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Evidence head tilt has dissociable effects on dominance and trustworthiness judgments, but does not have category-contingent effects on hypothetical leadership judgments

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Data files and analysis scripts are publicly available at

<https://osf.io/sae8t/>

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Abstract

Previous research has found that physical characteristics in faces that influence perceptions of trustworthiness and dominance have context-contingent effects on leadership perceptions. People whose faces are perceived to be trustworthy are judged to be better leaders in peacetime contexts than wartime contexts. By contrast, people whose faces are perceived to be dominant are judged to be better leaders in wartime contexts than peacetime contexts. Here we tested for judgment-contingent (dominance versus trustworthiness) effects of head tilt (i.e., head-pitch rotation) on person perception and context-contingent (peacetime versus wartime) effects of head tilt on leadership judgments. Although we found that head tilt influenced judgments of trustworthiness and dominance (Study 1), head tilt did not influence leadership judgments (Study 2). Together, these results suggest that the context-contingent effects of physical characteristics on leadership judgments reported in previous work do not necessarily extend to head tilt, even though head tilt influences perceptions of trustworthiness and dominance.

Introduction

People make inferences about other people's dominance, trustworthiness, and other traits from facial cues (Todorov, Olivola, Dotsch, & Mende-Siedlecki, 2015). These inferences have direct effects on real world outcomes, such as decisions about who people choose to associate with and hire (Rhodes, 2006). Similarly, people make judgments about other people's leadership qualities from facial cues (Ballew & Todorov, 2007; Todorov,

Mandisodza, Goren, & Hall, 2005). These judgments are made very rapidly (Ballew & Todorov, 2007; Todorov, Mandisodza, Goren, & Hall, 2005) and influence actual voting decisions (Little, Burriss, Jones, & Roberts, 2007; Todorov, Mandisodza, Goren, & Hall, 2005).

Facial judgments of leadership appear to be context-contingent. That is, people judge different types of facial appearance to be better suited to leadership at times of war versus times of peace (Little, et al., 2007). For example, people judge individuals with more dominant-looking or masculine faces to be better wartime leaders and those with more trustworthy-looking or feminine faces to be better peacetime leaders (Ferguson, Owen, Hahn, Torrance, DeBruine & Jones, 2019; Grabo & Van Vugt, 2018; Laustsen & Petersen, 2017; Little, Roberts, Jones, & DeBruine, 2012; Re, DeBruine, Jones, Perrett, 2013; Spisak, Homan, Grabo, & Van Vugt, 2012). This is consistent with other work suggesting that dominant-looking individuals are more likely to be selected for group membership in situations involving inter-group competition than they are for cooperative situations (Hehman Leitner, Deegan, Gaertner, 2015).

Van Vugt and Grabo (2015) proposed that these context-contingent effects of facial characteristics on leadership judgments reflect evolved stereotypic expectations regarding leadership for different situational context. They suggest this occurs because traits typically associated with dominance would be useful in wartime (i.e., when conflict and aggression may be particularly advantageous in a leader), while traits typically associated with

trustworthiness would be relevant in peacetime (i.e., when diplomacy and cooperation may be particularly advantageous in a leader).

The studies described above investigated effects of relatively invariant facial characteristics (e.g., facial shape) on leadership judgments. However, by their very nature, these cues are stable and individuals (i.e., potential leaders) have little-to-no control over their expression. What about cues that can change more rapidly over short periods of times (e.g., seconds)? Might these characteristics also influence leadership judgments and in a context-contingent way? If an important decision such as choosing a leader can be manipulated by cues that are easily controllable, then potential leaders can manipulate the perceptions of those who might choose, potentially undermining their choices.

It has been suggested that head tilt (altering the pitch of one's head up or down, alternatively referred to as 'head pitch rotation'), can function as a dominance display similar to that in primates (Mignault & Chaudhuri, 2003). This similarity to the signals expressed in non-human primates means that head tilt is a likely candidate to influence leadership perceptions under Van Vugt and Grabo's (2015) evolutionary perspective. Several studies have found that tilting a head down increases perceived dominance (Hehman, Leitner & Gaertner, 2013; Toscano, Schubert & Giessner, 2018; Witkower & Tracy, 2019), yet others have suggested the opposite, that tilting up increases dominance and masculinity perceptions (Bee, Franke & André, 2009; Burke & Sulikowski, 2010; Mignault & Chaudhuri, 2003). Consequently, we first

investigated the effects of head tilt on perceptions of dominance and trustworthiness¹ (Study 1). We then tested whether the observed judgment-contingent (dominance versus trustworthiness) effects of head tilt on person perception extended to context-contingent (peacetime versus wartime) effects of head tilt on leadership judgments (Study 2).

Study 1

Study 1 investigated the effects of head tilt on dominance and trustworthiness perceptions.

Methods

One hundred and fifteen participants (44 male; mean age=29.70 years, SD=9.69 years, 65 female; mean age=26.45 years, SD=10.59 years, 6 did not report their sex) were randomly allocated to rate faces for either dominance (“How dominant is this person?”), or trustworthiness (“How trustworthy is this person?”) using 1 (not very) to 7 (very) scales. Faces were of 10 adult men and 10 adult women aged between 35 and 45 (mean age=40.2 years, SD=3.44 years), randomly selected from a larger set of images with this age range. Individuals posed front on at a standardized height with direct gaze. Images were collected using a DI3D system (www.di4d.com) using six standard digital cameras (Canon EOS100D with Canon EF 50 mm f/1.8 STM

¹ In 2017, we preregistered the prediction that upward-tilted faces would be judged as better leaders in the wartime than peacetime context because upward-tilted faces are perceived to be more dominant (<https://osf.io/sae8t/>). This prediction was based largely on early studies reporting that upward-tilted faces were perceived as more dominant (Bee, Franke & André, 2009; Burke & Sulikowski, 2010; Mignault & Chaudhuri, 2003). We reconsidered this prediction in light of subsequent work suggesting that downward-tilted faces are perceived to be more dominant (e.g., Toscano, Schubert & Giessner, 2018; Witkower & Tracy, 2019). All other aspects of our methodology and analysis are unchanged from the preregistration.

lenses). This allows us to create three versions of the face by manipulating it in 3D space: original (front on), up-tilted (tilted 10 degrees up), and down-tilted (tilted 10 degrees down) versions (see Figure 1). Participants were then presented all 60 images, with trial order being fully randomized. The study was run online at faceresearch.org, with participants recruited by following links to an online face perception study on social bookmarking websites.



Figure 1. Example face stimuli used in the study (from left to right; head tilted down 10 degrees, front on, head tilted up 10 degrees).

Results

Ratings were analyzed using R version 3.5.1 (R Core Team, 2016), with lme4 version 1.1-18-1 (Bates et al., 2014) and lmerTest version 3.0-1 (Kuznetsova et al., 2013). Random slopes were specified maximally following Barr et al. (2013) and Barr (2013). Data files and analysis scripts are publicly available on the Open Science Framework (<https://osf.io/sae8t/>). The model included face sex, rater sex, head tilt, and judgment as predictors, as well as all possible interactions up to (and including) the four-way interaction among all predictors. Sex of face and sex of rater were included in the models because they have previously been found to have effects on social judgments of faces (Little et al., 2011). All predictors were effect coded (face sex: women = -0.5, men = 0.5; rater sex: women = -0.5, men = 0.5; orientation tilted down = -0.5, front on = 0, tilted up = 0.5; judgment: dominance = 0.5, trustworthiness = -0.5). The six participants who did not report their sex were removed from the data set prior to analyses. A priori power simulations of the study design indicate that this analysis has 100% power at $n = 100$ and stimulus $n = 20$ to detect an interaction between head tilt and judgment type (or context, as in study 2) of 0.25 points on the 1-7 rating scale. Full results of this analysis are shown in Table 1.

	Estimate	Std. Error	z	p
Rater Sex	-0.135	0.296	-0.457	0.648
Face Sex	-0.195	0.152	-1.281	0.200
Head Tilt	0.083	0.056	1.474	0.141
Judgment	0.393	0.296	1.325	0.185
R. Sex X F. Sex	0.565	0.092	6.121	<.001
R. Sex X Head Tilt	-0.250	0.113	-2.217	0.027
F. Sex X Head Tilt	-0.209	0.113	-1.848	0.065
R. Sex X Judgement	-0.758	0.593	-1.278	0.201
F. Sex X Judgement	1.289	0.093	13.84	<.001
Head Tilt X Judgement	-0.717	0.113	-6.334	<.001
R. Sex X F. Sex X Head Tilt	-0.084	0.226	-0.372	0.709
R. Sex X F. Sex X Judgement	-0.284	0.184	-1.539	0.124
R. Sex X Head Tilt X Judgement	-0.064	0.228	-0.278	0.781
F. Sex X Head Tilt X Judgement	-0.125	0.226	-0.558	0.577

R. Sex X F. Sex X Head Tilt X Judgement	0.332	0.456	0.728	0.466
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Table 1. Results of analysis testing for judgment-contingent (dominance versus trustworthiness judgments) effects of head tilt on person perception.

There was a significant interaction between judgment type and head tilt ($\beta = -0.72$, $z = -6.33$, $p < .001$), whereby head tilt had a positive effect on trustworthiness, but a negative effect on dominance (see Figure 2). A significant interaction between face sex and judgment type ($\beta = 1.29$, $z = 13.845$, $p < .001$), indicated that female faces were judged less dominant than male faces and male faces were judged less trustworthy than female faces (see Figure 3). There were no other significant effects or interactions involving judgment type ($p > .065$).

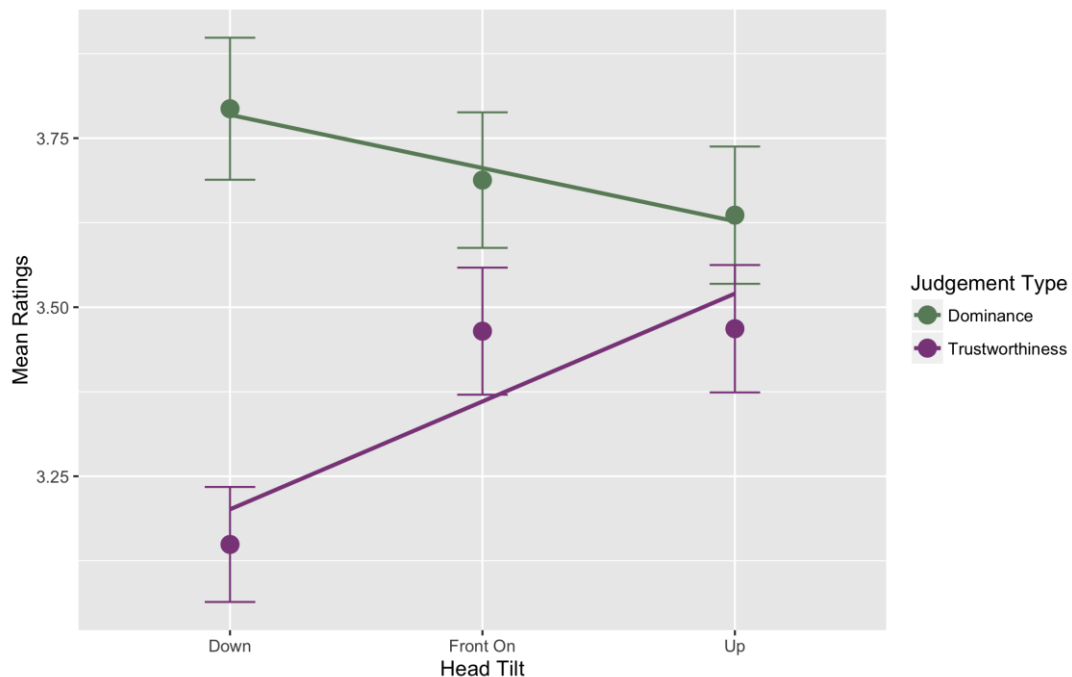


Figure 2. The significant interaction between judgment type (dominance versus trustworthiness) and head tilt in Study 1. Error bars show standard error of the mean.

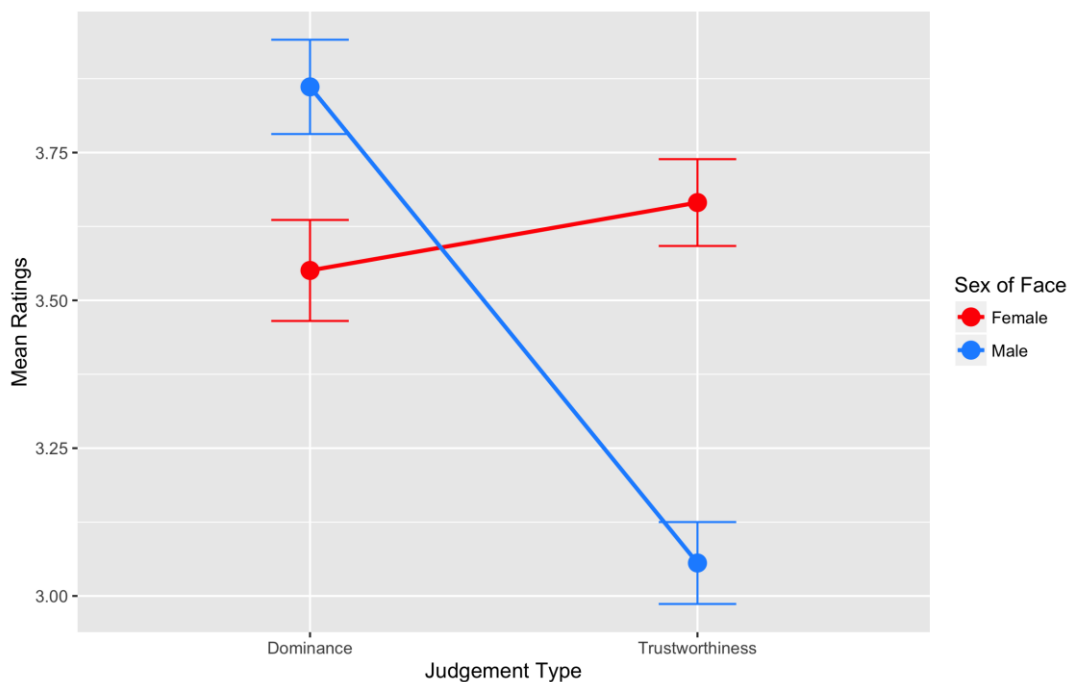


Figure 3. The significant interaction between judgment type (dominance versus trustworthiness) and face sex in Study 1. Error bars show standard error of the mean.

Additional analyses of Study 1

One reviewer asked that we carry out alternative analyses in which dominance and trustworthiness judgments were analysed separately. These analyses can be seen at <https://osf.io/zg4ut/> and also show that downward tilt increases dominance perceptions, but decreases trustworthiness perceptions.

Study 2

In Study 1, we found that tilting head downward increased dominance perceptions, but decreased perceptions of trustworthiness. Accordingly, in Study 2 we investigated whether tilting heads down increased their perceived

leadership ability during wartime, while tilting heads up increased their perceived leadership ability during peacetime. Such results would follow from previous work linking perceptions of dominance to leadership during wartime and perceptions of trustworthiness to leadership during peacetime (Ferguson, et al., 2019; Grabo & Van Vugt, 2018; Laustsen & Petersen, 2017; Little, et al., 2012; Re, et al., 2013; Spisak, et al., 2012).

Methods

The methods and stimuli used in Study 2 were identical to those used in Study 1 except here 101 participants (46 male; mean age=29.49 years, SD=10.11 years, 55 female; mean age=27.87 years, SD=10.77 years) rated 60 faces for leadership on a 1 (very bad leader) to 7 (very good leader) scale. Participants were randomly allocated to rate the faces for either “How good a leader would this person be for a country during a time of war?” or “How good a leader would this person be for a country during a time of peace?”.

Results

Ratings were analyzed as in Study 1, except the variable leadership context (wartime, peacetime) replaced the variable judgment type (dominance, trustworthiness). None of the participants in Study 2 had taken part in Study 1. Full results of this analysis are shown in Table 2.

	Estimate	Std. Error	z	p
Rater Sex	0.491	0.253	1.944	0.052
Face Sex	-0.172	0.210	-0.819	0.413
Head Tilt	0.085	0.057	1.495	0.135
Context	0.330	0.253	1.307	0.191
R. Sex X F. Sex	0.374	0.093	4.004	<.001
R. Sex X Head Tilt	-0.039	0.114	-0.342	0.732
F. Sex X Head Tilt	-0.229	0.114	-2.010	0.045
R. Sex X Context	-0.374	0.505	-0.742	0.458

F. Sex X Context	-0.919	0.093	-9.790	<.001
Head Tilt X Context	0.008	0.114	0.072	0.942
R. Sex X F. Sex X Head Tilt	0.308	0.228	1.350	0.177
R. Sex X F. Sex X Context	0.154	0.187	0.826	0.409
R. Sex X Head Tilt X Context	-0.011	0.228	-0.050	0.960
F. Sex X Head Tilt X Context	0.050	0.228	0.218	0.828
R. Sex X F. Sex X Head Tilt X Context	-0.247	0.456	-0.541	0.589

Table 2. Results of analysis testing for context-contingent (wartime versus peacetime) effects of head tilt on leadership judgments.

There was a significant interaction between rater sex and face sex (beta=0.37, $z=4.00$, $p<.001$), whereby women, but not men, tended to rate women to be better leaders than men (see Figure 4). There was also a significant interaction between face sex and context (beta=-0.92, $z=-9.79$, $p<.001$), whereby women were judged better leaders in the peacetime than wartime context, while men tended to be judged better leaders in the wartime than peacetime context (see Figure 5). The significant interaction between face sex and head tilt (beta=-0.23, $z=-2.01$, $p=.045$) suggested that head tilt had a positive effect on judgments of women's, but not men's, leadership (see Figure 6). Although men tended to give higher ratings than women, this main effect of rater sex was not significant (beta=0.49, $z=1.94$, $p=.052$). No other effects were significant or approached significance ($p>.135$).

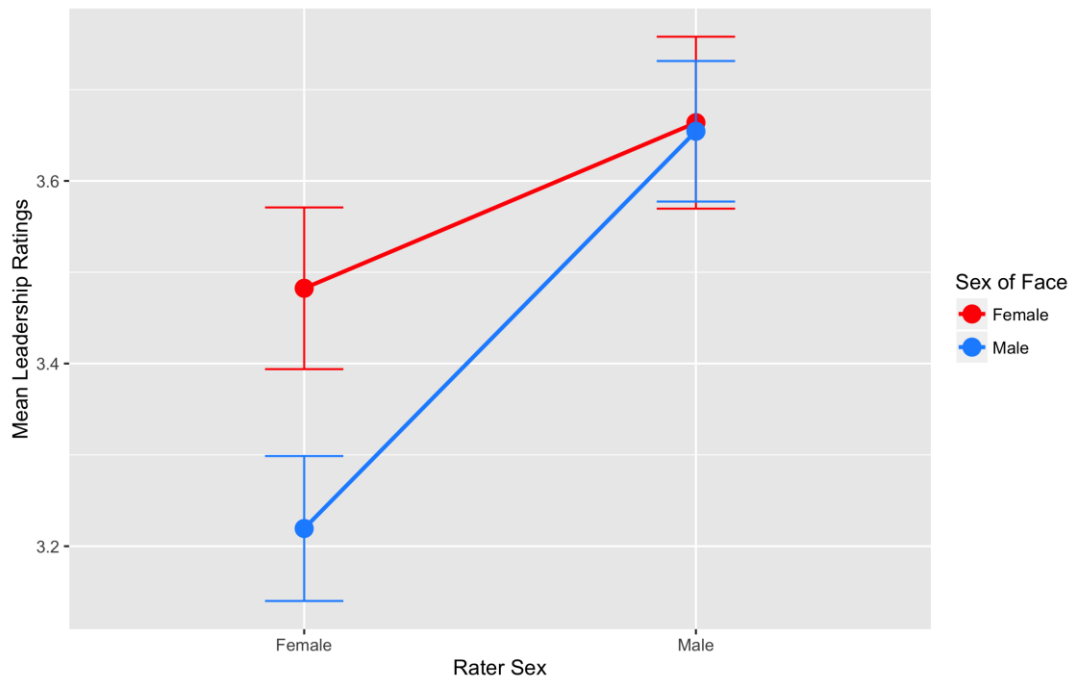


Figure 4. The significant interaction between face sex and rater sex for leadership judgments (Study 2). Error bars show standard error of the mean.

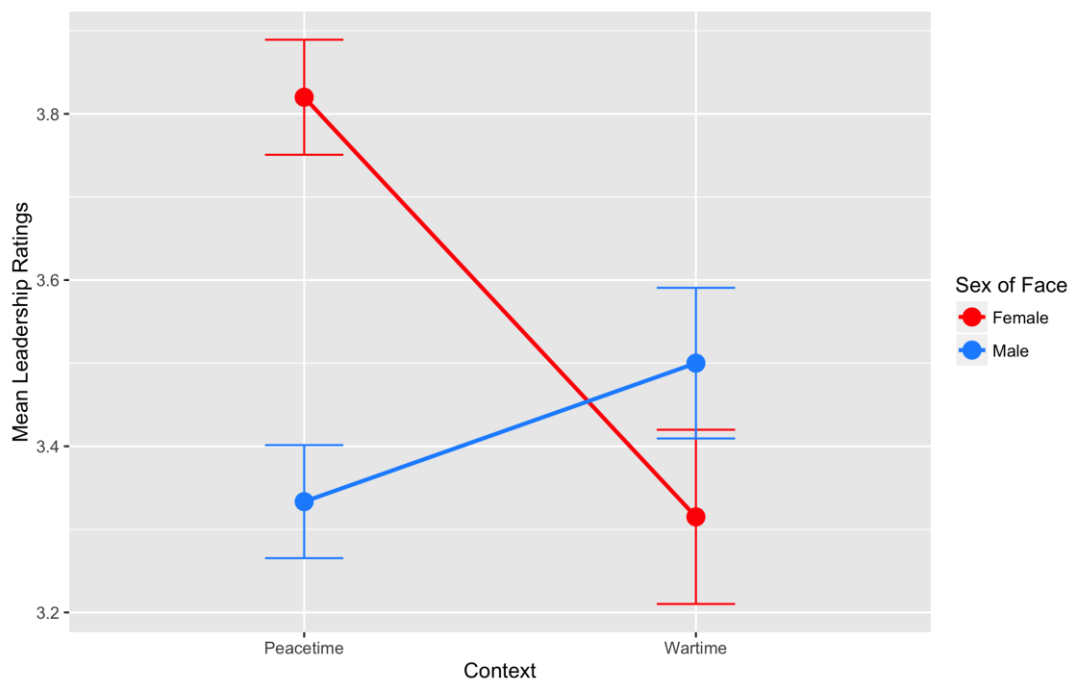


Figure 5. The significant interaction between face sex and context for leadership judgments (Study 2). Error bars show standard error of the mean.

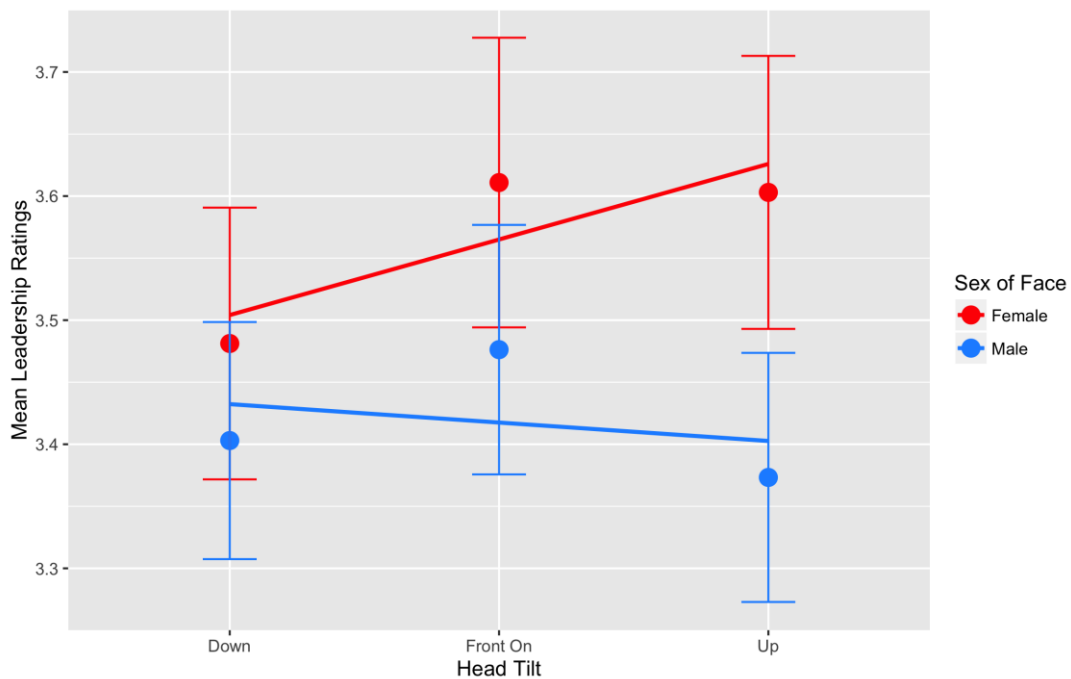


Figure 6. The significant interaction between face sex and head tilt for leadership judgments (Study 2). Error bars show standard error of the mean.

Additional analyses of Study 2

One reviewer asked that we carry out an alternative analysis in which upward tilted faces were excluded from the analysis. This analysis can be seen at <https://osf.io/zg4ut/>, but also showed no evidence for category-contingent effects of head tilt on leadership judgments.

Discussion

In Study 1, consistent with some previous research (Hehman, et al., 2013; Toscano, et al., 2018; Witkower & Tracy, 2019), we found that tilting heads down increased perceptions of dominance. In addition, and consistent with

research suggesting that dominance and trustworthiness are negatively correlated (Perrett et al., 1998), we also found that tilting heads down decreased perceptions of trustworthiness (Study 1). In Study 2, we tested whether these judgment-contingent effects of head tilt can also give rise to context-contingent effects of head tilt on hypothetical leadership judgments.

By contrast with previous results for physical characteristics (Ferguson, et al., 2019; Grabo & Van Vugt, 2018; Laustsen & Petersen, 2017; Little, et al., 2012; Re, et al., 2013; Spisak, et al., 2012), we found no evidence that head tilt had context-contingent effects on leadership judgments (Study 2).

Importantly, these null results for context-contingent effects of head tilt on leadership perceptions (Study 2) are unlikely to be due to our head tilt manipulation not influencing dominance and trustworthiness perceptions because Study 1 showed clear and dissociable effects of head tilt on both perceived dominance and trustworthiness.

Although we found no evidence that head tilt had context-contingent effects on leadership judgments, we did find that women were judged as better leaders in the peacetime than wartime context, while men were judged as better leaders in the wartime than peacetime context. This is consistent with previous research finding that feminine faces were perceived as better leaders for peacetime than wartime, while masculine faces were perceived as better leaders for wartime than peacetime (Ferguson et al., 2019; Grabo & Van Vugt, 2018; Lausten & Petersen, 2017; Little et al., 2012; Spisak et al., 2012). This context-contingent effect of face sex on leadership judgments

suggests that the null result for context-contingent effects of head tilt on leadership judgments was not simply because our testing paradigm was unsuitable to detect context-contingent effects on leadership judgments in general.

It should be noted that the stimuli used in these studies were single 3D images with virtually manipulated pitch (i.e., were individual images manipulated in 3D space), rather than images of the target naturally tilting their head. This method allows for precise control of the head tilt angle, but has some limitations. When an individual tilts their head naturally, there is additional stretching or folding of the skin at points on the face. This does not happen with a virtually tilted head. Secondly, when virtually manipulating head tilt, eye gaze becomes confounded with tilt angle, i.e. when the head is tilted eye gaze is no longer directed. It is possible that the presence or absence of these cues could influence social perceptions. This raises the possibility that the results of Study 1 may not just be due to our head tilt manipulation. However, a recent study by Witkower and Tracy (2019) used both computer generated stimuli and human stimuli with natural head tilt and directed gaze, and found the same pattern of results for the effect of head tilt on dominance perceptions as we saw in the current study. Additionally it should be noted that these possible limitations do not explain why, with identical stimuli and sample sizes, we see an effect of head tilt for dominance and trustworthiness judgments (Study 1) but do not see an effect for leadership judgments (Study 2). Taken together, this information suggests that our null results in Study 2

are not a consequence of our paradigm or stimuli being unsuitable for detecting effects of head tilt on social judgments.

Given the body of research linking cues of dominance and trustworthiness to context-contingent leadership judgments (Ferguson, et al., 2019; Grabo & Van Vugt, 2018; Laustsen & Petersen, 2017; Little, Roberts, Jones, & DeBruine, 2012; Re, DeBruine, Jones, Perrett, 2013; Spisak, Homan, Grabo, & Van Vugt, 2012), it seems unlikely that dominance and trustworthiness are in fact unrelated to leadership judgments in these contexts. The question then remains as to why we find no context-contingent effects of head tilt on leadership judgments when we do see judgment- contingent effects of head tilt. One possible explanation would be that, from an evolutionary standpoint, judgments about trustworthiness and dominance can have immediate consequences (i.e., misjudging these could lead to physical harm), and so you may be more attuned to transient cues that could communicate immediate intent. Leadership judgments however have more long-term consequences; therefore it may be more beneficial to pay less attention to transient cues and focus on invariant cues that may be more indicative of stable traits. This is speculative, however, and further studies are needed to investigate this issue.

In conclusion, we found that head tilt affected trustworthiness and dominance perceptions, but did not have the context-contingent effects on leadership judgments. However, female faces were judged to better leaders in peacetime than wartime contexts and male faces were judged to be better leaders in

wartime contexts than peacetime contexts. That sex of face, but not head tilt, had context-contingent effects on leadership judgments suggests that the well-documented context-contingent effects of physical characteristics on leadership judgments do not necessarily extend to head tilt and, potentially, other changeable facial characteristics.

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