Social Power and Recognition of Emotional Prosody:

High Power is Associated with Lower Recognition Accuracy than Low Power

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Abstract

Listeners have to pay close attention to a speaker's tone of voice (prosody) during daily conversations. This is particularly important when trying to infer the emotional state of the speaker. While a growing body of research has explored how emotions are processed from speech in general, little is known about how psycho-social factors such as social power can shape the perception of vocal emotional attributes. Thus, the present studies explored how social power affects emotional prosody recognition. In a correlational (Study 1) and an experimental study (Study 2), we show that high power is associated with lower accuracy in emotional prosody recognition than low power. These results, for the first time, suggest that individuals experiencing high or low power perceive emotional language differently.

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Accurate perception of others' emotional states forms the basis of successful and healthy interpersonal relationships (Levenson & Ruef, 1992). To accurately infer how others feel, individuals typically rely on the integration of emotional cues gathered from different sources such as semantics, face, posture, gestures, and voice. Sometimes, however, emotional inferences are made using a limited set of cues, such as when a listener relies on emotional prosody recognition when talking on the phone to decode the other person's emotional state.

Emotional prosody is characterized by psychoacoustic parameters such as pitch, loudness, voice quality, and tempo. Research on emotional prosody has typically studied how well (e.g., accurate, fast) listeners recognize basic emotions from semantically meaningful sentences (e.g., Paulmann, Pell, & Kotz, 2008) or so-called pseudo-sentences (i.e., sentences that convey no semantic meaning) (e.g., Scherer, Banse, & Wallbott, 2001). A growing body of research has confirmed that listeners are generally much better than predicted by chance at deciphering how speakers feel, though some emotions (e.g., anger) are often better recognized than others (e.g., disgust, happiness). Interestingly, few investigations have attended to social psychological factors that could potentially influence emotional speech recognition. Exceptions to this come from research on the moderating role of cultural background (e.g., Paulmann & Uskul, 2014; Pell, Monetta, Paulmann & Kotz, 2009; Scherer et al., 2001), sex (e.g., Schirmer, Kotz, & Friederici, 2002) and age (e.g. Paulmann et al., 2008; Kiss & Ennis, 2001) in emotional prosody processing. In the current research, we examine for the first time social power – the capacity to control one's own and others' resources and outcomes (e.g., Keltner, Gruenfeld, & Anderson, 2003) - as a factor that may impact the recognition of emotional prosody.

Whilst there is no research to date designed to investigate the role of power in emotional prosody perception; past studies have demonstrated that power shapes identification of emotions from other emotional cues (e.g. facial expressions). This research has yielded evidence for both high *and* low power increasing emotion recognition accuracy. In particular, it has been shown that participants primed with high power were less accurate than unprimed (control) participants (Galinsky, Magee, Ines, & Gruenfeld, 2006, Study 3) and those who were primed with low power in recognizing emotions communicated in static faces (Shirako, Blader, & Chen, 2013 [as cited in Magee & Smith, 2013]). Similarly, men assigned to a high power position in a mixed-sex dyad were less accurate in judging emotions of their subordinates (inferred from their partner-estimates) based on different cues than were men assigned to a low power position (Gonzaga, Keltner & Ward, 2008). Using transcranial magnetic stimulation, Hogeveen, Inzlicht, and Obhi (2014) showed that participants primed with high power before observing another person's actions exhibited lower levels of motor resonance than did participants primed with low power. This neural processing difference between the high vs. low primed groups was suggested to explain lower interpersonal sensitivity shown among high power individuals compared to their low power counterparts.

Other research has provided evidence in the opposite direction. For example, power and status correlate positively with non-verbal decoding accuracy (see Hall, Halberstadt, & O'Brian's, 1997 meta-analysis), superiors outperform subordinates in a nonverbal cue-decoding task (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; Hall & Haberstadt, 1994), personality characteristics indicative of low-power are associated with poorer facial emotion recognition (Toner & Gates, 1985), and high power increases empathic accuracy (Schmid Mast, Jonas, & Hall, 2009). Thus, findings in this literature are equivocal and further research on the role of social power in emotional processing is warranted.

We examined the role of power in inferring emotional states through prosody by measuring individuals' generalized sense of power (Study 1) and inducing feelings of low vs. high power (Study 2) before an emotion recognition task. Across both studies, we investigated the role of power in emotional prosody recognition across six different emotions and neutral tone of voice. Participants in both studies were native English speakers, born and raised in the UK.

STUDY 1

We designed the first study to examine the association between individual differences in sense of power and level of accuracy in recognizing emotional prosody from the voice.

Method

Participants and procedure. Ninety-nine undergraduate students (63 women, M_{age} = 19.94) first completed the Sense of Power Scale (Anderson, John & Keltner, 2012, e.g., I can get people to listen to what I say, 1: *disagree strongly* to 7: *agree strongly*) (α = 0.82, *M* = 4.49, *SD* = .90). Next, in individual cubicles and using headphones, they listened to 28 pseudo-sentences (e.g., Flotch deraded the downdary snat) expressed in 6 different emotions (anger, disgust, fear, happiness, surprise, and sadness) or in a neutral tone of voice and were asked to identify the emotion conveyed in each sentence by clicking on one of seven response options which appeared on screen after the sentence ended. Specifically, we first presented a fixation cross (for 250 ms) followed by a pseudo-sentence. Next, a response screen came up and participants were asked to make a decision. Participants started with 5 practice sentences followed by 196 sentences presented pseudo-randomly in seven blocks; each block was followed by a short break. No time limit was imposed and no feedback was given to participants about their performance.

Pseudo-sentences were created by retaining phonological properties of British English. Such sentences are often employed to explore how emotional prosody is processed independent of semantic information using materials closely resembling the participant's language (e.g., Pell et al., 2009). This approach prevents listeners from using lexical-semantic cues to infer the speaker's emotional intention. Sentences used in the current studies were spoken by a native British English-speaking actress and selected from a larger pool of sentences based on an accuracy level exceeding three times chance (~42%) (see Paulmann & Uskul, 2014, for details of the rating procedure and results). Participants gave their written informed consent before the start of each study.

Results

To investigate the relationship between participants' sense of power and emotional prosody accuracy ratings, we conducted a multi-level model analysis, commencing with a basic intercept model, and then adding fixed effects. Type of emotion was treated as a repeated measure, nested within individuals, and modeled using a diagonal covariance matrix and maximum likelihood (ML) estimates. The basic intercept model revealed significant differences between emotions, F (7, 164.16) = 1488.70, p < .001. Anger was recognized with the highest accuracy (M = 90.37, SD = 11.17), followed by neutral tone of voice (M = 88.17, SD = 13.90), sadness (M = 81.60, SD = 11.94), disgust (M = 77.09, SD = 19.24), fear (M = 64.94, SD = 16.90), surprise (M = 62.70, SD = 16.34), and happiness (M = 48.99, SD = 17.81). With the exception of anger, participants made more errors in the recognition of emotional prosody than in the recognition of a neutral tone of voice (all *p*s < .001).

The addition of the grand-mean centered power variable improved the model fit ($\chi 2$ = 4.09, p = .043) and explained 6.8% of the between-subjects variance. The residual between-subjects variance was significant (τ^2 = 37.23, SE = 9.06, Z = 4.11, p < 001). The fixed effect estimates indicated that a higher sense of power score was associated with lower accuracy (coeff. = -1.87, SE = .92, t(93.68) = -2.05, p = .043). Compared to individuals with a low sense of power (-1*SD*), individuals with a high sense of power (+1*SD*) recognized 4.16% fewer prosodies (see Figure 1). Next, we examined the interaction between power and emotion type, which was not significant, F < 1, and accordingly did not improve the model fit ($\chi 2$ = 1.19, p = .276).

We also examined the contributions of gender as a fixed effect, starting with the intercept model. Even though women had somewhat higher accuracy scores than men, the fixed effect of gender (coeff. = -2.74, SE = 1.64) was not significant t(93.99) = 1.67, p = .098). Further analyses indicated that and there were no gender differences in participants' sense of power (F < 1), consistent with past research (cf. Anderson, et al., 2012), and gender did not interact with emotion type or with power, *F*s < 1. Finally, controlling for sense of power did not impact the association between gender and prosody recognition, which remained unchanged (*F*s = 2.46 vs. 2.79). Thus, the effects of gender observed in Study 1 cannot be attributed to differences in participants' sense of power.

Study 1 provides initial evidence that power is associated with reduced performance in emotional prosody recognition. In Study 2, we build on this initial evidence to explore the role of power in emotional prosody recognition using a commonly employed experimental design to induce feelings of low vs. high power.

STUDY 2

Method

Participants and procedure. One-hundred-and-fifteen undergraduates (57 women, M_{age} = 20.45) were randomly assigned to a low (*n* = 58) or high (*n* = 57) power condition before they completed the emotion recognition task described in Study 1. To prime power, we asked participants to either write about a personal incident in which they had power over another individual or individuals (high power), or a personal incident in which someone had power over them (low power) (Galinsky, Gruenfeld, & Magee, 2003). In this task, power was defined as controlling the ability of another person to get something he/she wanted or being in a position to evaluate someone else. Participants were given five minutes to complete this task. Following the completion of the emotion recognition task, participants responded to a 7-item manipulation check that assessed how they felt during the incident (e.g., in-control, powerful, 1 = *strongly disagree* to 9 = *strongly agree*, α = 0.92).

Results

The manipulation check confirmed that participants in the high power condition (*M* = 6.74, *SD* = 1.35) perceived themselves as having significantly more power than those in the low power condition (*M* = 3.06, *SD* = 1.13), F (1, 113) = 252.08, $p < .001$,

$\eta^2 = .69$.

A mixed model ANOVA with emotional prosody recognition as the dependent variable, type of emotion as a within-subjects factor, and power prime and participants' sex as between-subjects factors revealed significant main effects of power prime, (F (1,111) = 15.61, $p < .001$) and type of emotion, (F (6, 666) = 152.78, $p < .001$). Anger was recognized with highest accuracy (M = 87.52, SD = 14.12), followed by neutral tone of voice (M = 86.43, SD = 12.99), sadness (M = 77.76, SD = 12.84), disgust (M = 72.17, SD = 24.10), surprise (M = 61.52, SD = 17.73), fear (M = 59.76, SD = 21.09), and happiness (M = 42.05, SD = 16.38). The differences in recognition scores between emotions and neutral tone of voice were all significant at $p < .001$, except for anger, p = .41.

Importantly, participants primed with low power (M = 73.57%, SD = 9.46) were, overall, more accurate in recognizing emotions than participants primed with high power (M = 65.57%, SD = 12.27). The analysis also revealed a significant type of emotion x power prime interaction effect, F (6, 666) = 2.43, p = .025. Unfolding this interaction using simple effects analysis showed that the expected difference between participants primed with low vs. high power was statistically significant for all emotions (ps ranging from .001 to .011) except for neutral tone of voice, p = .24, sadness, p = .20, and surprise, p = .10 (see Figure 2).

Finally, paralleling the findings of Study 1, the analysis revealed a significant main effect of participant sex, (F (1, 111) = 13.77, $p < .001$); women (M = 73.41, SD = 10.24) recognized emotions with greater accuracy than did men (M = 65.86, SD = 11.74). No other significant interactions emerged (Fs < 1.99). We note that gender-related findings in both studies have to be interpreted cautiously as our participants (male and female) listened to stimuli spoken by a female voice only.

Discussion

In a correlational (Study 1) and an experimental study (Study 2), we demonstrated that high power was generally associated with lower accuracy in emotional prosody recognition than low power for a range of emotions, documenting for the first time the association between power and emotion recognition from the voice. These findings contribute to the current debate on the relationship between power and interpersonal accuracy and support the approach/inhibition theory of power (Keltner, Gruenfeld, & Anderson, 2003), which posits that low-power individuals are more interpersonally sensitive than high-power individuals (also see Fiske & Dépret, 1996; Goodwin, Gubin, Fiske, & Yzerbyt, 2000).

This difference in recognition accuracy between high and low power individuals could be argued to stem from the tendency of those in low power to focus on detail (e.g., Smith & Trope, 2006; Smith, Wigboldus, & Dijksterhuis, 2008). Given the complex fluctuations of these parameters and the unstatic nature of voice (especially when lexical-semantic cues are absent as in our stimuli), attention to detailed acoustic changes is crucial to assess the speaker’s emotional state. Thus, if high power individuals pay less attention to these complex acoustic fluctuations than low power individuals, then their emotional prosody accuracy is expected to be lower. This explanation is in line with recent work showing that low power increases vigilance in the processing of perceptual cues (Weick, Guinote, & Wilkinson, 2011).

Alternatively, individuals primed with low power (compared to those primed with high power) may have simply been more motivated to engage with the stimulus materials. In particular, it has been argued that high power individuals display more of a goal-directed behavior (e.g., Galinsky et al., 2003; Guinote, 2007). In a situation where there is no immediate benefit (like the current task), individuals primed with high power might choose not to pay attention to subtle differences in acoustic attributes.

Interestingly, a comparison between mean recognition rates from Study 1 (where we used no power prime) and Study 2 suggests that the high power prime reduced accuracy rates, but the low power prime did not improve accuracy rates in emotional prosody recognition. Evidently, further research is needed to disambiguate the source of the effects, and to replicate and extend the present findings.

Taken together, these data, for the first time, suggest that having or lacking power shapes the way people experience the acoustic world, fostering differences in the way people listen to and process emotional language stimuli.

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Figure Captions

Figure 1. Recognition accuracy rates for all emotional prosodies as a function of (measured) social power in Study 1.

Figure 2. Recognition accuracy rates for all emotional prosodies as a function of (manipulated) social power in Study 2.