., & Fiske, S. (2001). Effects of trait dominance on powerholders' judgments of subordinates. *Social Cognition, 19*(2), 161–180. https://doi.org/10.1521/soco.19.2.161.20704

Ronay, R., Oostrom, J. K., Lehmann-Willenbrock, N., Mayoral, S., & Rusch, H. (2019). Playing the trump card: Why we select overconfident leaders and why it matters. *The Leadership Quarterly, 30*(6), Article 101316. https://doi.org/10.1016/j.leaqua.2019.101316

Sallinen-Kuparinen, A., McCroskey, J. C., & Richmond, V. P. (1991). Willingness to communicate, communication apprehension, introversion, and self-reported communication competence: Finnish and American comparisons. *Communication Research Reports, 8*, 55–64. https://doi.org/10.1080/08824099109359876

Santamaria-Garcia, H., Burgaleta, M., & Sebastian-Galles, N. (2015). Neuroanatomical markers of social hierarchy recognition in humans: A combined ERP/MRI study. *Journal of Neuroscience, 35*(30), 10843–10850. https://doi.org/10.1523/jneurosci.1457-14.2015

Santamaría-García, H., Pannunzi, M., Ayneto, A., Deco, G., & Sebastián-Gallés, N. (2013). 'If you are good, I get better': The role of social hierarchy in perceptual decision-making. *Social Cognitive and Affective Neuroscience, 9*(10), 1489–1497. https://doi.org/10.1093/scan/nst133

Sočan, G., & Bucik, V. (1998). Relationship between speed of information-processing and two major personality dimensions — Extraversion and neuroticism. *Personality and Individual Differences, 25*(1), 35–48. https://doi.org/10.1016/s0191-8869(98)00031-2

Volk, A. A., Provenzano, D. A., Farrell, A. H., Dane, A. V., & Shulman, E. P. (2021). Personality and bullying: Pathways to adolescent social dominance. *Current Psychology, 40*(5), 2415–2426. https://doi.org/10.1007/s12144-019-00182-4

Warriner, A. B., Kuperman, V., & Brysbaert, M. (2013). Norms of valence, arousal, and dominance for 13,915 English lemmas. *Behavior Research Methods, 45*(4), 1191–1207. https://doi.org/10.3758/s13428-012-0314-x

Weidemann, C. T., & Kahana, M. J. (2016). Assessing recognition memory using confidence ratings and response times. *Royal Society Open Science, 3*(4), Article 150670. https://doi.org/10.1098/rsos.150670

Wickett, J., & Vernon, P. (2000). Replicating the movement time–extraversion link… with a little help from IQ. *Personality and Individual Differences, 28*(2), 205–215. https://doi.org/10.1016/s0191-8869(99)00063-x

Zarnoth, P., & Sniezek, J. A. (1997). The social influence of confidence in group decision making. *Journal of Experimental Social Psychology, 33*(4), 345–366. https://doi.org/10.1006/jesp.1997.1326

Zink, C., Tong, Y., Chen, Q., Bassett, D., Stein, J., & Meyer-Lindenberg, A. (2008). Know your place: Neural processing of social hierarchy in humans. *Neuron, 58*(2), 273–283. https://doi.org/10.1016/j.neuron.2008.01.025

Zuckerman, M. (1991). *Psychobiology of personality*. Cambridge University Press.