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BRIEF REPORT

Spatial Cues Influence the Visual Perception of Gender

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Spatial localization is a basic process in vision, occurring reliably when people encounter an object or person. Yet the role of spatial-location in the visual perception of people is poorly understood. We explored the extent to which spatial-location distorts the perception of gender. Consistent with evidence that the perception of objects is constrained by their location in visual scenes, enhancing perception for objects in their typical location (e.g., Biederman et al., 1982), we hypothesized that people would see relatively greater femininity in faces that appeared lower in space. On each of many trials, participants briefly viewed a pair of faces that varied in gender-ambiguity. One face appeared higher than the other, and participants identified the 1 that looked more like a woman's face (Study 1) or indicated whether the 2 faces were the same (Study 2). Across 2 experiments, participants perceived greater femininity in faces seen lower (vs. higher) in space. These effects seem to be perceptual—changes to spatial location were sufficient for altering whether 2 faces looked identical or different. Thus, spatial-location modulates visual percepts of gender, providing a biased foundation for downstream processes involved in gender biases, sexual attraction, and sex-roles.

Keywords: gender, social perception, spatial-location, statistical regularity, vision

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People are always located somewhere. Thus, whenever people see each other, spatial analysis is active in human vision. Spatial analysis begins as soon as light hits the retina, is remarkably precise at the earliest stages of the cortical visual hierarchy (Engel, Glover, & Wandell, 1997; Holmes, 1945), and enables people to recognize complex scenes and the objects within them with remarkable speed (e.g., Oliva & Torralba, 2007). Yet despite the importance of spatial analysis in visual perception and a growing literature on the visual perception of people (Adams, Ambady, Nakayama, & Shimojo, 2011; Rhodes & Jeffery, 2006; Rhodes, Jeffery, Watson, Clifford, & Nakayama, 2003), little is known about the role of spatial-location in the visual perception of social identities, social vision more broadly, or face perception more specifically. In an effort to bridge these gaps, we examined the influence of vertical-location on gender perception.

People acquire categorical knowledge of others' gender exceptionally quickly via social encounters (Freeman, Rule, Adams, & Ambady, 2010; Ghuman, McDaniel, & Martin, 2010; Little, DeBruine, & Jones, 2005), and such knowledge provides the essential basis for downstream processes involved in gender biases and sexual attraction (e.g., Hoyt & Burnette, 2013; Reuben, Sapienza, & Zingales, 2014). But despite its speed and social importance, gender discrimination is not necessarily an easy or reliable process. Even when facial features are unambiguously gendered (which is often *not* the case), perception can be noisy, as when a face is seen briefly or in the periphery. Such perceptual ambiguity is not unique to gender, and with respect to objects, is often resolved with input from visual context (Bar, 2004; Oliva & Torralba, 2007). For example, objects in scenes are more easily recognized in their typical locations, and these effects appear to be driven by visual processes (e.g., Biederman, Mezzanotte, & Rabinowitz, 1982). Given the investment humans have in quickly identifying others' gender, spatial information may similarly be recruited to disambiguate perception when analysis based on facial features is uncertain or difficult.

Specifically, vertical-location is an ecologically valid cue to facial-gender (men are taller than women, on average) and may thus bias visual perception of faces. Indeed, in a recent study, 22 participants identified male faces faster than female faces when they appeared higher (vs. lower) in-space (Zhang, Li, Eskine, & Zuo, 2014). These findings are consistent with the possibility that vertical-location influences visual percepts of gender but due to design limitations, results may simply reflect a decisional bias.

There are, in fact, multiple pathways through which spatial-location might influence gender judgments. One possibility is that, like other effects of visual context, the influence of spatial-location occurs entirely "in the visual module itself" (see Firestone & Scholl, 2015). Such effects can occur in less than 1/5th of a second

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via stimulus-driven ("bottom-up") information about visual context (e.g., Biederman et al., 1982), or slightly later via location-based encoding of object representations in visual short-term memory (STM) (Hollingworth, 2006). Either of these processes could distort visual percepts of faces, so that faces actually look different when high versus low in space. Another possibility is that spatial-location cues distort visual perception from the "top-down", via social–cognitive mechanisms responsive to spatial-location (Giessner & Schubert, 2007; Schubert, 2005). A final possibility is that social–cognitive mechanisms responsive to spatial-location bias decisions to favor "man" for high faces and "woman" for low faces, with no real influence on visual percepts. Ruling out this last possibility is central to the current endeavor.

We examined the extent to which spatial-location distorts visual percepts of facial gender. The experiments reported below utilize tasks recommended for distinguishing perceptual from decisional processes in that these tasks (a) directly link performance to visual experience (Firestone & Scholl, 2015) and (b) implement strict boundaries on visual exposure and attention.

In Study 1, we created continua of facial-gender morphs and used a two-alternative forced-choice design to examine whether and to what degree spatial-location distorted the perception of gender. On each trial, participants viewed two images of the *same* facial identity (one more feminine than the other) that were matched for low-level image attributes like size and orientation, as well as social attributes like emotion and eye-gaze. Faces were vertically arranged, shown for 300 ms, and backward-masked. Participants judged gender of the postcued face. Study 2 included a nearly identical task that permitted stronger inferences about visual percepts: participants simply indicated whether the two faces were identical.

Study 1

Method

Participants. The final sample consisted of 147 participants (68% women; 82% white).[1] Please see supplementary online materials (SOM) for sample size calculations.

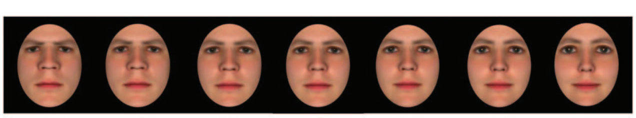

Figure 1. Example of FaceGen stimuli from a single identity. Faces range from masculine on the left to feminine on the right. We simplified the scale values by their lowest common denominator and thus −5 corresponded to −35 and +5 corresponded to +35, with a 7-unit FaceGen increment corresponding to a 1-unit change in our values and a 9% change in facial gender. We pretested the facial stimuli to confirm that perceived facial gender tracked with FaceGen values. MTurk participants ($N = 214$) rated each of the 42 faces from 1 (*extremely masculine*) to 10 (*extremely feminine*). FaceGen facial gender values linearly predicted perceived gender, $F(1, 197) = 1385.80$, $p < .001$, $\eta^2 = 7.03$. Furthermore, simple effects tests revealed a significant difference from each FaceGen morph value to the next ($ts > 7.59$, $ps < .001$) such that the slightly feminine face was perceived as more feminine than the gender-neutral face, for example, and the moderately feminine face as more feminine than the slightly feminine face. See the online article for the color version of this figure.

Facial stimuli. Each of the six identities in our face set were systematically varied in sex-typicality across seven levels—from extremely masculine (−5) to extremely feminine (+5; see Figure 1). Faces (4.16° × 5.50°) were generated using FaceGen, a morphable statistical face model that allows random generation and manipulation of faces based on parameters gathered from hundreds of three-dimensional images of actual women and men (Blanz & Vetter, 1999). Thus, systematic variation of sex-typicality was based on actual anthropometric variability. For each identity we sampled from (nearly) the entire range of facial gender available in FaceGen (see Figure 1).[2]

Procedure. Experiments were conducted using DirectRT software (Jarvis, 2012) on a CRT monitor at a distance of 55 cm. The participant's chair was adjusted so that her/his eyes were at a height identical to center-screen. Participants then completed the gender perception task in two blocks (144 trials/block). Twelve practice trials preceded each block.

On each trial, participants viewed one gender-neutral face and one gendered face of the same identity (26.8cd/m^2) for 300 ms. Because spatial associations become especially important for recognition when object-identity is ambiguous (Bar & Ullman, 1996), we selected brief and peripheral presentations to most effectively draw out the predicted effect of vertical-location. Each face from the pair was presented with its center 5.50° above or below fixation. To prevent residual visual processing beyond stimulus offset (Rolls, Tovée, & Panzeri, 1999), each face was followed by a 500-ms mask (see Figure 2). A black screen then displayed a pair of dots at the centroid of one of the previously presented faces, cueing it as the face to be rated. Participants were asked "Was the cued-face more *feminine* (*masculine*) than the other face?". Question-type (feminine/masculine) varied by block. Participants responded "yes" (j) and "no" (f) via the keyboard. The next trial began after a 1-s break. Block order was counterbalanced via random assignment but was not a significant predictor (see SOM). Thus, results for all trials were merged (i.e., masculine blocks were reverse-scored).

Each trial varied in the extent to which the two faces differed in facial gender: the gendered face was one of three amounts less feminine (−5, −3, −1) or more feminine (+1, +3, +5) than the gender-neutral face (0). The location of the cue (high/low) and the gender of the cued-face were evenly represented across trials. Ceiling effects were limited by task-difficulty; faces appeared simultaneously and peripherally for 300 ms (without hair), and were backward-masked. The brief duration and unpredictable cue location (which appeared after the faces had disappeared) discouraged a strategy of selectively attending to one location on the screen and instead encouraged participants to distribute attention

[1] Participants whose PSEs (based on logistic fits) were greater than 2.5 standard deviations from the sample mean were excluded from data analysis ($n = 7$). These participants showed little-to-no sensitivity in the task, leading the curve fitting algorithm to produce parameter estimates with impossible values. We also excluded 3 participants who did not complete the perceptual task and 3 minors.

[2] Facial luminance covaries with facial gender, such that extremely feminine and extremely masculine FaceGen faces differed in brightness by 31.24 cd/m^2 (measured via luminance gun). To limit this difference, we held texture and coloring constant within FaceGen, limiting the luminance difference across each continuum to 3.26 cd/m^2.

across the screen while maintaining fixation for the duration of each trial.

The design was thus 2 (Block Order) × 6 (Femininity of gendered-face) × 2 (Spatial-Location: cued-face high vs. low), with repeated-measures on the last 2 factors. Each participant completed 288 trials before completing a demographics questionnaire.[3]

Results

We plotted the proportion of trials in which the participant reported that the cued-face was more feminine than the other face (*y* axis) as a function of the physical gender difference between faces in each pair (*x* axis). We examined this relationship for trials in which the cued-face was (a) above fixation and (b) below fixation, yielding two logistic functions per participant. For each fit, we expected a positive slope, indicating that participants were sensitive to changes in the femininity of the cued-face (i.e., exhibited above-chance accuracy). We then identified the point of subjective equality (PSE) for each fit. Generally, the PSE indicates the point along a continuum of physical differences at which a pair of stimuli looks subjectively equal in some experimental context. In the current experiment, this value was the amount of facial gender (noted along the *x* axis) that led participants to rate it as gender-neutral (i.e., more feminine/masculine 50% of the time). We expected faces to appear more masculine when top-cued than bottom-cued, and for top-cued faces to thus require more feminine characteristics to appear gender-neutral. Hence, we expected rightward (positive) and leftward (negative) shifts of the logistic fits (and associated PSEs) for the top-cued and bottom-cued conditions, respectively. A PSE difference score of these two fits ("top-cued" vs. "bottom-cued") was computed to estimate the extent to which spatial-location modulated gender percepts.

Bottom-cued faces were more likely to be identified as feminine, with the PSE shifted 2.5 gender units to the left relative to the PSE for top-cued faces, $t(146) = 4.87$, $p < .001$, $d = .81$, 95% CI [1.49, 3.52]. The magnitude of this shift suggests that faces located low in space appeared about 25% more feminine than the same faces located high in space (see Figure 3).

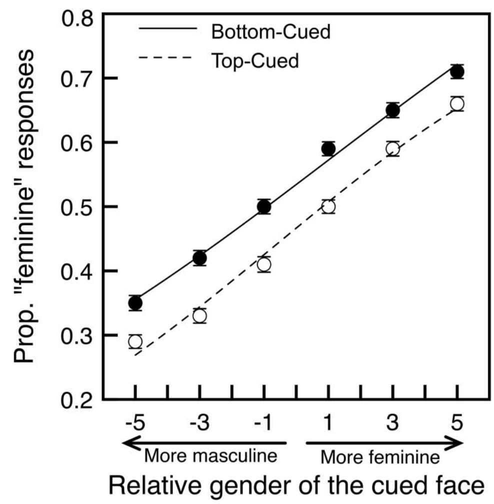

Figure 3. The proportion of feminine responses is plotted by facial gender for top- and bottom-cued faces in Study 1. Standard errors are depicted, but small.

Study 2

The results of Study 1 are consistent with the idea that vertical-location distorts visual percepts of facial gender. This interpretation reflects the use of a task that limited attentional shifts via brief exposure time and postcued responses, and that directly tied performance to how participants saw the stimuli. The use of gender-continua paired with logistic fits provided a reasonable estimate for the magnitude of distortion in gender percepts. But to more clearly rule out the possibility that these effects were entirely decisional and did not reflect visual percepts, Study 2 included an experimental design that typically prevents response bias. We based our design on approaches that have been used to rule out response bias in studies of visual object recognition (see Bar, 2004 for a review). Participants saw two faces and simply indicated whether they were the same. We expected top faces to look masculine and bottom faces to look feminine. Hence, the top face in a pair would require more physical-femininity than the bottom face for those faces to look identical.

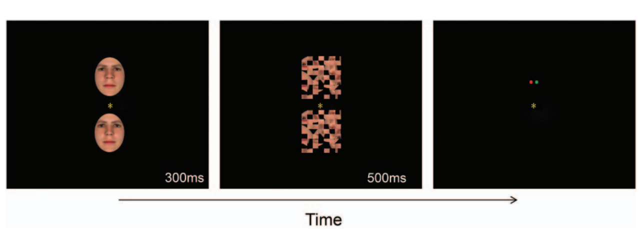

Figure 2. Structure of a typical trial in Study 1. Masks were generated by dividing the gender-neutral image into 156 equally sized squares and randomly redistributing these squares. See the online article for the color version of this figure.

Method

Participants. The final sample consisted of 92 participants (75% women; 75% white).[4]

Design and procedure. This study was a 7 (Facial Femininity) × 2 (Spatial-location: gendered-face was high vs. low) repeated-measures design. Procedures and materials were nearly identical to Study 1, but participants indicated, as quickly and accurately as possible, whether the two faces were identical after masks disappeared (there was no cue). On each trial, the gender-neutral face (0) appeared above or below another face of the same identity with one of seven gender values (−5, −3, −1, 0, +1, +3, or +5). The neutral-neutral comparison (0-to-0) was oversampled

[3] Most participants completed a Gender–Power Implicit Associations Task and a brief Bem Sex-Role Inventory after the perceptual task. Neither measure moderated the effects described below: implicit associations, $r(94) = .14$, $p = .176$, or explicit stereotypes, $r(94) = .09$, $p = .410$, emerged. However, other untested gender stereotypes may be top-down moderators. Finally, measures for a separate project were collected after the perceptual task (see Appendix).

[4] One participant did not complete the task and was excluded from analyses.

(70 trials) to ensure sufficient "same" responses, whereas other trial types (e.g., 0 vs. +3) were each allotted 20 trials ($N = 190$ trials). Note that simply paying attention to one face from the pair would not have been informative.[5]

Results

Participants should be more likely to respond "same" on trials in which the faces were objectively similar in facial gender, with fewer "same" responses when the gendered face was far more feminine (or masculine) than the neutral face. Across the continuum of facial gender, then, visual sensitivity would result in a normal distribution of "same" responses.

We examined if and how the distribution of "same" responses might differ depending on the location of the gendered face. When the gendered face was high in space, we expected the distribution to be shifted to the right. To be perceived as identical to the neutral face below it, the gendered face should need more feminine characteristics to offset the perceptual distortion from its high location. Conversely, when the gendered face was low in space, it should need more masculine characteristics for it to look identical to the neutral face, shifting the distribution of "same" responses to the left. These patterns would comprise a statistical interaction between gendered-face location and the degree of femininity in the gendered face.

We conducted a 2 (Spatial-location) × 7 (Facial Gender) repeated-measures ANOVA. A main effect of facial gender confirmed that perception of similarity was more likely to the degree that faces were similar in physical gender, $F(6, 546) = 43.87$, $p < .001$, $\eta^2 = .27$. As expected, the main effect of spatial-location was not significant, $F(1, 91) = 1.55$, $p = .22$, $\eta^2 = .001$.

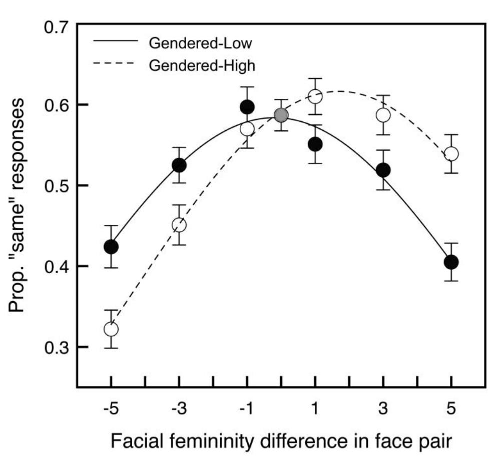

Figure 4. Proportion of responses in which participants indicated that a pair of faces looked identical, plotted as a function of how much these faces actually differed in gender. See text for primary analysis. Solid and dashed lines depict Gaussian fits to the averaged data from the gendered-low and -high conditions, respectively. The peak of each distribution on the *x*-axis indicates the average value at which a gendered face looked identical to the nongendered face. The two faces were most likely to appear identical when the top face in the gendered-high condition had a feminine gender value of 1.70, 95% CI [1.30, 2.09], and when the bottom face in in the gendered-low condition had a slightly masculine gender value of −.20, 95% CI [−.61, .22]. Critically, the 95% CIs for spatial-location conditions did not overlap. See SOM for details on analyses using Gaussian fits.

Table 1
Effect of Spatial-Location at Each Value of Facial Gender

Facial gender	*M*	[95% CI]	*t*	*df*	*p*	*d*
−5	−10.25	[−14.81, −5.70]	−4.47	91	<.001	.94
−3	−7.38	[−11.27, −3.49]	−3.77	91	<.001	.79
−1	−2.64	[−6.51, 1.23]	−1.35	91	.180	.28
0	1.00	[−1.27, 3.27]	.88	91	.382[a]	.18
+1	5.90	[2.16, 9.65]	3.13	91	.002	.66
+3	6.78	[2.36, 11.20]	3.05	91	.003	.64
+5	13.32	[8.82, 17.83]	5.88	91	<.001	1.23

[a] Note that the comparison of spatial-location for gender-neutral trials is only a manipulation check (we expected no differences) as these trials did not have "Gendered-High" and "Gendered-Low" conditions.

Most importantly, and as predicted, the interaction between facial gender and spatial-location was significant, $F(6, 546) = 17.73$, $p < .001$, $\eta^2 = .080$. Figure 4 and Table 1 clearly illustrate that, at each level of facial gender, "same" responses in the gendered-low condition were left-shifted relative to the gendered-high condition. High spatial-locations exaggerated masculinity, so these faces required more physical-femininity for them to appear identical to the neutral face below. Conversely, low spatial-locations exaggerated femininity. All effects were significant except when the slightly masculine face was paired with the gender-neutral face. These results converge with our findings from Study 1, but with a paradigm that more directly isolated effects on visual percepts from strictly post-perceptual effects. Additionally, we were able to illustrate the magnitude of this effect of spatial-location by pinpointing the amount of actual facial gender necessary to nullify it.

Discussion

Spatial cues influenced visual percepts of facial gender. Across two experiments, faces looked more masculine when seen relatively high and more feminine when seen relatively low. We observed this phenomenon using psychophysics paradigms optimal for distinguishing visual from decisional effects, and Study 2 provided especially strong evidence that results were not due to decisional response biases.

There are of course limitations to these studies. For example, although our evidence supports the view that spatial-location distorts visual percepts of facial gender, the role of bottom-up and top-down processes in achieving this perceptual effect remains underspecified. We speculate that these effects reflect a lifetime of visual learning (i.e., men higher in space than women), such that similar effects might be observed for other ecologically valid spatial cues to social identity. Indeed, even novel associations between an object's location and appearance can be rapidly learned (in a single experiment) and used to facilitate visual search and memory (Endo & Takeda, 2004; Hollingworth, 2006), supporting the notion that an object's identity and its probability of being in a specific location are among the most basic relations that characterize a visual scene (Biederman et al., 1982). Adults have

[5] Two measures were included for a separate project and followed the perceptual task (see Appendix).

a lifetime of encountering such relations between facial gender and vertical space. By repeatedly encoding the joint probability between gender and space, the visual system may thus develop a heuristic that distorts the gendered appearance of faces. Indeed, the effects observed here are similar to other effects of visual context on perception, especially those achieved through statistical learning (Chun & Turk-Browne, 2008; Smith, Grabowecky, & Suzuki, 2007). Our speculative explanation awaits empirical testing, both in terms of (a) examining how experience might shape such a heuristic and (b) clarifying whether changes in the visual percepts of gender result from early feed-forward visual analyses, like rapid object categorization (VanRullen & Koch, 2003) or top-down influences on perception that would occur later in time (e.g., Puce, Allison, & McCarthy, 1999). Finally, the observed effects may be driven more by perceptual information about upper (vs. lower) faces (e.g., Drain & Reuter-Lorenz, 1996), though this caveat does not qualify our results.

In sum, vertical-location influenced visual percepts of facial gender, suggesting that spatial cues may systematically influence visual percepts of social identity. In keeping with considerable evidence that spatial analysis plays a key role in vision, these results also support the view that perception of objects—even faces—can be distorted by visuospatial context (e.g., Biederman et al., 1982). Ultimately, by changing the way a person's gender is perceived, spatial context may have numerous downstream consequences, including gender biases and sexual attraction.

References

Adams, R. B., Ambady, N., Nakayama, K., & Shimojo, S. (Eds.). (2011). *The science of social vision*. New York, NY: Oxford University Press.

Bar, M. (2004). Visual objects in context. *Nature Reviews Neuroscience, 5,* 617–629. http://dx.doi.org/10.1038/nrn1476

Bar, M., & Ullman, S. (1996). Spatial context in recognition. *Perception, 25,* 343–352. http://dx.doi.org/10.1068/p250343

Biederman, I., Mezzanotte, R. J., & Rabinowitz, J. C. (1982). Scene perception: Detecting and judging objects undergoing relational violations. *Cognitive Psychology, 14,* 143–177. http://dx.doi.org/10.1016/0010-0285(82)90007-X

Blanz, V., & Vetter, T. (1999). A morphable model for the synthesis of 3D faces. *Proceedings of the 26th Annual Conference on Computer Graphics and Interactive Techniques - SIGGRAPH '99*, 187–194. http://dx.doi.org/10.1145/311535.311556

Chun, M. M., & Turk-Browne, N. B. (2008). Associative learning mechanisms in vision. In S. J. Luck & A. Hollingworth (Eds.), *Visual memory* (pp. 209–245). New York, NY: Oxford University Press. http://dx.doi.org/10.1093/acprof:oso/9780195305487.003.0007

Drain, M., & Reuter-Lorenz, P. A. (1996). Vertical orienting control: Evidence for attentional bias and "neglect" in the intact brain. *Journal of Experimental Psychology: General, 125,* 139–158. http://dx.doi.org/10.1037/0096-3445.125.2.139

Eisler, R. M., & Skidmore, J. R. (1987). Masculine gender role stress. *Scale development and component factors in the appraisal of stressful situations. Behavior Modification, 1,* 123–136. http://dx.doi.org/10.1177/01454455870112001

Endo, N., & Takeda, Y. (2004). Selective learning of spatial configuration and object identity in visual search. *Perception & Psychophysics, 66,* 293–302. http://dx.doi.org/10.3758/BF03194880

Engel, S. A., Glover, G. H., & Wandell, B. A. (1997). Retinotopic organization in human visual cortex and the spatial precision of functional MRI. *Cerebral Cortex, 7,* 181–192. http://dx.doi.org/10.1093/cercor/7.2.181

Firestone, C., & Scholl, B. J. (2016). Cognition does not affect perception: Evaluating the evidence for "top-down" effects. *Behavioral and Brain Sciences, 39,* e229. http://dx.doi.org/10.1017/S0140525X15000965

Freeman, J. B., Rule, N. O., Adams, R. B., Jr., & Ambady, N. (2010). The neural basis of categorical face perception: Graded representations of face gender in fusiform and orbitofrontal cortices. *Cerebral Cortex, 20,* 1314–1322. http://dx.doi.org/10.1093/cercor/bhp195

Ghuman, A. S., McDaniel, J. R., & Martin, A. (2010). Face adaptation without a face. *Current Biology, 20,* 32–36. http://dx.doi.org/10.1016/j.cub.2009.10.077

Giessner, S. R., & Schubert, T. W. (2007). High in the hierarchy: How vertical location and judgments of leaders' power are interrelated. *Organizational Behavior and Human Decision Processes, 104,* 30–44. http://dx.doi.org/10.1016/j.obhdp.2006.10.001

Hollingworth, A. (2006). Scene and position specificity in visual memory for objects. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 32,* 58–69. http://dx.doi.org/10.1037/0278-7393.32.1.58

Holmes, G. (1945). Ferrier Lecture : The organization of the visual cortex in man. *Proceedings of the Royal Society of London, Series B: Biological Sciences, 132,* 348–361. http://dx.doi.org/10.1098/rspb.1945.0002

Hoyt, C. L., & Burnette, J. L. (2013). Gender bias in leader evaluations: Merging implicit theories and role congruity perspectives. *Personality and Social Psychology Bulletin, 39,* 1306–1319. http://dx.doi.org/10.1177/0146167213493643

Klonis, S. C., Plant, E. A., & Devine, P. G. (2005). Internal and external motivation to respond without sexism. *Personality and Social Psychology Bulletin, 31,* 1237–1249. http://dx.doi.org/10.1177/0146167205275304

Jarvis, B. G. (2012). *DirectRT*. New York, NY: Empirisoft Corporation.

Little, A. C., DeBruine, L. M., & Jones, B. C. (2005). Sex-contingent face after-effects suggest distinct neural populations code male and female faces. *Proceedings. Biological Sciences, 272,* 2283–2287. http://dx.doi.org/10.1098/rspb.2005.3220

Oliva, A., & Torralba, A. (2007). The role of context in object recognition. *Trends in Cognitive Sciences, 11,* 520–527. http://dx.doi.org/10.1016/j.tics.2007.09.009

Puce, A., Allison, T., & McCarthy, G. (1999). Electrophysiological studies of human face perception. III: Effects of top-down processing on face-specific potentials. *Cerebral Cortex, 9,* 445–458. http://dx.doi.org/10.1093/cercor/9.5.445

Reuben, E., Sapienza, P., & Zingales, L. (2014). How stereotypes impair women's careers in science. *Proceedings of the National Academy of Sciences of the United States of America, 111,* 4403–4408. http://dx.doi.org/10.1073/pnas.1314788111

Rhodes, G., & Jeffery, L. (2006). Adaptive norm-based coding of facial identity. *Vision Research, 46,* 2977–2987. http://dx.doi.org/10.1016/j.visres.2006.03.002

Rhodes, G., Jeffery, L., Watson, T. L., Clifford, C. W. G., & Nakayama, K. (2003). Fitting the mind to the world: Face adaptation and attractiveness aftereffects. *Psychological Science, 14,* 558–566. http://dx.doi.org/10.1046/j.0956-7976.2003.psci_1465.x

Rolls, E. T., Tovée, M. J., & Panzeri, S. (1999). The neurophysiology of backward visual masking: Information analysis. *Journal of Cognitive Neuroscience, 11,* 300–311. http://dx.doi.org/10.1162/089892999563409

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Schubert, T. W. (2005). Your highness: Vertical positions as perceptual symbols of power. *Journal of Personality and Social Psychology, 89,* 1–21. http://dx.doi.org/10.1037/0022-3514.89.1.1

Smith, E. L., Grabowecky, M., & Suzuki, S. (2007). Auditory-visual crossmodal integration in perception of face gender. *Current Biology, 17,* 1680–1685. http://dx.doi.org/10.1016/j.cub.2007.08.043

VanRullen, R., & Koch, C. (2003). Is perception discrete or continuous? *Trends in Cognitive Sciences, 7,* 207–213. http://dx.doi.org/10.1016/S1364-6613(03)00095-0

Zhang, X., Li, Q., Eskine, K. J., & Zuo, B. (2014). Perceptual simulation in gender categorization: Associations between gender, vertical height, and spatial size. *PLoS ONE, 9,* e89768. http://dx.doi.org/10.1371/journal.pone.0089768

Appendix

Additional Measures

Study 1

Rosenberg Self-Esteem Scale (Rosenberg, 1965)

External and Internal Motivation to Respond Without Sexism (Klonis, Plant, & Devine, 2005)

Masculine Gender Role Stress Scale (Eisler & Skidmore, 1987)

Vertical Location-Power Associations Task (Schubert, 2005)

Explicit Self Power Ratings

Study 2

Gender–Power Implicit Associations Task

Vertical Location–Power Associations Task (Schubert, 2005)

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