When Appearance Does not Match Accent: Neural Correlates of Ethnicity-Related Expectancy Violations

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Funding

This work was supported by the German Research Foundation (STE 938/10-2; FOR 1097 to M.C.S. and T.R.; WI 3219/4-1; FOR 1097 to H.W.), the Polish National Science Centre (Fuga DEC-2013/08/S/HS6/00573 to K.H.) and the Foundation for Polish Science (START 030.2015-W to K.H).

Acknowledgements

We thank Bettina Kamchen for her help in data collection, as well as Suzanne Horwitz, Paweł Tacikowski, and two anonymous reviewers for their valuable comments on a previous version of this manuscript.

Abstract

Most research on ethnicity in neuroscience and social psychology has focused on visual cues. However, accents are central social markers of ethnicity and strongly influence evaluations of others. Here, we examine how varying auditory (vocal accent) and visual (facial appearance) information about others affects neural correlates of ethnicity-related expectancy violations. Participants listened to standard German and Turkish-accented speakers and were subsequently presented with faces whose ethnic appearance was either congruent or incongruent to these voices. We expected that incongruent targets (e.g., German accent/Turkish face) would be paralleled by a more negative N2 event-related brain potential (ERP) component. Results confirmed this, suggesting that incongruence was related to more effortful processing of both Turkish and German target faces. These targets were also subjectively judged as surprising. Additionally, varying lateralization of ERP responses for Turkish and German faces suggests that the underlying neural generators differ, potentially reflecting different emotional reactions to these targets. Behavioral responses showed an effect of violated expectations: German-accented Turkish-looking targets were evaluated as most competent of all targets. We suggest that bringing together neural and behavioral measures of expectancy violations, and using both visual and auditory information, yields a more complete picture of the processes underlying impression formation.

Keywords: accent, face, event-related brain potentials, ethnicity, expectancy violations

Abstract word count: 199 (max. 200)

Text word count: 4951 (max. 5000)

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Due to increased mobility and global migration, native and nonnative speakers of a given language interact in many everyday situations. Hence, some people speak with a foreign accent, others with a native accent. Additionally, specific characteristics of a person's appearance may suggest a migration background. Importantly, certain combinations of accents and appearance can be surprising and violate people's expectations (Jussim, Coleman, & Lerch, 1987), guiding (negative or positive) reactions to expectancy-violating people. Whereas influences of ethnicity as signaled by appearance and by accent are usually studied separately, their combinations can evoke different reactions than separate studies would suggest. Moreover, people's explicit and implicit reactions to others can converge or differ. In the current article, we look at event-related potential (ERP) correlates of contrasting accent and appearance cues, extending previous research on neural correlates of expectancy violations by studying accent-appearance combinations. As appearance and accent are increasingly mixed as a consequence of growing migration, it appears socially and theoretically important to understand the processes underlying people's reactions to others whose appearance and accent do not match.

The influence of the manner of speaking including accents on impression formation has been studied in the fields of sociolinguistics, second language acquisition, and social psychology (Giles & Coupland, 1991; Shepard, Giles, & Le Poire, 2001). Ethnolinguistic identity theory (ELIT) postulates that language is the most important marker of ethnic identity, and that others' first impressions are often based on accent (Giles, Bourhis, & Taylor, 1977; Giles & Johnson, 1981, 1987). People who speak with a nonstandard accent are perceived as being less intelligent and of lower social status (Fuertes, Gottdiener, Martin, Gilbert, & Giles, 2012). Nevertheless, accents have not received nearly the same research attention as facial cues (Gluszek & Dovidio, 2010).

Only few social-psychological studies combined accent and appearance cues (see also Freeman & Ambady, 2011; Zuckerman, Miyake, & Hodgins, 1991). These studies converge on the finding that accents more than appearance drive ethnic categorization (Rakić, Steffens, & Mummendey, 2011), ingroup favoritism (Kinzler, Shutts, Dejesus, & Spelke, 2009), and impression formation (Hansen, 2013). When the combination of one's accent and appearance is unexpected, first impressions could simply be driven by accent as a strong cue, but they could also depend on whether expectations are violated – in a positive or negative way.

Expectancy violations produce more extreme outcomes than situations matching expectations (e.g., Burgoon, 2009; Jussim et al., 1987; Roese & Sherman, 2007). For example, Blacks with strong academic qualifications were evaluated as more competent than comparable Whites, representing positive expectancy violations based on the stereotype that Blacks are less academically-oriented (L. A. Jackson, Sullivan, & Hodge, 1993). Conversely, Whites who spoke nonstandard English were viewed more negatively than Blacks who did, representing negative expectancy violations (Jussim et al., 1987). Regardless of whether the final impression is positive or negative, expectancy violations cause arousal and distraction (Roese & Sherman, 2007). For instance, expectancy-violating partners were shown to evoke threat-like physiological responses (Le Poire & Burgoon, 1996; Mendes, Blascovich, Hunter, Lickel, & Jost, 2007). Expectancy violations also evoke more effortful cognitive processing than situations that match expectancies, as the former involve a discrepancy between new information and preexisting concepts (Bettencourt, Dill, Greathouse, & Charlton, 1997; Roese & Sherman, 2007).

Previous neuroscientific research used functional magnetic resonance imaging (fMRI) to explore which regions of the brain are related to expectancy violations in person perception.

Harris and Fiske (2010) gave participants information about warm or competent behavior and then showed pictures of people responsible for this behavior. The pictures were of social groups either incongruent (low on warmth or competence) or congruent (high on warmth or competence) with the behavior information. Both warmth and competence expectancy violations activated striatal regions of the brain, which represent evaluative and prediction error signals (Harris & Fiske, 2010).

While fMRI methods allow for the spatial localization of brain activity, ERPs provide measures of the exact timing of neural responses to a stimulus. Of relevance for the present study, a fronto-central positive deflection, the P2 (or Vertex Positive Potential [VPP], see Jeffreys, 1989) peaks approximately 150 to 200 ms after stimulus onset and has been shown to be more positive for other- relative to own-race faces (e.g., Ito & Bartholow, 2009; Wiese, 2012; Willadsen-Jensen & Ito, 2006). Neural responses to expectancy violation, however, have been observed particularly in the subsequent N2 and N400 ERP components.

The fronto-central N2 (approximately 200-350 ms post-stimulus) has been larger in conflict situations, such as inhibiting a frequent response on infrequent trials in a go/no-go task (Nieuwenhuis, Yeung, Van Den Wildenberg, & Ridderinkhof, 2003). In addition, N2 was larger during categorization of racial ingroup than outgroup targets (Willadsen-Jensen & Ito, 2006), which was interpreted as ingroup attentional bias. In line with both interpretations, the largest N2 amplitudes were reported for ingroup targets on trials with high conflict. For example, participants indicated whether a negative behavior could have been performed by a White (ingroup) or a Black (outgroup) person presented on a photograph (Dickter & Gyurovski, 2012). Most negative N2 amplitudes were observed in an incongruent condition where negative sentences were followed by White target faces. Dickter and Bartholow (2010) examined ethnic categorizations of a central Black or White target face presented together with either ethnically congruent or incongruent flanker faces. They found more negative N2 amplitudes in the incongruent condition, but only when White (ingroup) targets were presented along with incongruent Black flanker stimuli. Generally, more pronounced N2 amplitudes were interpreted as reflecting increased cognitive processing in these studies (Dickter & Gyurovski, 2012; Nieuwenhuis et al., 2003).

In addition, research on ERP correlates of incongruence during language comprehension (e.g., Kutas & Hillyard, 1980) has established an N400 effect (approximately 200-600 ms after stimulus onset) reflecting more negative amplitudes for incongruent items (Kutas & Federmeier, 2011), typically interpreted as reflecting more effortful processing. N400 can be similarly elicited by face stimuli. For instance, a more negative N400 is observed when a specific familiar face is presented subsequent to an unrelated (or incongruent) relative to an associated (or congruent) other person (see e.g., Wiese & Schweinberger, 2008, 2011). The N400 was also observed in a study of stereotype accessibility, where participants were presented with either African-American or European-American faces, followed by either stereotypically race-congruent or race-incongruent positive or negative adjectives (Hehman et al., 2013). The N400 was more negative for race-incongruent relative to congruent trials. As N400 was not affected by whether the stereotypes regarded Blacks or Whites, or were positive or negative, it seemed to reflect semantic rather than evaluative processes.

Taken together, ERP studies indicate more pronounced N2 and N400 components when expectancy-violating information is processed. Importantly, although information from different stimulus modalities can potentially violate expectancies, the abovementioned studies used mainly words and pictures of faces as stimuli. Surprisingly, in spite of the strong influence of nonstandard accents on person perception, the neural basis of expectancy violations based on accent information has not been studied.

The Present Research

The goal of the present research was to examine the combined effects of accents and appearance on the processing of expectancy-confirming and expectancy-violating targets. We conducted our study in Germany and we presented participants with typically German or typically Turkish faces that were paired with German- and Turkish-accented voices. The face-voice combinations were either congruent (German-German or Turkish-Turkish) or incongruent (German-Turkish or Turkish-German). As described above, the cognitive and neural processes of forming impressions of people whose appearance suggests a different ethnic group than their accent are not yet well understood. At the same time, this combination of stimulus modalities is arguably of particular relevance in everyday life interactions, and can be important for the perceiver's implicit and explicit impressions and reactions. Explicit and implicit responses may converge or differ (e.g., Dovidio, Kawakami, & Gaertner, 2002) because people may not be aware of their attitudes (generally or temporarily) or may want to show attitudes different from their real beliefs. Importantly, implicit attitudes can still influence behavior in a favoring or discriminatory way (Dovidio et al., 2002). In the present study, we used ERPs, and particularly the N2 and N400, to test whether target faces violated participants' expectations about the speakers. As these ERP components represent spontaneous and difficult to control neural responses, they presumably reflect implicit processes, which are largely independent of overt responses (Kayser et al., 1997).

Specifically, as the N2 component was larger in stereotypically incongruent conditions in previous research (Dickter & Bartholow, 2010, Dickter & Gyurovski, 2012), we hypothesized that participants' violated expectations of incongruent targets would be similarly reflected by a larger N2. Furthermore, as research has shown larger N2 amplitudes for ingroup rather than outgroup targets in high-conflict trials (Dickter & Gyurovski, 2012), the N2 effect in the present study was expected to be larger for German (ingroup) relative to Turkish target faces (outgroup). At the same time, other research did not find differences in N400 for ingroup and outgroup incongruent conditions: N400 was more negative for race-incongruent compared to congruent trials both for Blacks and for Whites (Hehman et al., 2013). Accordingly, no difference in the N400 effect was expected between Turkish faces matched with German voices and for German faces matched with Turkish voices.

Regarding explicit responses, we expected that participants would perceive incongruent targets as more expectancy violating than congruent targets. Because accent is a strong cue in person perception (Giles & Johnson, 1987; Hansen, 2013; Kinzler et al., 2009; Rakić et al., 2011), we predicted that it plays a more important role than appearance in the explicit evaluation of targets. Specifically, we expected that targets speaking standard German would be evaluated as more competent than those speaking with a Turkish accent. Based on expectancy-violation research (e.g., Jussim et al., 1987), incongruent targets should be judged more extremely than congruent targets in terms of their perceived competence. Consequently, we expected that German-accented Turkish-looking targets would be evaluated as more competent than congruent German targets (positively violated expectations), and Turkish-accented German-looking targets as worse than congruent Turkish targets (negative violation).

Method

Participants

Participants were 21 undergraduate students of the University of Jena, native speakers of German without immigration background. After excluding one participant with substantial artifacts in the EEG, the final sample consisted of 20 (7 men, 13 women, $M_{\text{age}} = 22.55$, $SD = 2.69$). All participants were right-handed according to the Edinburgh Handedness Inventory (Oldfield, 1971), reported no neurological or psychiatric disorders, and had normal or corrected-to-normal vision and hearing. They were compensated with €10 or partial course credit.

Stimuli

We used portrait photographs of faces from two image databases (Langner et al., 2010; Minear & Park, 2004) and added several of our own photographs of Turkish men. All targets were young men with a neutral facial expression, without glasses, and with a neutral modern haircut. Pictures were converted into black and white and cropped to a frame of 300×380 pixels, resulting in a visual angle of 6.7°×8.5° at a viewing distance of 90cm.

Naïve listeners have problems in recognizing accents and Germans often perceive people from Arabic countries as typically Turkish (Hansen, 2013). Therefore, short voice samples of young German, Turkish, and Arabic native speakers were recorded. All speakers said the same neutral everyday phrase, “Good morning. Nice to meet you”, ensuring that accented sentences were easy to understand and excluding any influence of content of the statement. Speakers were briefly trained, speech rate was held constant; voice samples were approximately three seconds long.

To ensure that stimuli were perceived as typical for their respective groups, all stimuli were pre-tested by asking (1) how typically German and (2) how typically Turkish targets appeared or sounded. Audio stimuli were also pre-tested for accent strength. Pre-test participants ($N = 57$) did not participate in the experiment, but were from the same population. A pre-test consisted of a block of faces and a block of voices. After each face or voice was presented in random order, participants answered typicality questions on 7-point scales (1 – *not at all* to 7 – *very much*).

From 85 pre-tested photographs of faces, we selected 30 German- and 30 Turkish-looking faces typical for their respective groups (Table 1). Similarly, from 104 pre-tested voices, we selected 30 typical voices for each accent (Table 1). German-accented voices were perceived to speak with almost no accent, $M = 1.66$, $SD = 0.45$, and Turkish-accented voices to speak with a moderately strong accent, $M = 4.64$, $SD = 0.55$, with a significant difference between the accents, $t = -21.42$, $p < .001$, as expected.

Design

The experiment had a 2 (ethnicity of the targets' face: Turkish vs. German) × 2 (congruence: face congruent vs. incongruent with accent) within-subject design. Participants evaluated 15 targets of each of four types (60 targets): German accent/German appearance (GG, congruent), Turkish accent/Turkish appearance (TT, congruent), Turkish accent/German appearance (TG, incongruent), and German accent/Turkish appearance (GT, incongruent). After a short break, the evaluation block was repeated with the same stimuli, but in a different randomized order (total: 120 trials). Stimulus pairings were counterbalanced: any given voice (e.g., speaking standard German) was matched with a congruent picture (German-looking person) for half of the participants and with an incongruent picture (Turkish-looking person) for the other half.

Procedure

After being welcomed by a "blind" experimenter, participants signed informed consent, EEG electrodes were placed, and participants were seated in front of a computer screen in an electrically shielded, sound-attenuated cabin with their heads in a chin rest. Before the main experiment, participants were trained to use the answer keys for a 6-point scale that was used in the experiment (1-2-3: left hand; 4-5-6: right hand). Then, participants were asked to imagine they were helping in a recruitment process at their workplace and they spoke with job candidates on the phone. For each target, participants were instructed to listen to the voice (via loudspeakers) and form an impression of the person. During this practice block, participants evaluated 30 voices speaking standard German and 30 voices speaking German with a Turkish accent. In the second, main block, participants were asked to imagine that the candidates came to the interview and now they could be both heard and seen. Participants were instructed to listen to the same voices again, but half a second after hearing an already familiar voice, a photograph of a face was shown for three seconds (Figure 1). Then, participants evaluated the target on a competence scale, which used the items competent, competitive, and independent, each on a separate screen ($\alpha = .94$, 1 = *not at all* to 6 = *very much*, e.g., Asbrock, 2010; Fiske, Cuddy, Glick, & Xu, 2002). This block was repeated after a short break. Afterwards, participants were shown one target of each type and were asked to answer three questions ($\alpha_{GG} = .88$, $\alpha_{TT} = .86$, $\alpha_{GT} = .41$, $\alpha_{TG} = .70$) about whether this target confirmed their expectations (e.g., *Did the person confirm the expectations you had about him at the beginning*?, 1 = *strongly disagree* to 6 = *strongly agree*). Items were averaged to measure explicit expectancy violations. At the end, participants answered demographic questions, were thanked, and given their reward.

ERP Recording and Analysis

EEG was recorded using a 64-channel BioSemi Active II system (BioSemi, Amsterdam, Netherlands). Active sintered Ag/AgCl-electrodes were mounted in an elastic cap, and EEG was recorded continuously with a 512 Hz sampling rate from DC to 155 Hz. BioSemi systems work with a “zero-ref” setup with ground and reference electrodes replaced by a CMS/DRL circuit (cf. http://www.biosemi.com/faq/cms&drl.htm). Blink artifacts were corrected using the algorithm implemented in BESA 5.3 (MEGIS Software GmbH, Graefelfing, Germany). EEG was segmented relative to target onset from -200 to 1000 ms, with a 200 ms baseline. Trials contaminated by non-ocular artifacts and saccades were rejected using an amplitude threshold of 100 μV and a gradient criterion of 75 μV. Remaining trials were re-calculated to average reference, averaged relative to face onset separately for Turkish and German target faces in the congruent and incongruent conditions, respectively, and digitally low-pass filtered at 40 Hz (12 db/oct, zero phase shift).

ERPs were analyzed in a five by five electrode grid covering frontal to parietal scalp positions, including two left (F3, FC3, C3, CP3, P3; F1, FC1, C1, CP1, P1), the midline (Fz, FCz, Cz, CPz, Pz), and two right-hemispheric lines of electrodes (F2, FC2, C2, CP2, P2; F4, FC4, C4, CP4, P4). Mean amplitudes were calculated for P2/VPP (120 – 180 ms), N2 (210 – 280 ms) (see Dickter & Gyurovski, 2012), and N400 (300 – 600 ms) (see e.g., Wiese & Schweinberger, 2008). Mean amplitude measures were statistically compared using repeated-measures analyses of variance (ANOVA). When appropriate, degrees of freedom were corrected according to the Greenhouse-Geisser procedure.

Results

ERP Results

We report only main effects and interactions involving the experimental factors of target facial ethnicity and congruence, as general topographical effects of the ERP components are not of primary interest here. We computed a repeated-measures ANOVA on P2 amplitude (120 – 180 ms) with the factors laterality (5 levels; left-most to right-most sites), site (5 levels; frontal to parietal sites), ethnicity of the targets' face (Turkish, German), and congruence (face congruent vs. incongruent with accent). This analysis revealed a main effect of target facial ethnicity, $F(1,19) = 4.49$, $p = .048$, $\eta^2_p = .19$, as well as an interaction of site × facial ethnicity, $F(1.36, 25.79) = 5.06$, $p = .02$, $\eta^2_p = .21$ (other Fs < 1). This effect reflected more positive amplitudes for Turkish target faces, particularly at anterior and central sites (Figure 1), replicating earlier findings of more positive amplitudes for ethnic outgroup faces.

Analysis of the subsequent N2 time window (210 – 280 ms) yielded a significant main effect of facial ethnicity, $F(1,19) = 9.05$, $p = .007$, $\eta^2_p = .32$, with more negative amplitudes for

German faces, consistent with previous findings (Willadsen-Jensen & Ito, 2006). Importantly, an additional interaction of laterality × congruence × facial ethnicity was detected, $F(1.72, 32.57) = 3.83$, $p = .04$, $\eta^2_p = .17$. Post-hoc analyses revealed significant effects of congruence, with relatively more negative-going amplitudes in the incongruent relative to the congruent condition (Figure 1), at left electrode sites (F3, FC3, C3, CP3, P3) for Turkish, $F(1,19) = 7.64$, $p = .012$, $\eta^2_p = .29$, but not for German faces, $F < 1$. At right sites (F4, FC4, C4, CP4, P4), a corresponding congruence effect was observed for German, $F(1,19) = 7.96$, $p = .01$, $\eta^2_p = .30$, but not for Turkish faces, $F < 1$ (other *F*s < 1). These results suggest a difference in the topographical distribution of congruence effects depending on target facial ethnicity.

Finally, an ANOVA in the N400 time window (300 – 600 ms) revealed a significant main effect of facial ethnicity, $F(1,19) = 14.96$, $p < .001$, $\eta^2_p = .44$, with more negative amplitudes for German faces, as well as a significant interaction of site × laterality × congruence, $F(2.25, 42.70) = 2.21$, $p = .04$, $\eta^2_p = .10$. Post-hoc tests showed effects of congruence with more negative-going amplitudes for faces incongruent with accents (than faces congruent with accents) at electrodes C3, CP1, and FC4 (see Table 2).

Ratings of Violated Expectations

A 2 (ethnicity of the targets' face: Turkish vs. German) × 2 (congruence: face congruent vs. incongruent with accent) repeated measures ANOVA tested whether participants also reported expectancy violations explicitly. Indeed, incongruent targets were perceived as violating participants' expectations more ($M = 4.48$, $SD = 0.66$) than congruent targets ($M = 2.93$, $SD = 1.13$), $F(1,19) = 19.17$, $p < .001$, $\eta_p^2 = .50$ (Figure 3). The effect of facial ethnicity was not significant ($F < 1$), but the interaction of facial ethnicity and congruence was, $F(1,19) = 11.34$, $p = .003$, $\eta_p^2 = .37$. The incongruent Turkish-looking German-accented target violated participants' expectations more than the congruent Turkish-Turkish target, $F(1,19) = 67.49$, $p < .001$, $\eta_p^2 =$

.78, but the difference for German-looking targets was not significant, $F(1,19) = 1.06$, $p = .32$, $\eta_p^2 = .05$.

Competence Impressions

A corresponding ANOVA for competence evaluations showed that neither facial ethnicity [main effect, $F(1,19) = 2.55$, $p = .13$, $\eta_p^2 = .12$] nor congruence influenced evaluations [main effect $F(1,19) = 2.04$, $p = .17$, $\eta_p^2 = .10$]. However, an interaction of facial ethnicity and congruence, $F(1,19) = 35{,}07$, $p < .001$, $\eta_p^2 = .65$, showed that German-German targets were evaluated as more competent than Turkish-Turkish targets, $F(1,19) = 14{,}90$, $p = .001$, $\eta_p^2 = .44$, and than Turkish-accented German-looking targets, $F(1,19) = 18{,}69$, $p < .001$, $\eta_p^2 = .50$ (Figure 4). German-accented Turkish-looking targets were evaluated as more competent than Turkish-accented German-looking targets, $F(1,19) = 39{,}54$, $p < .001$, $\eta_p^2 = .68$, and than Turkish-Turkish targets, $F(1,19) = 40{,}66$, $p < .001$, $\eta_p^2 = .68$. Thus, German-accented targets were always evaluated better, supporting the hypothesis of the strong role of accent in determining impressions. Furthermore, German-accented Turkish-looking targets were evaluated best, in line with the hypothesis of positively violated expectations. However, Turkish-accented German-looking targets were evaluated similarly to Turkish-Turkish targets.

Discussion

When people encounter others, they often both see and hear them, and their appearance, speech, as well as the combination of these two sources of information can influence people's reactions. In the present study, fictitious job candidates were heard in short voice recordings and then seen in photographs. They spoke German with a standard accent or with a Turkish accent and looked Turkish or German. Our results thus extend previous research on the neural correlates of impression formation to an ecologically more valid setting. For both German and Turkish target faces, ERPs in the N2 time range were more negative in the incongruent relative to the congruent condition. We suggest that incongruence of vocal and facial ethnicity violated participants' expectations, and that the N2 congruence effect reflects a neural correlate of this phenomenon. Interestingly, N2 congruence effects for Turkish- versus German-looking targets were lateralized to the left and right hemispheres, respectively. At the same time, explicit ratings revealed increased perceived competence for incongruent versus congruent Turkish-looking faces.

Both the observed polarity and timing of the N2 congruence effect is similar to previous results. The N2 time window (210 – 280 ms) was chosen after Dickter and Gyurovski (2012). In their study, White (ingroup) target faces in an incongruent condition (following stereotypically Black sentences) elicited more negative amplitudes than the same targets in a congruent condition (following stereotypically White sentences). As N2 was only tested at Fz, no information about the scalp distribution of the effect is available. Similarly, Dickter and Bartholow (2010) examined ethnic categorizations of a central Black or White target face presented together with either ethnically congruent or incongruent flanker faces. They found more negative N2 amplitudes at frontal electrodes (F3, Fz, F4) between 220 and 350 ms in the incongruent condition when White (ingroup) targets were presented. No differential effects over left- versus right-hemispheric electrodes were observed, but the small number of electrodes and the limited coverage of the scalp in their analysis may restrict conclusions about hemispheric lateralization of N2 congruence effects. Overall, having established the general similarity of the N2 effects with previous findings, we interpret the more pronounced N2 amplitudes for incongruent than congruent targets in the present study as reflecting more effortful cognitive processing due to violated expectations, in line with previous research (Bettencourt et al., 1997; Dickter & Gyurovski, 2012; Nieuwenhuis et al., 2003). At potential variance with some of the studies discussed above, we observed N2 congruence effects for both in- and out-group faces.

A novel finding of our study is the clearly different scalp distribution of congruence effects for Turkish- and German-looking targets. German-accented Turkish-looking targets evoked more effortful processing over the left, whereas Turkish-accented German-looking targets elicited more effortful processing over the right hemisphere. Thus, our results demonstrate that congruence facilitated the processing of both Turkish and German target faces, but the underlying neural generators seem to differ, reflecting a different location and/or orientation of the respective equivalent current dipoles (see e.g., A. F. Jackson & Bolger, 2014).

Interestingly, Kayser et al. (1997) presented pictures of patients with dermatological diseases before (negative condition) or several years after surgical treatments (neutral condition). The authors observed augmented N2 amplitudes for negative stimuli over the right hemisphere. Moreover, studies on neural correlates of emotion recognition show a pattern similar to ours (Balconi & Pozzoli, 2012, Experiment 2; Davidson & Fox, 1982). In such studies, adults (Balconi & Pozzoli, 2012) or children (Davidson & Fox, 1982) view neutral or emotional facial stimuli (e.g., expressing anger or happiness). Results show an increased left-sided response for positive emotions and an increased right-sided response for negative emotions. These findings are in line with models of functional cerebral asymmetries in emotion processing, suggesting a stronger involvement of the left hemisphere in positive emotions, whereas the right hemisphere is more closely related to negative emotions, particularly to fear, anger, and sadness (Demaree, Everhart, Youngstrom, & Harrison, 2005; Najt, Bayer, & Hausmann, 2013).

Previous research has shown that expectancy violating people cause emotional arousal (e.g., Mendes et al., 2007). In the current study German-accented Turkish-looking targets were evaluated as particularly competent. Taken together, the different scalp distribution of our N2 congruence effect could be emotion-driven: expectancy violations triggered by German-accented Turkish-looking targets may have evoked positive, whereas Turkish-accented German-looking targets evoked negative emotions. We note, however, that this interpretation is tentative at present, and future studies should more directly test the role of emotional processing on the lateralization of N2 congruence effects.

Subsequent to the N2, evidence for congruence effects was also observed in the N400 time window in a three-way interaction with electrode site and laterality. However, the particular topographic pattern observed in post-hoc tests was only weak and unexpected, and therefore needs replication before it can be interpreted. Moreover, congruence effects were not different for in- versus out-group targets. As a semantic mismatch between voice and face information was probably observed for both in- and out-group targets, this finding is generally in line with studies suggesting that the N400 reflects semantic rather than evaluative processing (Hehman et al., 2013). Similarly, Proverbio and Riva (2009) observed an N400 effect for pictorial material that violated or matched semantic expectations, and N400 effects of semantic relatedness were also observed in face recognition (Wiese & Schweinberger, 2011). Furthermore, previous studies on stereotype accessibility interpreted similar effects as reflecting an N400 component (Hehman et al., 2013). Interestingly, some researchers suggest that the N2 and N400 could be interrelated or even reflect the same underlying mechanism (White et al., 2009). Although the time windows for the two effects are clearly overlapping across previous studies, the present results of a differential scalp distribution for in- versus out-group congruence effects in the N2 but not in the N400 suggest that the underlying processes at least partly differ.

We also observed a P2/VPP effect that showed more positive amplitudes for Turkish target faces, particularly at anterior and central sites. This replicates earlier research showing more positive amplitudes for ethnic outgroup faces using Black versus White faces (Ito & Bartholow, 2009) or Asian versus White faces (Wiese, 2012). Such effects are reminiscent of findings of more negative amplitudes for other-race faces in the face-sensitive N170 component (e.g., Caharel et al., 2011; Walker, Silvert, Hewstone, & Nobre, 2008; Wiese, Kaufmann, & Schweinberger, 2014), reflecting a negative peak at occipito-temporal channels at approximately 170 ms. It has been shown that the P2/VPP and N170 reflect polarity-reversed deflections of the same underlying neural processes, measured at different positions of the scalp (Joyce & Rossion, 2005). Accordingly, ethnicity effects in P2/VPP and N170 presumably represent the same perceptual mechanism (see Wiese, 2012). We showed a P2/VPP ethnicity effect for two Caucasian groups, which shows that relatively minor ethnicity-related facial differences may elicit this effect, while categorization of faces into age- or gender-based ingroups versus outgroups are not paralleled by corresponding N170 effects (see Wiese, Schweinberger, & Hansen, 2008; Wolff, Kemter, Schweinberger, & Wiese, 2014).

Mirroring the EEG results, participants stated that incongruent targets violated their expectations. We also observed the predicted effect of accent on evaluations: Regardless of their appearance, German-accented job candidates were evaluated as more competent than Turkish-accented job candidates, which contributes to the body of research on ELIT indicating that language and accent are important social markers. However, the incongruence effects in the ERP results were not fully reflected in differentiated competence evaluations. Expectancy violation theory states that surprising events and people are evaluated more extremely than expected ones (Burgoon, 2009; Roese & Sherman, 2007). Here, the German-accented Turkish-looking targets were evaluated in a more extreme way – they were viewed as most competent, showing the effect of positively violated expectations. However, the Turkish-accented German-looking targets were not viewed as least competent. This could reflect a reinterpretation of the accent and the person as a foreigner from some other country (see also the smaller violation of expectations in Figure 3), a process that would presumably occur subsequent to the relatively early and implicit N2 effect.

In conclusion, previous research and theory have suggested that when people meet a counter-stereotypical person, the discrepancy leads to re-categorization and re-interpretation of this person (e.g., Fiske & Neuberg, 1990; Kunda & Thagard, 1996). Our ERP results suggest that expectancy-violating people indeed provoke more cognitive processing (Dickter & Gyurovski, 2012; Nieuwenhuis et al., 2003). Regarding the observed differential lateralization of ERP congruence effects, it should be studied how people change their emotional and cognitive state when encountering incongruent people, and what consequences this has. As Crisp and Turner (2011, p. 1) wrote, "when social and cultural diversity is experienced in a way that challenges stereotypical expectations (…) the experience has cognitive consequences that resonate across multiple domains." The present research, by stressing the importance of accents and expectancy violations in impression formation, can be a starting point to explore these timely issues.

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Table 1

Ratings of Ethnic Typicality of Photographs of Faces and Recordings of Voices Used in the Experiment

	German stimuli				Turkish stimuli			
	$M(SD)_{\text{typicalG}}$	$M(SD)_{\text{typicalT}}$	t	p	$M(SD)_{\text{typicalG}}$	$M(SD)_{\text{typicalT}}$	t	p
Faces	5.42 (1.09)	1.34 (0.46)	26.07	<.001	1.92 (0.82)	5.47 (1.07)	-14.66	<.001
Voices	5.47 (1.07)	1.44 (0.60)	22.84	<.001	1.93 (0.86)	3.70 (1.35)	-8.11	<.001

Note. $N = 57$. Presented t-tests examine differences between numbers in the rows, e.g., whether German faces were more typically German than typically Turkish.

Table 2

Results of the Post-Hoc Tests Comparing ERPs to the Congruent and Incongruent Targets in the N400 Time Range (300 – 600 ms)

	3			1			z			2			4		
	F	p	η^2_p	F	p	η^2_p	F	p	η^2_p	F	p	η^2_p	F	p	η^2_p
F	1.80	.20	.09	0.08	.79	<.01	0.52	.48	.03	2.06	.17	.10	3.65	.07	.16
FC	0.79	.39	.04	0.35	.56	.02	0.64	.43	.03	1.80	.20	.09	6.73	.02*	.26
C	7.72	.01*	.29	0.22	.64	.01	0.02	.88	<.01	1.03	.32	.05	0.32	.58	.02
CP	1.44	.25	.07	4.70	.04*	.20	0.46	.50	.02	1.05	.32	.05	1.14	.30	.06
P	1.57	.23	.08	1.19	.29	.06	0.37	.55	.02	2.31	.15	.11	0.03	.87	<.01

Note. * $p < .05$. F = frontal, FC = fonto-central, C = central, CP = centro-parietal, P = parietal, 3 = left, 1 = middle-left, z = midline, 2 = middle-right, 4 = right. Please note that alpha levels are not adjusted for multiple comparisons.

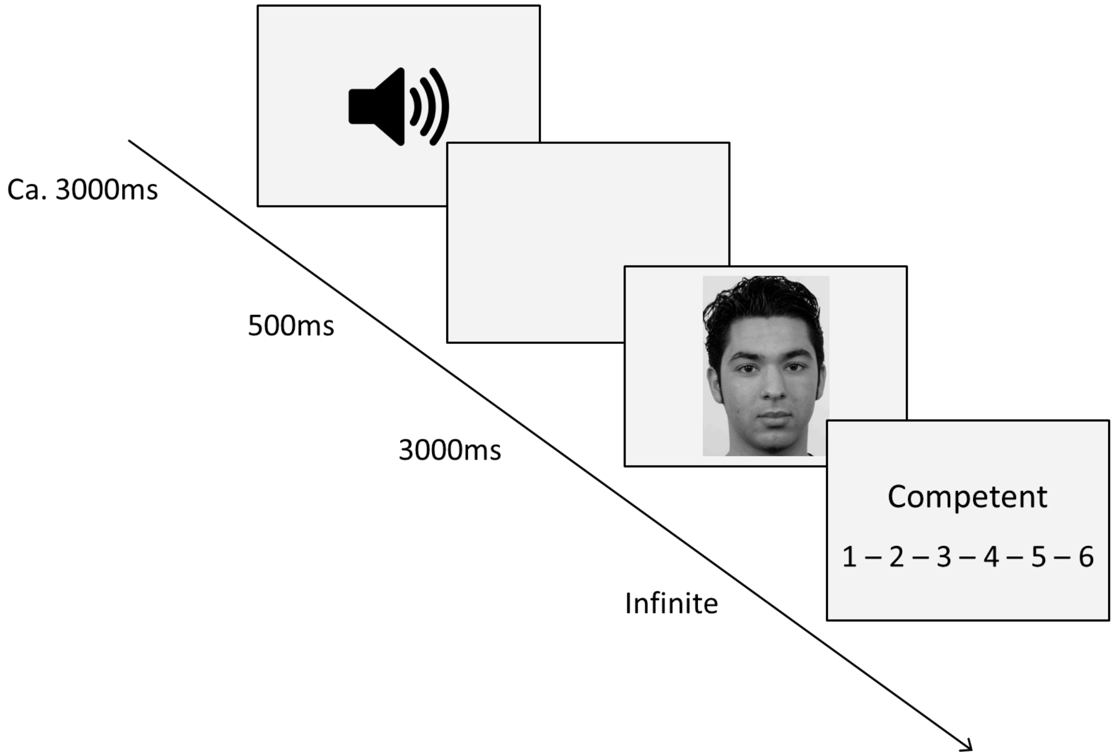

Figure 1. Schematic illustration of the trial structure in the main block of the present study.

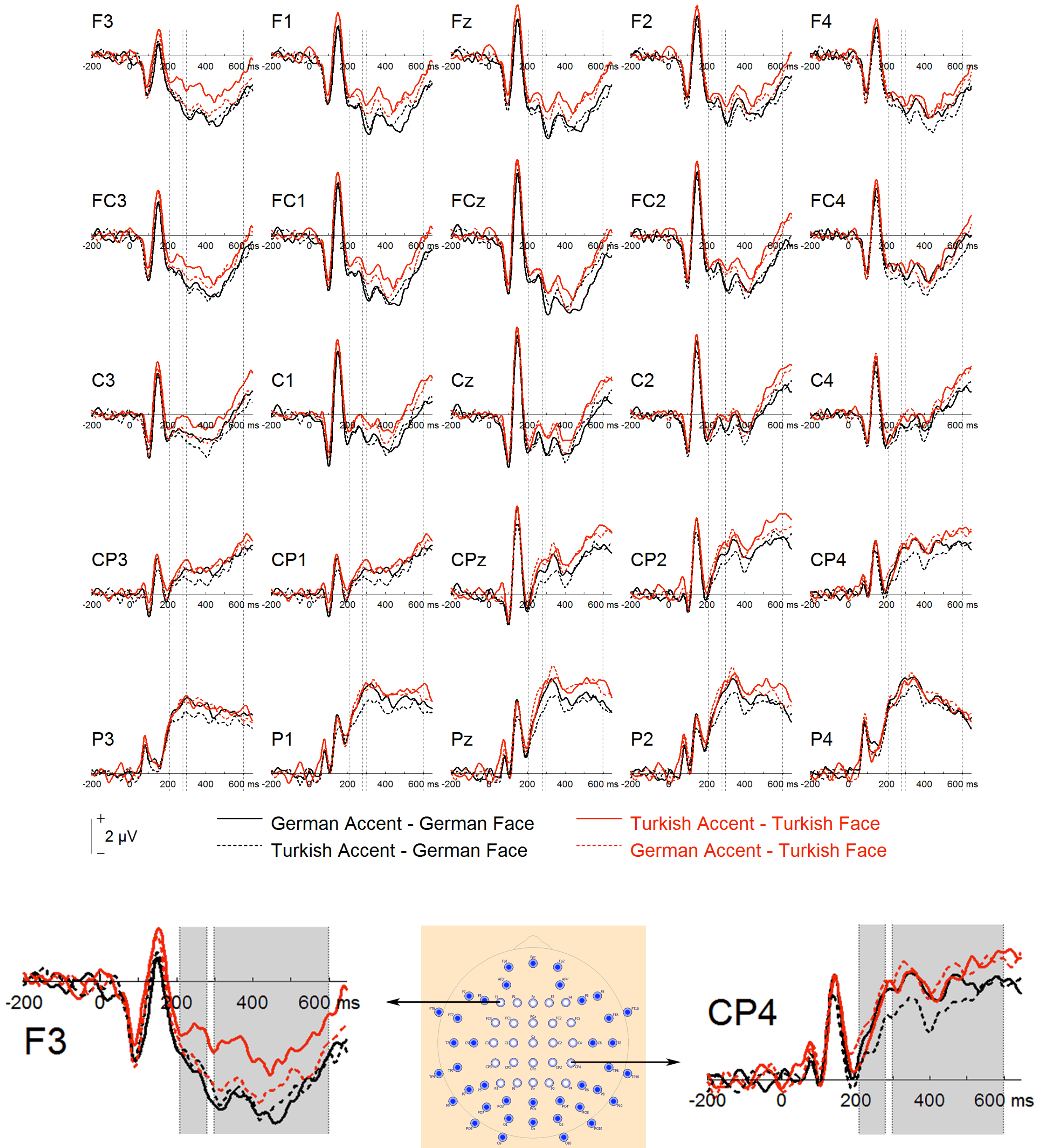

Figure 2. Grand mean event-related potentials at frontal, fronto-central, central, centro-parietal, and parietal left, midline, and right electrode sites. More negative amplitudes are in the incongruent condition (dashed lines) for N2 between 210 and 280 ms for Turkish faces over left and for German faces over the right hemisphere.

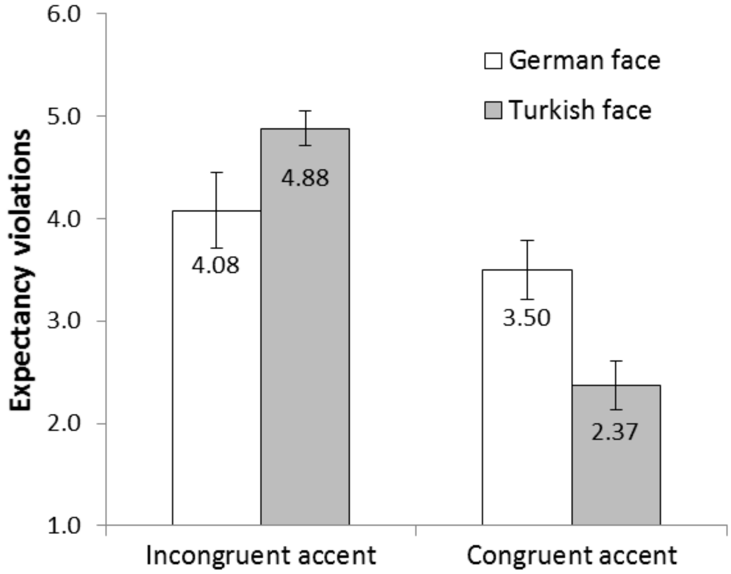

Figure 3. Reported degree of expectancy violations evoked by the targets. Error bars represent standard errors of the mean.

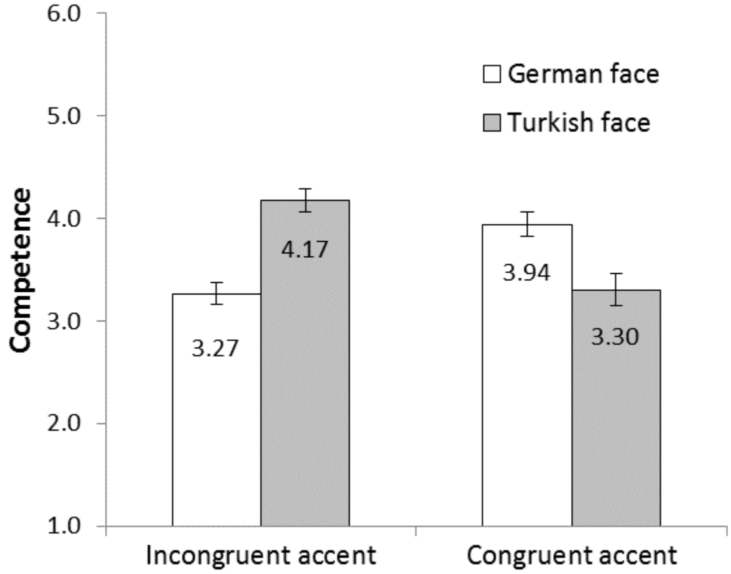

Figure 4. Mean competence evaluations by target type. Error bars represent standard errors of the mean.