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Dominance and competence face to face: Dissociations obtained with a reverse correlation approach

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Transparency Statement
All the data, scripts of the analyses, and supporting information are publicly available online in the Open Science Framework and can be accessed via the URL: https://doi.org/10.17605/osf.io/hr5pd.

Abstract

The article explores whether the traits representing the dimensions underlying the structure of facial and non-facial impressions are similarly mapped in the face space. Two studies examine whether the trustworthiness-by-dominance and the warmth-by-competence two-dimensional models overlap in face perception. In Study 1 (N = 200), we used a reverse-correlation task to obtain classification images (CIs) reflecting how each dimension is mapped onto a face. Results show that the similarity between CIs was higher between warmth and trustworthiness than between competence and dominance. In Study 2 (N = 31) the evaluations of each CI on each social dimension show a higher dissociation between dominance and competence than between trustworthiness and warmth. These results, obtained at both perceptual and judgment levels, suggest that there is only a partial correspondence between the two models that seems to be driven by the relationship that the competence and dominance dimensions establish with valence.

Keywords: competence, dominance, face perception, person perception, reverse correlation

Despite the abundance of traits that we are able to infer from a person's face, two trait dimensions were found to be central in face-driven impressions of personality: trustworthiness and dominance (Oosterhof & Todorov, 2008; Sutherland et al., 2013). Trustworthiness judgments capture facial features associated with the perceived intentions of a person; whereas dominance judgments capture facial features associated the target's ability to implement benevolent or malevolent intentions toward the perceiver (e.g., cues to physical strength; Oosterhof & Todorov, 2008; Toscano, Schubert, & Sell, 2014). When combined, these dimensions inform approach–avoidance decisions regarding social interactions (Krumhuber et al., 2007; Todorov, Baron, & Oosterhof, 2008).

Interestingly, the *trustworthiness-by-dominance* model strongly resembles other two-dimensional models of social perception such as the classical *social-by-intellectual* model of person perception (Rosenberg, Nelson, & Vivekananthan, 1968), or the more recent *warmth-by-competence* model of stereotype content (akin to Rosenberg's person perception model; see Cuddy, Fiske, & Glick, 2008; Fiske, Cuddy, & Glick, 2007; Fiske, Cuddy, Glick, & Xu, 2002). Warmth (cf. Rosenberg et al.'s social dimension) is a dimension that encapsulates traits relevant for social functioning (Fiske et al., 2007). In turn, the competence dimension (cf. Rosenberg et al.'s intellectual dimension) encompasses ability-related traits. From a functional perspective, these two dimensions are thought to reflect a primary concern of the social perceiver to gather information about someone's intentions (warmth) and their ability to enact them (competence). Identically to the trustworthiness and dominance dimensions, warmth and competence are thought to inform approach–avoidance behavioral decisions (Fiske et al., 2007). This

Correction added on 23 February 2019, after first online publication: the affiliation for Leonel Garcia-Marques has been updated in this version of the article.

view suggests an overlap in the functional meaning attributed to personality inferences derived from facial and non-facial social information (i.e., conceptual knowledge about traits). But are the dimensions of both models represented equally in terms of physical facial appearance in the minds of perceivers?

The current article aims to go beyond the apparent functional overlap of the two impression formation models and address how these models overlap in terms of facial content. Specifically, our aim was to assess the facial content expected by perceivers to be associated with warmth and competence and then compare it with the expected facial content of the trustworthiness and dominance dimensions. We have done this by testing how the facial content of these four dimensions objectively (physical similarity between face images) and subjectively (trait judgments of faces) overlaps. While doing so, we further explored how valence may be playing an important role in shaping the relationship between the trustworthiness-by-dominance and the warmth-by-competence models, based on previous literature suggesting evaluative distinctions between dominance and competence.

Warmth and Trustworthiness Versus Competence and Dominance

Although the warmth dimension was initially viewed as unidimensional (Fiske et al., 2007; Rosenberg et al., 1968), there is growing evidence in person perception suggesting that sociability- and morality-related traits are conceptually distinguished and differently weighted by perceivers (Brambilla & Leach, 2014; Brambilla, Rusconi, Sacchi, & Cherubini, 2011; Goodwin, Piazza, & Rozin, 2014; Leach, Ellemers, & Barreto, 2007). As a result, some authors recently proposed a branching of the warmth dimension into two facets: morality and warmth/sociability (Abele et al., 2016; Fiske, 2018). This becomes relevant to our research aims when coupled with previous studies showing that whereas trustworthiness is perceived as a morality-related trait, warmth is perceived as a sociability-related trait (Brambilla et al., 2011, Study 1). A more nuanced distinction between warmth and trustworthiness may, however, not easily emerge in face-driven impressions. The shorter time window associated with spontaneous inferences from faces (Willis & Todorov, 2006), or the information that physical features of faces are able to convey, may not allow for more fine-grained impressions. Previous studies have shown that both face judgments of trustworthiness (morality-related) and of sociability (warmth-related) share valence as their latent construct (see table S3 in Oosterhof & Todorov, 2008). In addition, Walker and Vetter (2016) found a positive correlation between trustworthiness and *communion* (a dimension considered to be akin to Fiske and colleagues' warmth dimension; Abele & Wojciszke, 2014) in face judgments. Thus, with regard to face-driven impressions, we did not expect warmth to be easily discriminated from trustworthiness.

A distinction between dominance and competence may, however, be more likely. There is a body of research suggesting that dominance and competence are distinguishable not only at a conceptual level, but also at an evaluative level. At the conceptual level, it was recently proposed that competence, along with assertiveness, can be regarded as two distinct facets of a superordinate dimension called *agency* (i.e., a dimension encapsulating traits related with goal-achievement and task-functioning, akin to Fiske and colleagues' competence dimension; Abele et al., 2016; Abele & Wojciszke, 2014; Carrier, Louvet, Chauvin, & Rohmer, 2014). This branching is consistent with research showing that dominance and competence are associated with distinct perceptions of status (Carrier et al., 2014; Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Henrich & Gil-White, 2001). Traits implying an underlying motivation for self-promotion (e.g., assertiveness, dominance) are better predictors of perceived status than traits purely related with task-functioning ability (e.g., intelligence, competence; Carrier et al., 2014). The distinction is also apparent in work showing that socioeconomic success is related to dominance, but not competence (Koch, Imhoff, Dotsch, Unkelbach, & Alves, 2016). In personality impressions, Rosenberg and Sedlak (1972a, p. 264) have shown that these dimensions are not entirely redundant in the underlying structure of unrestricted person descriptions. At the evaluative level, attaining status via dominance implies more negative behaviors (e.g., coercion, threat) than those associated with the competence route (i.e., prestige) (Henrich & Gil-White, 2001). Moreover, bodily expressions of pride perceived as dominant were found to be less likeable compared to bodily expressions perceived as competent (Lange & Crusius, 2015). In face evaluation, facial dominance has been found to resemble more negative emotional expressions than facial competence (Said, Sebe, & Todorov, 2009). This is in line with evidence showing that facial dominance is perceived as threatening (Chen, Jing, & Lee, 2014; Said et al., 2009; Todorov, Said, Engell, & Oosterhof, 2008). Preliminary evidence in the work of Oosterhof and Todorov (2008; see Table S3) also shows that face judgments of intelligence load higher in the valence/trustworthiness component than in the dominance/power component. Moreover, Todorov, Said, et al. (2008) reported that faces representing one diagonal dimension of the trustworthiness-by-dominance face space tracked judgments of likeability, extraversion, and competence, thus suggesting that facial competence and valence-related dimensions such as likeability are positively related. Altogether this body of research suggests that (i) dominance and competence should be easily distinguished in terms of facial content and (ii) should lead to judgments of opposite valence (i.e., competent faces judged as more positive in general than dominant faces).

Overall, these arguments lead us to hypothesize a higher overlap between the diagnostic facial content of warmth and trustworthiness, and a lower overlap between the diagnostic facial content of competence and dominance. Preliminary information about these hypotheses has been provided by previous studies (Sutherland, Oldmeadow, & Young, 2016; Todorov, Said, et al., 2008). In Sutherland et al. (2016) participants were asked to rate a set of 1,000 highly varied face photographs on warmth, competence, trustworthiness and dominance. These authors found that although there was a positive correlation between warmth and trustworthiness ratings and between dominance and competence ratings, the correlation was significantly lower between dominance and competence. The current article aimed to conceptually replicate and extend Sutherland et al.'s (2016) work, by assessing how participants map traits onto a face based on their prior expectations about how conceptual trait information is associated with facial content. To do this we used a reverse correlation (RC) approach.

Reverse Correlation Methodology

Reverse correlation methods have proven their usefulness in social perception research as a data-driven tool to probe a perceiver's *a priori* expectations (or internal representations) about their social world (for a review see Brinkman, Todorov, & Dotsch, 2017; Jack & Schyns, 2017). These methods allow the identification of face configurations that are diagnostic of specific social judgments. In essence, the methodology requires the perceiver to report the extent to which the features of a target stimulus (e.g., face) match with the content of her internal representation of the target concept (e.g., competence). During this process, the internal representation activated by the target concept serves as the reference to which the incoming stimuli are compared. As a result, this method and its output are highly sensitive to the content of the representation. In a typical RC task, participants select from a pair of face images (that convey a great number of random variations of a base face stimulus) the one that elicits a particular trait. This allows researchers to obtain a classification image (CI): an image that isolates the relevant stimulus features that predict the target trait (e.g., face image whose features predict a "dominant" judgment).

One advantage of RC over traditional methods of identifying diagnostic facial features of traits based on ratings of photographs is the possibility to directly perform analyses with the output pixel data of CIs. By comparing the resulting CIs researchers can obtain an objective measure of the degree of overlap between the visual content of trait representations, and analyze inter-CI agreement based on pixel information (Dotsch & Todorov, 2012). Additionally, subsequent trait ratings of the CIs inform about the trait signal contained in the face, and how much independent judges agree on the face features that elicit a given trait dimension. Previous studies already tapped into the visual facial content of both the trustworthiness and dominance dimensions (Dotsch & Todorov, 2012), and the warmth and competence dimensions (Imhoff, Woelki, Hanke, & Dotsch, 2013) showing that the CIs successfully elicited their intended traits. However, these studies' CIs used different base faces, thus preventing their comparison. In the present article we generated CIs for all four dimensions using the same base face, to be able to investigate their overlap.

The Present Research

Our aim was to reveal whether perceivers associate similar facial content with trait dimensions sharing the same functional interpretation (i.e., trustworthiness and warmth, and dominance and competence), considering that similar facial patterns are known to elicit similar judgments (Secord & Bevan, 1956). In terms of facial content, we expected to find a higher overlap between the trustworthiness and warmth dimensions, and a lower overlap between the dominance and competence dimensions, due not only to conceptual differences, but also to the different relationships established between these dimensions and valence.

In our approach, we selected the warmth and competence model on the basis of (i) the similarity of its labels with those of the seminal social and intellectual model of person perception (Fiske et al., 2007), (ii) previous findings suggesting that friendly (warmth-related) and intelligent (competence-related) are highly frequent traits in spontaneous person descriptions (Rosenberg & Sedlak, 1972b), and (iii) the functional interpretation shared with the trustworthiness-by-dominance model. In Study 1 we used a RC paradigm to generate CIs representing our four target dimensions and addressed their objective similarity (via pixel correlations) to examine the degree of overlap in facial content between their corresponding trait poles (e.g., dominant vs. competent). In Study 2, we asked independent raters to judge all the CIs in traits previously identified as relevant in the person perception and face evaluation domains in order to validate the CIs, analyze the structure underlying these judgments, and examine their relationship with valence.

Data Availability and Supporting Information

All the data, scripts of the analyses, and supporting information are publicly available online in the Open Science Framework and can be accessed via the URL: https://doi.org/10.17605/osf.io/hr5pd.

Study 1

Participants and Design

For the sake of clarity, we divided this study into two moments, each represented by a sample. This division

results from a decision to collect additional data for the competence dimension. This was done with the purpose of clarifying whether the trait-adjective words we first used to represent competence (see Target Traits section for more details) were adequately capturing the intended construct (see Results section).

Sample 1a was composed by 160 university students and employees (135 females; M_{age} = 21.7 years, SD_{age} = 5.90), who participated either in exchange for course credits or to earn a chance to win a lottery, in a between-participants design defined by 4 (trait dimension: trustworthiness vs. warmth vs. dominance vs. competence) × 2 (dimension pole: high vs. low).

Sample 1b was composed by 40 university students (39 female; M_{age} = 20.1 years, SD_{age} = 5.08) who were allocated to either the *Competent* or *Incompetent* trait condition.

Following the recommendations of previous RC studies (Dotsch & Todorov, 2012), twenty participants participated in each condition, and each participant provided 300 decisions (i.e., trials). Although this is not recommended to analyze CIs at an individual level (see Brinkman et al., 2018), our focus was on the so-called group-level CIs—henceforth simply referred to as CIs (for CIs analyses at the individual level, please see sample size requirements presented in Brinkman et al., 2018). We followed a common approach in RC studies and analyzed data at the group-level (Dotsch & Todorov, 2012; Imhoff, Dotsch, Bianchi, Banse, & Wigboldus, 2011). Thus, we ignored dispersion at the level of individual image creators, and assumed that the averaged data retain the "true" signal (i.e., facial features that are highly predictive of judgment). Consequently, our interpretations are made at the group level, and are derived only from the visual content of trait representations. This visual content is common across perceivers and evades the idiosyncratic content of a single perceiver's representation. However, as we discuss in the Results section, we rely on the error component of the averaged data as a measurement of participants' agreement regarding the content of each CI.

Face Stimuli

The face stimuli used as targets on the main task were generated with the R package rcicr version 0.3.0 (Dotsch, 2015). Each stimulus consisted of a base-face image on which random visual noise was superimposed. The noise generation procedure was identical to the one reported in Dotsch and Todorov (2012). Further details can be found in the Supporting Information. The base image was the grayscale average male face (Karolinska Face Database; Lundqvist, Flykt, & Ohman, 1998), resized to 256 × 256 pixels (Dotsch & Todorov, 2012). By repeatedly applying these visual noise patches to the same base-face image (e.g., each iteration yields a face image with superimposed noise), we essentially created many different versions of the same face, as a result of the distortions introduced by the noise in random locations of the face stimulus. The randomness of the task stimuli circumvents *a priori* assumptions made about the facial content associated with any of the target trait dimensions (Gosselin & Schyns, 2003; Jack & Schyns, 2017).

Target Traits

Data from the first sample (1a) were collected using traits selected from Oosterhof and Todorov's (2008) dimensions labels and Rosenberg and Sedlak's (1972b) study showing that the trait-adjectives *friendly* and *intelligent* occur frequently in spontaneous person descriptions and represent the warmth and competence dimensions (also known as social and intellectual dimensions; Rosenberg et al., 1968). Our second sample (1b) yielded CIs associated with the competence labels themselves (i.e., competent and incompetent), instead of the (competence-related) intelligence traits.

For each trait dimension we used two trait-adjectives representing the dimension's poles (e.g., friendly and unfriendly). To represent the high-pole of each trait dimension we used: *Dominant*, *Trustworthy*, *Friendly*, *Intelligent*, in sample 1a, and *Competent* in sample 1b. For the low-pole we used: *Submissive*, *Untrustworthy*, *Unfriendly*, *Unintelligent*, in sample 1a, and *Incompetent* in sample 1b.

The trait-adjectives Competent and Incompetent, were used to generate additional CIs representing the competence dimension. Although Rosenberg and Sedlak's (1972b) work suggests that intelligent may be a trait-adjective that is spontaneously used by perceivers in their evaluations of competence—and thus, that it should adequately capture the construct—we decided to further clarify the extent to which the constructs of intelligence and competence overlap. Specifically, we were concerned about whether competence would be broader in meaning than intelligence.[1]

Procedure

Participants were invited to participate in a study about personality impressions based on faces. All

[1]A similar question could be asked regarding the friendliness trait-adjectives representing warmth. The concept of friendliness may also be more specific than warmth. Nevertheless, according to the perspective that warmth encapsulates two facets (see Introduction), friendliness is a sociability-related trait, whereas trustworthiness is a morality-related trait. As a result, using a more specific trait to represent warmth (i.e., friendliness), seems to be acting against our hypothesis that warmth and trustworthiness are harder to disentangle in face evaluation. Thus, we consider the comparison between the two traits as a more conservative test. A choice to generate additional CIs for the trait-adjectives *Warm* and *Cold* would be likely to promote a finding that fits with our hypothesis, if indeed it is a broader concept than friendliness. On the other hand, by choosing to generate additional CIs for a broader concept such as competence, we are also being conservative, in the sense that we may be promoting a lower differentiation between competence and dominance (e.g., a dominant-looking bouncer can be judged as competent), which acts against our hypothesis of low overlap. Under these circumstances, any findings supporting our hypotheses may be considered as more compelling.

participants were randomly distributed across the trait conditions. The experiment ran on desktop computers stationed inside one-person laboratory cubicles. Instructions provided on the computer screen emphasized that they should not spend too much time on a trial and that they should follow their "gut feeling" whenever they felt they were taking too long. The 2IFC image classification task consisted of 300 trials and included a forced pause of 2 minutes after the 150th trial. Trials were randomly presented without replacement, and the side of the screen on which the image with the superimposed inverted noise (i.e., negative image) appeared was counterbalanced within participants (i.e., left image with inverted noise for half of the trials; noise generation details can be found in the online Supporting Information). In each trial, a pair of faces was presented side-by-side in the center of the screen with a question asking the participant to select the face that, in their opinion, best elicited the target trait. To give their response they pressed "E" on the keyboard to select the left image, and "I" for the right image. Before each trial a blank screen with a centered fixation cross was exhibited for 1,000 ms. After completing the task, participants were thanked and debriefed.

Results and Discussion

Classification image generation. A CI for each dimension was assembled by first averaging all the noise patterns selected by all the participants in a trait condition (i.e., average of the noise patches of the images selected by participants in the task), and subsequently superimposing the averaged noise on the original base-face image. Although a CI can be computed for each participant using the participant's 300 responses (i.e., individual CI), our focus was on the group-level CIs. Each group-level CI (see Figure 1) reflects the average of all individual CIs' noise patterns, keeping only the most commonly expected face features associated with a target dimension (i.e., inter-individual differences are averaged away).

Upon a brief visual inspection of Figure 1, the trustworthiness- and friendliness-CIs appear to share more resemblances overall than both competence-related CIs share with the dominance-CIs. Moreover, the competence-related CIs appear to be highly similar to the friendliness- and trustworthiness-CIs. A more objective analysis of the similarities between the CIs is reported ahead.

Inter-rater agreement. The extent to which participants showed agreement in their task responses in a given CI condition, and the extent to which the pixel data between the individual CIs' results were similar across participants of the same condition, were assessed with intra-class correlation coefficients (ICCs). Table 1 lists the ICCs for every group-level CI. The pattern of results was practically identical for the two types of data (i.e., response-based vs. pixel-based). Overall, ICCs indicate that there was higher inter-rater agreement for the trustworthiness- and warmth-CIs, and lower agreement for the dominance- and intelligence-CIs, especially in their low poles (submissive and unintelligent). Noticeably, the ICCs exhibit low values overall, possibly as the result of a guessing response strategy in trials where both target images were equivalent in signal strength (e.g., both high or low in signal). The data also suggest that it may have been harder for the participants to map dominance and competence-related traits onto a face space (i.e., a space defined by physical face features) than for the warmth and trustworthiness traits, which could have decreased agreement by promoting random responses. Another possibility is that participants indeed agree less on the facial content expected to represent these dimensions, especially at the low poles of competence and dominance. Low ICCs may lead to noisier group-level CIs, in that they capture less common features across participants' individual CIs. This pattern is consistent with findings by Hehman, Sutherland, Flake, and Slepian (2017) showing that competence-related judgments depend more on the perceiver's characteristics than on the target's facial features.

Objective similarities. Similarity between CIs was assessed using the correlation between their pixel luminance values. All CIs were masked beforehand with an oval shape that preserved only the pixels of the face, hair and ear regions. Positive correlations correspond to higher physical similarities between the images and negative correlations indicate that the images are physically opposite (i.e., the darker a pixel is in one image, the lighter it is on the other image). Close to null correlations indicate that the images share little to no similarities.

The correlations of interest are between: trustworthy and friendly, untrustworthy and unfriendly, dominant and intelligent, dominant and competent, submissive and unintelligent, and submissive and incompetent. The correlation values for these comparisons correspond to the bold values in Table 2, where we report the Pearson pixel-wise correlations between all possible pairs of CIs (for a color version of the correlation matrix see Figure S1 in the online Supporting Information file). Results suggest a stronger overlap between the friendliness and the trustworthiness CIs, than between the intelligence and the dominance and competence-CIs (close to zero correlations).

The almost null correlation found between the submissive, unintelligent, and incompetent CIs indicates that they have little to no similarities. These smaller correlations may have been promoted by their lower inter-rater agreement and higher noise. A closer inspection of the matrix of all CI inter-correlations shows, however, that CIs with low ICCs still exhibit correlations between .30 and .40 with the CIs representing their opposite pole, which suggests that they contain a signal of their intended trait (see Figure S1 in the online Supporting Information). This was

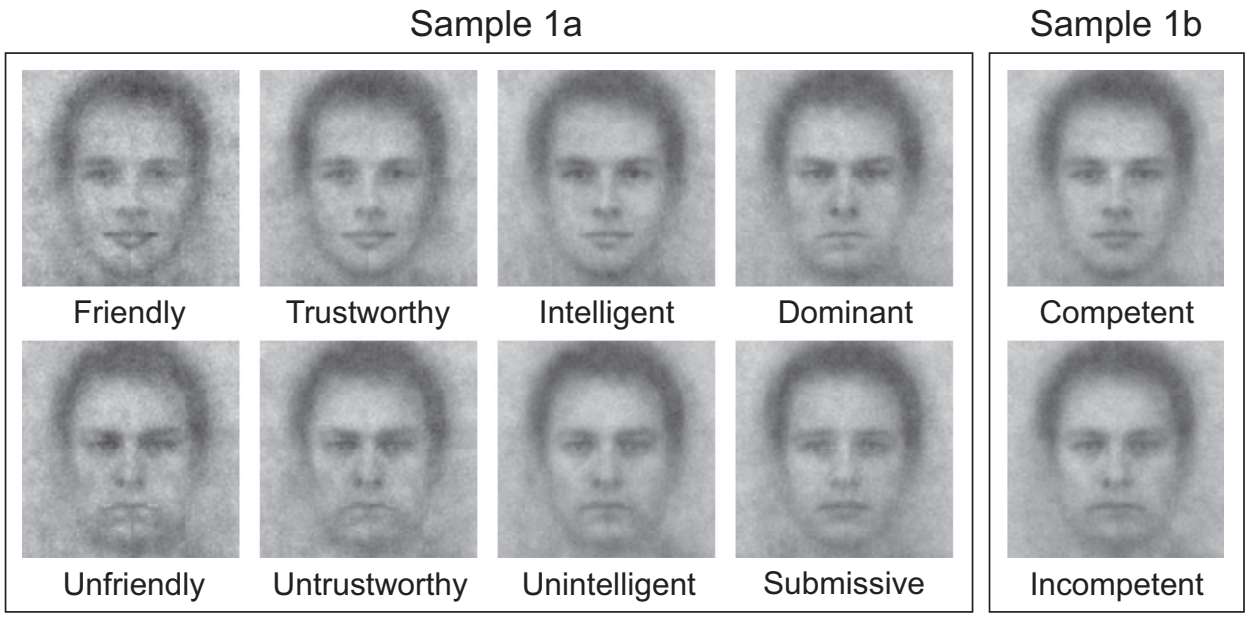

Fig. 1: Group-level classification images (CIs) by trait condition, for samples 1a and 1b. Each CI was computed using the responses of all participants of a trait condition

Table 1. Participants' agreement measures for 2IFC task judgments, and agreement between classification images' pixel data, in each CI trait condition quantified as intra-class correlation (ICC)

		2IFC response data		CI pixel data	
	CI	ICC (2, *k*)[a]	95% C.I.	ICC (2, *k*)[a]	95% C.I.
Sample 1a	Trustworthy	.60***	[0.53, 0.66]	.69***	[0.69, 0.69]
	Untrustworthy	.56***	[0.48, 0.63]	.61***	[0.61, 0.62]
	Dominant	.44***	[0.35, 0.53]	.51***	[0.50, 0.51]
	Submissive	.35***	[0.24, 0.45]	.29***	[0.29, 0.30]
	Friendly	.79***	[0.76, 0.82]	.81***	[0.81, 0.81]
	Unfriendly	.71***	[0.67, 0.76]	.74***	[0.74, 0.75]
	Intelligent	.41***	[0.31, 0.51]	.54***	[0.54, 0.55]
	Unintelligent	.21**	[0.08, 0.34]	.24***	[0.23, 0.25]
Sample 1b	Competent	.31***	[0.19, 0.42]	.30***	[0.30, 0.31]
	Incompetent	.22**	[0.08, 0.34]	.19***	[0.18, 0.20]

Notes: CI = classification image; C.I. = confidence interval.
[a]*k* represents the number of raters and *k* = 20 for each group-level CI, and applies to both the 2IFC response and pixel data sets. Degrees of freedom of the *F*-statistic were (299, 59,501) for 2IFC response data, and (65,535, 1,245,165) for pixel data.
**$p < .01$; ***$p < .001$.

subsequently confirmed by trait judgments of these CIs (see Figure 3).

To assess how the facial content associated with the dominance and competence-related dimensions is related with the facial content associated with the warmth and trustworthiness dimensions, we computed a dimensional CI for each of these five dimensions by subtracting the (masked) low-pole CI from the (masked) high-pole CI of the same dimension (e.g., subtracting the pixel matrix of the submissive CI from the pixel matrix of the dominant CI). Thus, the pixel information of each dimensional CI reflects the difference between the facial content its two CI poles, which can be understood as the information that is common across the dimension poles. Next, we ran separate multiple regression analyses where we entered either the dominance and competence or the dominance and intelligence dimensional CIs as predictors of either the warmth or the trustworthiness dimensional CI. Regarding the models with the warmth-CI as the outcome, the model estimates were negative for the dominance-CI and positive for competence-CI ($b_{\text{dominance-CI}} = -0.75$; $b_{\text{competence-CI}} = 1.09$, $R^2 = .46$, all $ps < .001$). Replacing the competence-CI with the Intelligence-CI in the model yielded practically the same results ($b_{\text{dominance-CI}} = -0.80$; $b_{\text{intelligence-CI}} = 0.79$; $R^2 = .41$, all $ps < .001$). Similar relationships were found for models with the trustworthiness-CI as an outcome ($b_{\text{dominance-CI}} = -0.50$; $b_{\text{competence-CI}} = 0.92$, $R^2 = .44$, all $ps < .001$; and $b_{\text{dominance-CI}} = -0.54$; $b_{\text{intelligence-CI}} = 0.71$; $R^2 = .41$, all $ps < .001$). The pixel-wise correlations between all

Table 2. Pearson correlations between group-level CIs' pixel luminance values (lower matrix triangle) and respective 95% confidence intervals (upper matrix triangle)

	Dominant	Untrustworthy	Unfriendly	Incompetent	Unintelligent	Submissive	Intelligent	Competent	Trustworthy	Friendly
Dominant	–	[0.52, 0.54]	[0.60, 0.62]	[0.03, 0.05]	[0.20, 0.22]	[−0.41, −0.40]	**[0.02, 0.04]**	**[−0.23, −0.21]**	[−0.38, −0.36]	[−0.50, −0.49]
Untrustworthy	.53 ***	–	**[0.73, 0.74]**	[0.30, 0.32]	[0.47, 0.49]	[−0.29, −0.27]	[−0.30, −0.28]	[−0.51, −0.49]	[−0.57, −0.56]	[−0.68, −0.67]
Unfriendly	.61 ***	**.74** ***	–	[0.26, 0.27]	[0.42, 0.43]	[−0.24, −0.22]	[−0.17, −0.15]	[−0.43, −0.41]	[−0.59, −0.58]	[−0.77, −0.77]
Incompetent	.04 ***	.31 ***	.27 ***	–	[0.34, 0.36]	**[0.01, 0.03]**	[−0.43, −0.41]	[−0.22, −0.20]	[−0.34, −0.32]	[−0.35, −0.33]
Unintelligent	.21 ***	.48 ***	.42 ***	.35 ***	–	**[−0.07, −0.05]**	[−0.39, −0.37]	[−0.35, −0.33]	[−0.47, −0.45]	[−0.49, −0.47]
Submissive	−.41 ***	−.28 ***	−.23 ***	**.02** ***	**−.06** ***	–	[−0.15, −0.13]	[−0.08, −0.07]	[−0.02, 0.00]	[0.08, 0.10]
Intelligent	**.03** ***	−.29 ***	−.16 ***	−.42 ***	−.38 ***	−.14 ***	–	[0.32, 0.34]	[0.30, 0.32]	[0.36, 0.38]
Competent	**−.22** ***	−.50 ***	−.42 ***	−.21 ***	−.34 ***	−.07 ***	.33 ***	–	[0.39, 41]	[0.48, 0.49]
Trustworthy	−.37 ***	−.56 ***	−.59 ***	−.33 ***	−.46 ***	−.01 *	.31 ***	.40 ***	–	**[0.68, 0.69]**
Friendly	−.50 ***	−.68 ***	−.77 ***	−.34 ***	−.48 ***	.09 ***	.37 ***	.48 ***	**.69** ***	–

Notes: Values in bold refer to the comparisons of interest between CIs of correspondent poles of the person perception and social face perception dimensions. Each correlation can be interpreted as an objective measure of similarity between the CIs.

$^*p < .05$; $^{***}p < .001$.

dimensional CIs can be found in the Supporting Information (Figure S2). In other words, these data suggest that the physical dissimilarity between the dimensional CIs of competence and dominance may be related with the opposite relationship that these dimensions establish with valence (i.e., dimension representing how positively a target is evaluated), while taking into account that trustworthiness highly overlaps with valence (see Oosterhof & Todorov, 2008).

In line with our hypotheses, these results suggest that dominance and competence-related traits were expected (by the participants) to be associated with very distinct facial content; whereas the facial content expected to be associated with trustworthiness and warmth-related traits (i.e., friendliness) is highly similar. Moreover, the lower overlap in the former comparison may stem from the different relationship that the concepts of competence and dominance establish with valence.

Study 2

The conclusions derived from Study 1's results hinge on the assumption that the facial content expressed by the CIs indeed predicts the trait judgments they are intended to represent. In this study we investigated how the CIs previously obtained in Study 1 were subjectively evaluated on several relevant trait dimensions. This allowed us to: (i) ascertain whether the CIs contained diagnostic information of the trait used to generate them (e.g., obtaining ratings of trustworthiness for the trustworthy CI); (ii) to replicate Study 1's findings at an evaluative, subjective level; (iii) to clarify how the CIs were perceived on valence and additional traits representing dimensions (e.g., warmth) and dimension facets (e.g., morality; sociability) previously identified as relevant in person perception research; and (iv) to examine the relationships established between these dimensions in social face perception.

Participants and Design

Thirty-one individuals (11 female; $M_{\text{age}} = 32.7$ years, $SD_{\text{age}} = 8.92$) with English as their first language were recruited online via Prolific Academic to judge a set of 10 CIs on a total of 9 dimensions with two poles each (18 trait judgments).

Face Stimuli

The target faces were all the CIs obtained in Study 1 (see Figure 1).

Trait Judgments

The selected traits included the high and low poles of each trait-dimension and included: (i) traits used to generate the CIs (*Friendly*, *Unfriendly*, *Intelligent*, *Unintelligent*, *Dominant*, *Submissive*, *Trustworthy*, *Untrustworthy*, *Competent*, and *Incompetent*); (ii) warmth traits (*Warm*, *Cold*) to ascertain whether the friendliness CIs

were perceived as intended in warmth; (iii) traits selected from the social perception literature to represent the two facets of warmth (*Sociable*, *Unsociable*, *Honest*, and *Dishonest*); and (iv) traits representing a general valence measure (*Likeable*, *Unlikeable*). The first two sets of traits (i.e., i and ii) were chosen to validate the CIs. The trait sets listed in (iii) and (iv) were chosen to explore the relationship of the four target dimensions (i.e., trustworthiness, warmth, dominance, and competence) with the previously identified facets of warmth (Abele et al., 2016; Brambilla et al., 2011; Goodwin et al., 2014) and with valence.

Procedure

The task was conducted online using Qualtrics software. After informed consent the participants were instructed to rate the CIs on multiple personality traits, using a seven-point scale ranging from 1 (*Not at all*) to 7 (*Very* [trait]). In each trial a face was positioned at the center of the screen with a question above it ("How [trait] does this person look to you?"), and the rating scale below. The faces were blocked by trait judgment (i.e., all faces were judged on the same trait before being judged on the next trait). Both the order of faces and judgment blocks was randomized. Upon task completion, participants were thanked, debriefed, and received compensation for their participation.

Results and Discussion

Inter-rater agreement. The inter-rater agreement for each trait subjective judgment across all 10 CIs was computed using ICCs. All ICCs were significant ($p < .001$) and ranged from .93 to .99 (see Table S1 in online Supporting Information). Albeit indicating high inter-rater agreement of these subjective ratings, the lowest values corresponded to the competence-related dimensions.

CI ratings. To test whether each CI was judged as intended in its correspondent trait (e.g., dominant CI judged as dominant), and to examine the extent to which CI pairs from two corresponding poles across the person and social face perception models had similar trait ratings, we ran two separate analyses. In the first analysis—CI validation—we compared any two CIs representing two opposing poles of one trait dimension (e.g., friendly CI vs. unfriendly CI). To do this, we computed the standardized difference (Cohen's *d*) between the judgments obtained for each pair of these CIs (e.g., judgment of competent for friendly CI and unfriendly CI). Each Cohen's *d* represents how differently the two CIs were judged in one and the same trait (e.g., how competent each one is perceived to be). The second analysis—CI comparisons—was identical to the first except that it compared between CIs corresponding to traits of the different models (i.e., CI of a person perception dimension vs. CI of a social face perception dimension). These results are summarized in the heat map depicted in Figure 2 (effect size values can be inspected in the interactive heat map available in our online data repository). The CI comparisons were the same as those previously done in Study 1(see comparisons associated with bold correlation values in Table 2).

CI validation. The overall pattern for comparisons of CIs of opposing poles of the same dimension (Figure 2) indicates that, in general, they were all judged higher in the trait that originated them compared to its counterpart (e.g., friendly CI judged as higher in friendliness than unfriendly CI; unfriendly CI judged higher in unfriendliness than the friendly CI). An important feature of these data is that, whereas the high pole CIs of competence, intelligence, and friendliness (i.e., warmth) were all evaluated as positive in valence (i.e., perceived as likeable), the high pole CI of dominance was evaluated as negative. This helps to clarify the negative correlation found between the competent and dominant CIs in Study 1, by suggesting that the dominance and competence dimensions exhibit an opposite relationship with valence. In other words, it is good to look competent, but bad to look dominant.

Regarding the comparisons between CIs of opposing poles of the same dimension, the results indicate that each CI is judged as intended in the trait that was used to generate it. For instance, the friendly CI is judged as more friendly, and the unfriendly CI is judged as more unfriendly. Nevertheless, each pair of CIs also tends to exhibit strong differences in other trait dimensions. A notable exception to this trend is the case of dominance CIs, with the dominant CI and the submissive CI maximally differing in their respective traits. This suggests that the facial content of the dominance-CIs predicted more successfully their intended trait judgment. Moreover, it also suggests that the facial content of the competence, warmth, and trustworthiness CIs may share more associations with the same trait judgments. This is in line with Study 1's findings showing that there is a high overlap between the facial content of warmth and trustworthiness CIs, and further suggests that these similarities are extended to the competence CIs.

CI comparisons. Data from Figure 2 suggest that the warmth and the trustworthiness CIs were judged more similarly across all trait dimensions (smaller effect sizes) than were the dominance- and competence-related CIs. Such a pattern adds to our claim that, unlike trustworthiness and warmth, competence and dominance are not redundant in social face perception, and replicates Study 1's objective findings at the subjective level.

Comparing Study 1 and 2: Objective and Subjective Similarities between CIs

We submitted the objective and subjective data from both studies to a Multidimensional Scaling (MDS) and property fitting analyses (ProFit; Chang & Carroll,

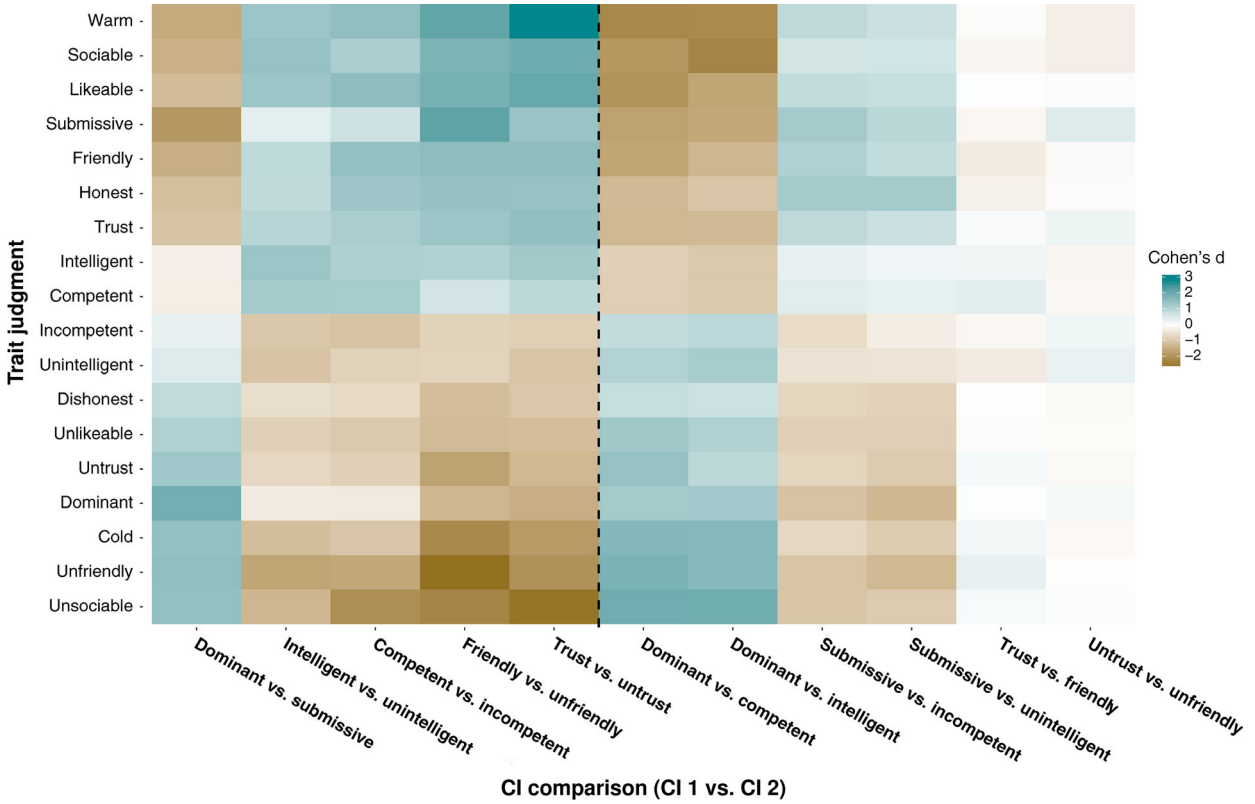

Fig. 2: Each effect size (Cohen's *d*) corresponds to a difference between the mean trait judgment ratings of two CIs under comparison (*x*-axis): the higher the effect size, the higher the difference. Columns on the left side of the vertical dashed line show the comparisons between two CIs of opposite poles of the same dimension. Columns on the right side of the dashed line represent comparisons between the correspondent pole CIs of different models (i.e., trustworthiness-by-dominance model vs. warmth-by-competence model). Positive values (green cells) indicate that the first CI (i.e., CI 1) was rated higher than the second CI (i.e., CI 2) in a given trait. Negative values (brown cells) indicate that CI 2 was rated higher in a trait than CI 1. The fainter the colors (*d*'s closer to zero), the less are the differences in how the two CIs were perceived in each trait. The color version of this figure can be found in the article online, or be reproduced using the R script included in our online data repository. [Colour figure can be viewed at wileyonlinelibrary.com]

1969; Rosenberg et al., 1968) to visualize how trait judgments were predicted by the pattern of physical similarities between CIs.

Multidimensional Scaling

Multidimensional Scaling (MDS) is a dimensionality reduction technique that allows us to represent the degree of similarity between a set of objects (e.g., CIs) in terms of spatial distances in an *n*-dimensional Euclidean space. Because the MDS requires dissimilarities (between objects) as input data, we converted the CI correlation matrix into a dissimilarity matrix. These dissimilarities were then submitted to an MDS (using the R package smacof version 1.8; De Leeuw & Mair, 2009). Next we selected the optimal number of dimensions characterizing the differences between the CI pixel data, based on the *Stress-I* goodness-of-fit index and multiple R^2 computed for several dimensionalities (Kruskal & Wish, 1978). A two-dimensional solution proved to be the most parsimonious solution with a good fit to the data (*Stress-I* = .082; R^2 = .952; see Table S2 in the online Supporting Information for higher dimensionality results). A 2D solution also has the advantage of yielding a more intelligible 2D plot, depicted in Figure 3.

Figure 3 represents a two-dimensional Euclidean space across which the dots representing the CIs (CI objects) are scattered according to their (dis)similarity along two dimensions. That is, similarly to the pixel correlations, the distances between CI objects in the 2D space represent their degree of similarity (correlation). The closer the CI objects are in space, the more physically similar they are.

The axes representing the two dimensions were not labeled, as this was not the goal of our analysis. Nevertheless, the differentiation between CIs along Dimension 1 suggests that this dimension can be interpreted as valence. Dimension 2 contrasts CIs of low ability with high ability (i.e., submissive vs. dominant or intelligent). In this regard, this 2D solution is in agreement with the structure of both the trustworthiness-by-dominance and warmth-by-competence models.

Figure 3 shows that CIs of opposing poles of the same dimension are located farther apart from each other, with trustworthiness and warmth CIs differentiated along the first dimension and competence-related and dominance-CIs differentiated along both the first and second dimensions. Moreover, trustworthiness and warmth CIs practically overlap in physical similarity, unlike competence-related and dominance-CIs.

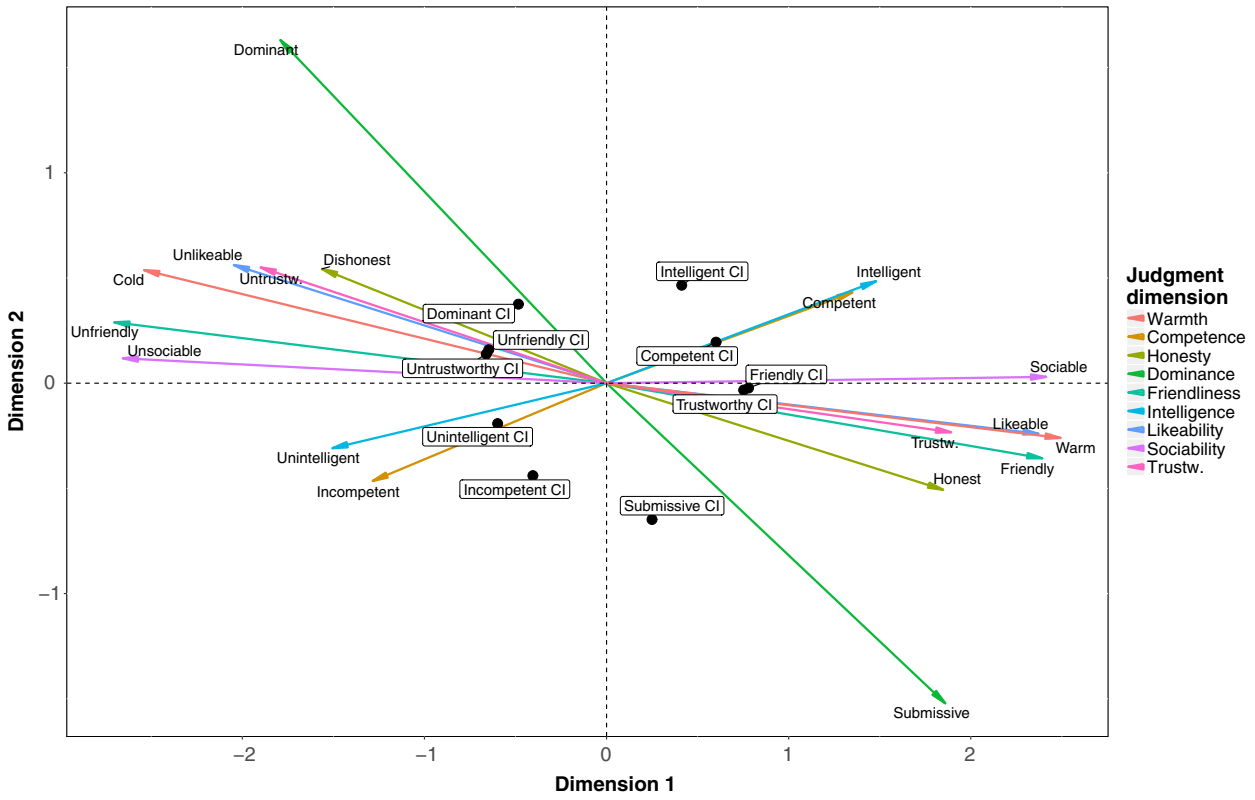

Fig. 3: Two-dimensional Euclidian space yielded by the Multidimensional Scaling (MDS). Black dots correspond to CIs. The higher the distance between CIs, the more physically dissimilar they are. Vectors correspond to trait judgments. Vector arrows indicate the direction toward which CIs were judged higher in a trait, and vector length indicates the magnitude of the judgment. The color version of this figure can be found in the article online, or be reproduced using the R script included in our online data repository. [Colour figure can be viewed at wileyonlinelibrary.com]

Property Fitting

A ProFit analysis using the trait judgments allowed us to examine how the coordinates of CIs in the 2D space predicted specific trait judgments, thus informing about the relationships between those trait dimensions in social face perception. In separate multiple regressions, the raw ratings of each trait judgment (e.g., dominant; submissive) across all CIs were regressed on the CI coordinates on the two dimensions (yielded by the MDS). The output of each regression was subsequently plotted as a vector in the 2D space (see Figure 3).

The goodness-of-fit values obtained from fitting the 18 trait judgments to the 2D configuration are available in the Supporting Information (Table S3), and provide a measure of how the spatial coordinates of the CIs in the 2D space account for each judgment (n = 310 observations per judgment). The models were highly significant across all the selected trait dimensions, suggesting that they were all relevant to interpret the pattern of physical similarity between CIs. Judgments of sociability, warmth, and likeability yielded the highest values (R^2's between .45 and .67), suggesting that these traits explain most of the discriminability between CIs. Dominance and morality-related judgments (i.e., trustworthiness and honesty) showed slightly lower values (R^2's between .50 and .33), but still account for considerable variability. Finally, the competence-related judgments exhibit the lowest values (R^2's between .35 and .28), suggesting that (i) the variability in these judgments may be overlapping with other trait judgments (e.g., valence-related), (ii) additional dimensions would be needed to better accommodate competence judgments, or (iii) simply be reflecting that there is low agreement between participants regarding face judgments of competence.

The angle between any two vectors is a geometric indicator of their correlation (see Rodgers & Nicewander, 1988). Therefore, the angles between the vectors plotted in Figure 3 inform about the relationship between trait judgments (matrix of Pearson correlations is available for comparison in Supporting Information, Figure S3). Acute angles indicate positive correlations, 90° angles indicate orthogonality, and obtuse angles indicate negative correlations. The perceptual map in Figure 3 clarifies that the vectors of all trait pairs chosen to represent opposite poles of a dimension are related by approximately 180° (mean angle = 175°, SD = 3.02°), corroborating that they indeed define one dimension.

Relevant for our goals, we found a positive correlation between warmth and trustworthiness judgments (1° at high pole, 4° at low pole) suggesting that these dimensions tend to be conflated in face impressions. Moreover, the low mean angle between warmth, trustworthiness, friendliness, sociability, honesty, and likeability (mean angle = 6°, SD = 4.68°, for the high-poles and, mean angle = 8°, SD = 5.16° for the low-poles) suggests that a strong common factor (likely

valence) underlies all these judgments. Consistent with an evaluative dissociation between dominance and competence, dominance- and competence-related judgments were negatively correlated (120° for Dominant–Competent; 120° for Dominant–Intelligent; 143° for Submissive–Incompetent, 121° for Submissive–Unintelligent).

The relationship established between likeability and dominance judgments was opposite to the relationship between likeability- and competence-related judgments. The angles between likeability and competence indicate a high positive correlation (24° at high pole, 35° at low pole). However, the correlation was highly negative between likeability and dominance (143° at high pole, 156° at low pole). We further examined how these differences in the relationship with valence played a role in the negative correlation found between the Dominant and Competent judgments. We partialled out the relationship with likeability from the equation, and found that the relationship between the dominance and competence judgments becomes orthogonal, partial $r(307) = .045$, *ns*, for high poles; partial $r(307) = .062$, *ns*, for low poles. This suggests that the dissociation between these dimensions is driven by their relationship with valence.

Figure 3 also informs that all judgments are more differentiated at their negative (i.e., as they are perceived in valence) than at their positive poles. This pattern is consistent with the density hypothesis according to which negative information is more differentiated than positive information in memory (Unkelbach, Fiedler, Bayer, Stegmüller, & Danner, 2008). This density effect has been previously generalized across hundreds of positive and negative words, images and daily events (Koch, Alves, Krüger, & Unkelbach, 2016), and agrees with findings by Bruckmüller and Abele (2013) showing that the positive poles of the Big Two (i.e., communion and agency dimensions) are perceived as more similar than their negative poles. This higher discrimination underlying negative traits should also be taken into account to understand the lower inter-rater agreement values observed in both studies (see Tables 1 and S1).

In sum, the overall results clearly suggest that competence and dominance did not overlap either in terms of expected facial content, or in their relationship with valence. On the other hand, warmth and trustworthiness seem to overlap in both facial content and in their relationship with valence. Moreover, competence and intelligence overlapped to a greater extent with warmth and trustworthiness, in both their expected facial content and relationship with valence. In sum, these interrelationships appear to stem mainly from the relationship that each of these dimensions establishes with valence.

General Discussion

Our research offered data suggesting that the basic dimensions of person perception and of social face perception should not be expected to be redundant in the context of face-driven impressions. As hypothesized, we observed an overlap between warmth and trustworthiness and a dissociation between the dominance and competence dimensions. Moreover, our results suggest that the dominance and competence dissociation is driven by their relationship with valence. In this way, our results add to other findings supporting the hypothesis that there is a lower overlap between dominance and competence than between warmth and trustworthiness in face impressions. First, they add to indirect evidence offered by Koch, Imhoff, et al.'s (2016) work showing that socioeconomic success overlaps with agency (dominance) but not competence, and by Lange and Crusius's (2015) work showing that bodily displays of dominance versus competence (hubristic vs. authentic pride) lead to distinct perceptions (malign vs. benign envy) which are dissociated in valence. Second, they add to more direct evidence offered by Oosterhof and Todorov's (2008) work, by specifically focusing on the relationship between dimensions. Finally, our findings are consistent with Sutherland et al.'s (2016). Note, however, that our approach inverts the logic used by Sutherland et al. (2016) to test the hypothesis. Sutherland et al. (2016) asked their participants to attribute trait ratings to faces and subsequently examined how these ratings were correlated. In our research, we asked participants to select the physical features that elicited a given trait and subsequently examined the physical and perceived overlap of these features across trait dimensions. In this way, the present work derives the dissociation between dominance and competence, not only from how traits are communicated by a face, but also from how facial features are communicated by traits, via a methodology that is highly sensitive to the content of internal representations of trait concepts: the RC methodology. This methodology allowed us to explore physical similarities between the facial content selected by participants to represent relevant traits (Study 1). The subsequent judgments of the CIs by independent judges (Study 2) showed that: (i) the CIs obtained in Study 1 were perceived as intended in the traits from which they were derived (i.e., contained trait signal); (ii) competence-related and dominance judgments were especially differentiated in their relationship with valence; and lastly, (iii) negative trait judgments were more clearly differentiated than positive trait judgments. These data offer compelling evidence that the person perception and face evaluation 2D models, although related, are not redundant in face impressions.

Although other studies offer data similar to ours, there is at least one study (Walker & Vetter, 2016) that found an overlap between facial dominance and a dimension that has been argued to be akin to the competence dimension: perceived agency (see Cuddy et al., 2008). This evidence raises the question of what may be the relevance of the models selected to examine the relationship between dimensions. Both

Sutherland et al.'s (2016) studies and ours anchored in ratings of warmth and competence based on the model's labels, whereas Walker and Vetter's (2016) data were based on the communion and agency (Big Two) model (Abele & Wojciszke, 2007; Bakan, 1966) and were obtained, not via direct trait ratings, but via a questionnaire (viz. GEPAQ; Runge, Frey, Gollwitzer, Helmreich, & Spence, 1981). This questionnaire measures perceptions of masculinity–femininity, and its adoption is assumed to be based on the overlap found between masculinity and femininity and the agency and communion constructs, respectively (Abele & Wojciszke, 2007). But more importantly, the questionnaire assesses agency/masculinity with items that directly measure perceived dominance, competitiveness, and aggressiveness, but never competence. As a result, Walker and Vetter's (2016) studies could only find an overlap between the perceived agency/masculinity and the perceived dominance of faces. In this regard, they are not informative about the status of an overlap between dominance and competence, because they never assess competence.

Other relevant information is obtained from our data. First, it shows a halo pattern between face judgments of trustworthiness and warmth that seems to be extended to competence, but not to dominance judgments. Whereas a competent face is judged as positive (e.g., likeable), a dominant face is judged as negative (e.g., unlikeable). This shows that competence and dominance face judgments will diverge given their opposite relationship with valence. This valence-driven dissociation also seems to extend beyond the present context of face impressions. Previous studies on group perception showed that competence and potency (i.e., power-related dimension of the semantic differential model; Osgood, Suci, & Tannenbaum, 1957) exhibit opposite correlations with warmth and valence (Kervyn, Fiske, & Yzerbyt, 2013). Second, although inter-rater agreement differs across dimensions, it is especially low for the competence-related traits. This may be informative about the perceivers' difficulty in mapping their representation of competence onto a face space, and/or about the variability in perceivers' expectations about the diagnostic facial features of competence (e.g., see Hehman et al., 2017). Although our data suggest that dominant and competent faces do not overlap at the group-level, their relationship may be more malleable due to low inter-rater agreement, especially at the low poles. For instance, an overlap between the CIs may emerge at the individual level in cases where the perceiver construes dominance as overlapping with competence. Third, our data also contributes with information about how trait-space elements (i.e., trait representations) take shape in the face-space (i.e., diagnostic face features), which is highly relevant for current theoretical approaches (Over & Cook, 2018; Stolier, Hehman, & Freeman, 2018; Tamir & Thornton, 2018) aiming to integrate face perception and personality inferences. Specifically, our results clarify that valence plays an important structuring role in shaping the relationship between the trustworthiness-by-dominance and the warmth-by-competence models.

Our studies are, however, not free of limitations, one being the unbalanced gender materials and participants' distribution. It may be argued that the fact that we conducted our studies only with male faces and a predominantly female sample does not offer the ideal setting to test our hypothesis. However, this is not incompatible with our aims. From a Popperian point of view, corroborations are logically always less informative than refutations (Popper, 1985). And although we cannot conclude that our results will necessarily generalize to the ratings of male participants and female targets, we can claim that competence and dominance do not always map very close onto each other. And that is indeed informative. The possibility that a dissociation between dominance and competence occurs in at least one of the cases suggests that the equivalence of the models derived from traits and faces is false. But our results do not exclude the hypothesis that gender plays an important role in the possibility of great overlap between conceptual and face models in the case of female respondents. This is a possibility since picturing a dominant man may—for a female respondent—evoke very different associations than picturing a dominant woman. Fortunately, Sutherland et al.'s (2016) work already clarifies this possibility. These authors balanced participant and face target gender and found that the dissociation between dominance and competence occur in both cases; just that it is lower for male targets than for female targets. Nevertheless, in fields of research where this moderation by target gender proves to be relevant, it may also be relevant to address it with data-driven methods that place the fewest restraints on the target stimuli and are sensitive to top-down biases (Dotsch, Wigboldus, & van Knippenberg, 2011), such as RC methods.

A second criticism we may make of our studies is that in order to assess internal face representations of personality dimensions, we need to label them. Because our hypotheses anchor in the warmth-by-competence and social-by-intellectual models (Fiske et al., 2007; Rosenberg et al., 1968) we labeled the two dimensions as warm (friendliness) and competence (intelligence). There was no guarantee that the naïve use of these labels would capture such dimensions. In addition, with a distinct theoretical background we could have used other labels to assess the two dimensions. Unlike the warmth and competence trait-based labels, the communion and agency constructs are assumed to capture a broader range of trait content (Abele & Wojciszke, 2007) and can be branched into two facets each: communion into warmth/sociability and morality, and agency into assertiveness and competence (Abele et al., 2016). If future studies replicate our data using a facets approach, we may discover that face impressions are better captured by the assertiveness facet of agency,

and by a general valence dimension that aggregates the competence, warmth/sociability, and morality facets, taking into account the results obtained by us, Sutherland et al. (2016), and Walker and Vetter (2016).

A third criticism pertains to the absence of prior power calculations. We must take two aspects into consideration to discuss it. The first is related to a limitation of the field itself regarding power implications for the reliability of the CIs (i.e., classification images). Although attempts have been made to overcome this limitation (see Brinkman et al., 2018) the current use of noise-based RC is still 'hampered by the lack of methodological work addressing validity, reliability, and guidelines for best practice' (Brinkman et al., 2017, p. 352). Until an optimal power analytical approach is established, the most viable option is to adopt the task parameters used in previous RC studies, as we have done here. A suggestion advanced by Brinkman et al. (2018), after our data collection, was that researchers should include at least 500 trials in a RC task to obtain reliable individual CIs (measured with a new index, infoVal, which assesses the amount of signal in a CI relative to CI data derived from random responses). But only future approaches would show how this is relevant to studies like ours that rely on CIs generated from 6,000 trials[2] provided by 20 different individuals. The second point is that our statistical inference was not based on the participant as the unit of analysis. Participants can be understood as the judges whose judgments allowed us to estimate the pixel luminance values used in our analysis. Thus, the units of analysis in Study 1 were pixel luminance values (n = 38,958 per masked CI) and in Study 2 we assessed the properties of the CIs with multiple regressions and property-fitting analyses based on 310 ratings (per trait judgment).

Finally, future research should account for how our impressions of personality are *gestaltic* despite being drawn from different stimulus modalities and qualitatively different information.

In sum, the current studies present compelling evidence supporting a divergence between dominance and competence in social face perception, which appears to be driven by the relationship that each dimension establishes with valence. Furthermore, it demonstrates the usefulness of RC methods in assessing and comparing approximations of socially meaningful visual information associated with fundamental social dimensions.

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[2]Please notice that a single trial in a 2IFC RC task is less informative (i.e., contains less signal) when compared to, for instance, a single item in a typical survey. This should be taken into consideration when discussing the amount of trials used in RC studies.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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