# Seeing What You Know: the Relationship Between Valenced Trait Information and Visual Perception

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Abstract

Past research has found that face perception is not altogether unbiased and can be measurably influenced by non-visual social information. In particular, Hassin and Trope (2000) proposed an automatic 'reading into faces' mechanism, wherein trait information affects our core perception and interpretation of one's facial characteristics. Specifically, when social information aligns someone with a level of a certain trait dimension, our perception of their face purportedly adjusts to integrate the facial configuration schema typically associated with that level of the given trait (i.e. the enhancement of trait-related facial cues). Previously, this effect has been measured in non-perceptual judgment tasks, therefore participant ratings may have reflected cognitively derived evaluations rather than the intended perceptual effect. Additionally, such studies only used explicit trait information (i.e. overtly labeled traits and valences) whilst in reality, trait information is frequently conveyed in an implicit context (i.e. behavioural accounts). In the present research, 50 undergraduate psychology students were presented with a series of 'neutral' faces paired with social information snippets (half explicit and half implicit) depicting high or low levels of dominance, threat and trustworthiness. After a brief interval, they were asked to recognise the previous face from two options, one being the learned neutral face adjusted to look higher in the respective trait (positive adjustment) and the other adjusted to look lower in the trait (negative adjustment). As hypothesised, it was found that neutral faces paired with a higher trait-level biased participants to select the positively adjusted face more often than when paired with the lower trait-level. No difference however was found in the effect size between explicit and implicit trait information groups. These results largely remedy the methodological flaws of previous studies in supporting the perceptual basis of a 'reading into faces' effect.

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**Visual Biases**

Throughout our daily interactions, we frequently rely on the faculties of visual perception to provide us with socially relevant information about others. For example, visual cues can serve to convey an individual's gender, physical stature and even mood. However, contrary to the widespread belief that "what you see is what you get", visual information often does not provide an unbiased, independent assessment of others. Specifically, there is evidence to suggest that non-visual, social information can influence these perceptual judgments. A striking example of this can be found in 'the halo effect'. In essence, this effect reflects the influence of global interpersonal evaluation on our appraisal of a given person's individual attributes. Nisbett and Wilson (1977) demonstrated this by showing student participants two different videotaped interviews with a foreign college instructor, getting them to appraise a number of his attributes on an 8-point Likert scale thereafter. One version of the interview portrayed this instructor as warm and friendly whilst the other depicted him as cold and distant. Those exposed to the former condition rated his appearance, mannerisms and accent as appealing, whilst those shown the latter judged the same attributes as irritating. The researchers concluded that this halo effect indicates a profound influence of social information on subsequent perceptual judgments, with global evaluations not only affecting our appraisals of ambiguous stimuli (e.g. giving a 'good' person the benefit of the doubt in a questionable situation) but also shifting our perceptions of particular attributes altogether (despite possessing sufficient information to engage in an independent assessment of these features).

While the Nisbett and Wilson (1977) study provides evidence of interpersonal appraisal bias, its perceptual claims (i.e. the direct effect of instructor portrayal on individual perception) are somewhat questionable given the subjective, decision-based response

paradigm used to measure group differences. That is, Likert scales involve cognitive judgments that potentially tap into elements of post-perceptual decision-making (i.e. ratings may reflect conscious assessments of character made on the basis of available information) rather than actual perception/perceptual change alone.

A later study conducted by Stapel and Koomen (1997) employed a more robust methodology in adding further support to this notion of social information affecting perception. Specifically, this study employed the principles of the Ebbinghaus illusion (a pre-established optical illusion of relative size perception) to investigate the effects of social categorisation on perceptions of physical magnitude. This illusion functions on the premise that a target stimulus surrounded by large context stimuli will appear smaller than a target stimulus (of the exact same size) surrounded by small context stimuli. This is the result of automatic comparisons drawn between a target object and its contextual stimuli, including that of physical size (Coren & Enns, 1993). Knowing that this comparability (and hence the extent of the illusion's effect size) is directly proportional to object similarity (i.e. the more similar two objects are, the more they invite comparisons), the experimenters compared the impact of various contextual stimuli on perceptions of magnitude. They achieved this by surrounding two pictures of a young girl with faces/objects of varying category similarity (e.g. female/male faces and vehicles) and comparing the relative size estimates provided by participants. As hypothesised, they found that with the increasing similarity of contextual stimuli came significantly larger estimates of face-size disparity (larger illusory effect size). This finding provides further evidence of an effect of social information (in this case provided in the form of object category cues) on visual perception, additionally remedying the flaws of the Nisbett and Wilson (1997) study (namely, the measurement of perceptual effects with a non-perceptual paradigm).

**Social Information and Face Perception**

**The effect of explicit trait information on face perception.**

Further research has been aimed at investigating whether this effect carries across to face perception, a component of visual processing vital to daily social functioning. Hassin and Trope (2000) highlight this idea in their proposal of an automatic 'reading into faces' mechanism, wherein personality data affects our visual perception and interpretation of one's facial characteristics. They demonstrated this by showing participants booklets containing two photographs of faces, each followed by a personality-linked sentence depicting high or low levels of kindness. Participants rated individual facial features on nineteen 9-point scales pertaining to relative physical dimensions (e.g. eye size, quantity of hair and length of eyelashes). They found a main effect of verbal information (i.e. conveyed level of kindness) for five facial features, with participants rating faces paired with kind sentences as significantly shorter, rounder, fuller, wider and more attractive than those paired with mean sentences. Again, the issue of measurement validity is called into question, with a non-perceptual paradigm being used to gauge a perceptual effect. That is, the completion of the feature scales may have been susceptible to the aforementioned decisional bias, with participant ratings reflecting intermediary cognitive evaluations distinct from actual perception. For example, after noting the depicted figure as mean, a participant may have consciously decided that such a person's face would likely appear brutish, thereby decreasing their attractiveness scores regardless of true visual perception.

The Hassin and Trope (2000) paper also documents a reciprocal process of this 'reading into faces' phenomenon, wherein personality data is automatically inferred from the appearance and configuration of various facial features. Aptly referred to as 'reading from faces', it is purported that humans frequently engage in this process to spontaneously derive trait-information from faces alone. Whilst the validity of these inferences appears to be largely ambiguous (a result of numerous conflicting findings), they are highly reliable in

nature, with various judges (including those drawn from cross-cultural samples) inferring similar traits from given face stimuli.

**The effect of feature alterations (physiognomic changes) on social perception (trait inferences).**

The apparent universality of this 'reading from faces' process lends support to the age-old body of work on physiognomy. Oosterhof and Todorov (2008) describe physiognomy as "the belief that the nature of the mind and personality can be inferred from facial appearance". This notion has pervaded throughout history, dating back to Ancient Greece, Rome and China, then later experiencing a resurgence in the early 19th century. At one point Cesare Lombroso, founder of criminal anthropology, proclaimed that certain physiognomies (in this case, the term 'physiognomy' is used to denote facial features and their spatial configuration) represent various subtypes of criminals. For example, he suggested that thieves possess small oblique-shaped eyes, thick and close eyebrows, distorted or squashed noses, thin beards and hair, and sloping foreheads. Since then, such specific categorical claims have been dismissed due to a sheer lack of evidence however, contemporary findings continue to show that people rapidly evaluate faces on multiple trait dimensions after as little as 38 ms exposure (Bar, Neta & Linz, 2006).

A study conducted by Keating, Randall and Kendrick (1999) investigated the role of physiognomic cues in social evaluations of well-known American political leaders. They did so by altering digitised images of Presidents Clinton, Reagan and Kennedy, manipulating key facial features known to be cues of facial maturity. Specifically, they made faces appear more neotenous by increasing eye and lip size and more mature by decreasing their size. They found that ratings of power (i.e. dominance, strength and cunning) increased significantly with enhanced maturity cues whilst ratings of warmth (i.e. honesty, attractiveness and

compassion) greatly decreased. Contrastingly, faces adjusted to appear more neotenous (i.e. less mature) were attributed with less power and more warmth. These findings indicate the vast power of physiognomic adjustment, with subtle feature alterations resulting in significantly different trait associations, even amongst prominent social figures. Thus it would seem that the main mechanism responsible for the aforementioned 'reading from faces' effect is that of mapping particular trait dimensions onto various physiognomies.

**Mapping trait dimensions onto physiognomies.**

Todorov, Said, Engell and Oosterhof (2008) elaborate on this notion, describing an inherent association between babyfacedness (and its component physiognomic cues) and various facets of personality. Specifically, they claim that baby-like features including large eyes, a large head and a small jaw increase perceptions of warmth, honesty, naïveté and weakness compared to other mature-faced counterparts. They attribute this to an 'overgeneralisation' effect wherein automatic responses to the facial characteristics of a baby are mistakenly activated (i.e. overgeneralised) when an adult with similar features is seen. They suggest that this overgeneralisation model can strongly account for the rapid, reliable and often inaccurate nature of these physiognomic trait judgments.

The same paper ran a principle components analysis of trait ratings made by participants in evaluating a large set of emotionally neutral faces. They found that 80% of variance in these judgments was accounted for by two orthogonal dimensions: face valence/trustworthiness and power/dominance. To explain this finding, they again applied their overgeneralisation model, stating that spontaneous evaluations made along the spectrums of face valence and dominance are a reflection of adaptive processes which enable us to gauge behavioural intentions and power hierarchy. That is, evolutionary processes have rendered humans sensitive to facial cues indicative of vital trait information. Specifically,

physiognomies signaling that a person should be avoided (e.g. anger) or approached (e.g. happiness) enable us to make snap-evaluations of a person's valence while features cueing physical strength (e.g. maturity and masculinity) permit us to gauge dominance.

In light of this supported mechanism of traits being mapped onto distinct facial configurations (via overgeneralisation effects), it can be extrapolated that such trait-physiognomy associations likely serve as the basis for the previously introduced effect of trait information on subsequent facial perception (i.e. 'reading into faces'). That is, when social information about someone aligns them with a level of a certain trait dimension, our perceptions of that face may adjust accordingly to integrate the physiognomies typically associated with that level of the given trait (e.g. a person deemed to be highly trustworthy will be perceived with characteristics specific to the innately programmed 'high trustworthiness' physiognomy).

This idea is reinforced in a neurophysiological account of trait impressions by Vuilleumier (2005), wherein the amygdala is implicated as the primary mechanism mediating such changes to face perception. Specifically, when viewing a face, early visual cortex projects relevant information onwards to the amygdala, a subcortical brain region responsible for appraising motivational value. The amygdala then receives input from the higher-order inferotemporal cortex (IT) in the form of a given face representation (i.e. it houses a series of physiognomic schemas associated with different trait levels). When a particular trait concept is activated (i.e. through social information), then it's respective face representation becomes the one transmitted onwards by the IT. The amygdala can then integrate this trait-linked physiognomy by modifying responses in core perceptual regions (e.g. early visual cortex). This is achieved through the amplification one's attentional resources to relevant facial cues (i.e. features congruent to a given trait schema).

## The Nature of Trait Information

### Gossip.

With the potential mechanisms of this effect established, it becomes apparent that information imbued with trait-value in particular is a crucial factor in the modulation of face perception. It is thus important to note the various forms this input can take and how they fit into the practical context of daily social functioning. A primary source of such detailed trait information can be found in the commonly practiced social ritual of gossip. Gossip is an essential component of human interaction, providing a wealth of socially relevant information without requiring direct experience. Effectively, this enables us to embed ourselves in extensive social networks and develop awareness of those we should avoid or approach (Baumeister, Zhang & Vohs, 2004). To test the efficiency of associations formed between valenced gossip and faces, Bliss-Moreau, Barrett and Wright (2008) showed participants neutral faces randomly paired with positive, negative or neutral behavioural sentences. When participants were later asked to appraise the valence of the face stimuli alone, they were able to do so for all three categories, with the accuracy of their decisions significantly exceeding chance levels. They additionally noted that this learning effect persisted over a period of two days. These findings indicate the salient nature of trait information conveyed through the medium of gossip, with enduring impressions being bound to faces even under minimal learning conditions.

A later study investigated the perceptual significance of this efficiently bound gossip information, documenting its impact on visual consciousness (Anderson, Siegel, Bliss-Moreau & Barrett, 2011). Again, a pairing phase was first used to attach valenced gossip to neutral face stimuli. Thereafter, participants were subjected to a binocular rivalry paradigm wherein the previously seen faces were presented to one eye and new images of houses were

shown to the other. This binocular rivalry phenomenon occurs when perceptually dissimilar images (in this case learned faces and novel houses) are shown to different eyes and ultimately compete for perceptual dominance. Thus by measuring the duration of each image's dominance (i.e. the amount of time each percept is reportedly seen), it is possible to note which of the inputs the brain is prioritising for conscious experience. It was found that faces previously paired with negative gossip dominated significantly longer in visual consciousness than those paired with positive or neutral trait information. This indicates that snippets of gossip stimuli are processed in a way that not only supports prolonged face-valence recognition but also mediates shifts in visual perception (i.e. the automatic visual prioritisation of faces paired with negative social information).

Overall, it becomes clear that gossip is a highly effective means of conveying valenced personality information, with its contents creating long-lasting interpersonal impressions as well as perceptual modulations.

**Spontaneous trait inferences.**

While social input can be explicitly trait-linked in nature, it often consists of behavioural information wherein the related trait is implied but never openly referred to (e.g. "he always get into fights" rather than "he is a highly aggressive individual"). Although these previously highlighted gossip studies looked at the way such behavioural stimuli created valence associations, they failed to recognise the specific trait categories that were likely activated in the process. This intuitive leap made from implicit information (i.e. behavioural gossip) to an explicit trait judgment is a process known as 'spontaneous trait inference' (STI).

In a 2008 review paper, Uleman, Saribay and Gonzalez describe this concept of STI as the inferring of the trait implication of a single behaviour and integrating it with the actor representation. Todorov and Uleman (2003) empirically demonstrated this effect using a false

recognition paradigm, wherein participants viewed 60 actor face photographs paired with trait-implying behaviours (e.g. “Richard dusted and vacuumed his room every day”, implying that he is neat). Thereafter, they viewed the faces paired with explicit trait statements and were asked to decide whether or not that trait was explicitly used in the photograph’s initial description. They found a significantly higher false recognition of implied traits paired with the actual actors’ faces than of implied traits randomly paired with other faces. This suggests that the social information spread through gossip is not only evaluated and stored in the form of valence judgments, but also as specific trait-linked associations. In another part of the study, they aimed to determine whether STIs were actually made about the actor or merely about the behaviours that were incidentally tied to the actor (e.g. were participants inferring that Richard is neat or just that he was behaving in a neat fashion?). They did so by separating participants into two conditions: those primed with a person-judgment task and those primed with a behaviour-judgment task. Both conditions were provided the same face-behaviour pairings however those in the person-judgment group were instructed to appraise the person (e.g. “is Richard neat?”) whilst those in the behaviour-judgment group judged the behaviour itself (e.g. “Is this a neat behaviour?”). They found that ‘person’ but not ‘behaviour’ inferences predicted subsequent STIs made about the actor in a false recognition task. This suggests that specific inferred traits can be bound to targets (as enduring personality characteristics), and not just their behaviours, when social information is transmitted through gossip.

**The Present Study**

It becomes apparent from a review of the literature that trait-linked information is a salient mechanism underlying prolonged impression formation and perceptual change. Specifically, such data can be efficiently derived from the contents of gossip (either via explicit trait-statements or STI) and bound to its target (or a visual representation of that

person). Furthermore, evidence has been put forth to suggest that valenced personality information can significantly alter face perception through top-down mechanisms involving an integration of IT face schemas in the amygdala. This provides a potential basis of the 'reading into faces' effect, wherein the physiognomic features innately linked to varying trait levels are effectively 'mapped' onto the faces of people associated with those given trait characteristics.

While previous research has examined this effect (Hassin & Trope, 2000) it did so using a judgment task wherein facial features were arbitrarily measured on a series of 9-point Likert scales. As the 'reading into faces' effect in question is perceptual in nature, the use of a non-perceptual paradigm renders the findings' overall validity questionable. With participants explicitly instructed to use the given trait information and describe faces on a multitude of facial characteristics in a single task, it is possible that decisional bias crept in with the ratings being cognitively derived evaluations (e.g. rating mean people as less attractive out of principle) instead of acting as direct reflections of visual perception. Additionally, the study only employed explicit verbal information stimuli with sentences overtly labeling a given trait and its valence (e.g. the depiction of low intelligence in the sentence, "there is no doubt that he is one of the most stupid men I have ever encountered"). As previously mentioned, gossip is a primary source of trait information and frequently occurs in an implicit context, wherein personality information is inferred from behavioural descriptions using STI. Moreover, there is considerable evidence to suggest that when materials are not perceived by participants as an attempt to influence them, they actually exert significantly greater influence (Skowronski, Carlston & Isham, 1993; Petty & Cacioppo, 1986). That is, by housing information in implicit stimuli, participants appear to be less likely to engage in the skeptical evaluations used to resist overt attempts of imposing influence (i.e. explicit trait stimuli).

The aim of the following study was to examine the impact of valenced trait information (conveyed in a gossip format) on face perception while remedying the flaws of past research. Consequently, a perceptually-based face recognition paradigm was selected to minimise the potential influence of decisional biases (i.e. cognitive middle-steps) inherent in previously employed judgment tasks. By pairing trait information with a neutral face and having participants select from two physiognomically adjusted faces (i.e. altered in a positive/negative direction on the facial characteristics associated with differing levels of a given trait), it is ultimately a perceptual phenomenon that was measured.

Also, the study employed implicit behavioural sentences in addition to the explicit trait statements used in past research. This was done to ensure that stimuli were realistic (i.e. formatted on the basis of actual gossip) and less likely to trigger the automatic resistance elicited by overt attempts to influence participants. Both conditions were included in order to enable a comparison of their respective perceptual effects (i.e. determining which method of information conveyance had the greatest impact).

Firstly, it was hypothesised that sentences conveying a high-spectrum trait (e.g. a highly trustworthy person) would be followed by significantly more 'recognitions' of the positively adjusted face (e.g. the face physiognomically altered to look more trustworthy) than after exposure to sentences depicting a low-spectrum version of that trait (e.g. an untrustworthy person), across both explicit and implicit conditions. Additionally, it was hypothesised that this effect size would be greater in the implicit condition than in the explicit condition as a result of participant resistance to the influence provoked by explicit stimuli.

## Method

### Participants

Participants were undergraduate psychology students (N=50; 42 female, 8 male) given course credit for the one-hour experiment. The mean age was 21.5 (range 17-42; *SD*=6.89). All participants reported normal or corrected-to-normal vision and were native English speakers.

## Design

This study employed a 2x1 mixed experimental design including two within subjects variables and one between subjects variable. The within subjects variables consisted of trait category with three condition levels (dominance, threat and trustworthiness) and trait spectrum with two condition levels (high and low). The between subjects variable reflected how the trait information was conveyed to participants and consisted of two condition levels (implicit and explicit).

### Computer-based recognition task.

Participants were randomly allocated to either the implicit or explicit trait information condition. They then read a sentence that either implicitly (implicit condition) or explicitly (explicit condition) linked a particular trait with an individual. The sentence either implied low or high levels of one of the three trait categories (dominance, threat or trustworthiness). The ordering of sentence presentation was randomised across trials in order to avoid the potential order-effects of trait category and trait spectrum level. A neutral face then appeared randomly selected from the relevant trait-specific pool of 24 faces (24 per trait, 72 in total). A fixation cross was viewed followed by the simultaneous presentation of two faces side by side. These faces were the initial neutral face manipulated to an equal extent along the given trait axis, one in a positive and one in a negative direction (e.g. a neutral face paired with a trustworthiness sentence would be followed by two faces physiognomically adjusted to look more or less trustworthy). The participant was then asked to select which face they had

previously seen, with the orientation of the negatively and positively adjusted faces randomised on the screen (left or right side). This was performed in order to counteract the effects of repetitive response sets (i.e. the tendency to use the same response for all/most trials) and attentional biases (i.e. the devotion of attentional resources to only one side of the screen). This recognition decision was the dependent variable, with responses coded '1' for selecting the positively adjusted face and '0' for selecting the negatively adjusted face.

## Materials

### Faces.

The face stimuli were gathered from a database of 300 Caucasian faces created by Oosterhof and Todorov (2008). They were generated using the FaceGen 3.1 Modeller program wherein dimensions were built (using a principal component analysis of vertices defining face surfaces) for manipulating levels of trustworthiness and dominance in a 50-dimensional space representing face shape. These established dimensions of face trustworthiness and dominance embody a 2D space within which other specific traits can also be physiognomically conveyed. For example, threatening faces lie in the untrustworthy/dominant spectrum and variations of this trait level were obtained through a linear combination of faces that varied simultaneously on both trustworthiness and dominance.

From this database, 24 neutral faces (those with a score of zero on both the trustworthiness and dominance dimensions) were obtained per trait category (72 overall) in addition to one positively adjusted and one negatively adjusted version of each face. Whilst the database contains three manipulations (of increasing extremity) in each direction per face, only the faces with the smallest physiognomic adjustments were selected in order to maximise participant confidence in their recognition decisions and thus decrease the potential for a

cognitive middle-step/decisional bias (i.e. realizing that the original face is absent and thus relying solely on trait information rather than perceptual faculties to select a face).

**Sentences.**

A pool of 90 implicit trait sentences was created wherein behavioural information pertaining to a given level (i.e. high or low) of a personality trait was conveyed. Specifically, this consisted of 30 sentences per trait category, half being high-spectrum and the other half low-spectrum. This was then reduced to the 24 most effective sentences per trait (corresponding to the 24 faces per trait obtained from the aforementioned database) on the basis of a conducted pilot study (modeled after Hassin and Trope's 2000 pilot) wherein 10 participants were asked to rate each sentence on a 9-point scale according to how strongly they conveyed the implied trait (1=extremely low, 9=extremely high). For each trait category, the three sentences with the lowest mean scores in the high-spectrum group were discarded as well as the three sentences with the highest mean scores in the low-spectrum group. In order to ensure that the remaining sentences didn't significantly differ in their strength of trait conveyance, a series of paired-samples t-tests were then run between the mean scores of the high-spectrum groups and the reversed mean scores of the low-spectrum groups. Within the threat condition, low-spectrum reversed means ($M$=7.54, $SD$=0.39) did not differ significantly from high-spectrum means ($M$=7.53, $SD$=0.33); $t(11)=0.08$, $p= .94$. Within the trustworthiness condition, low-spectrum reversed means ($M$=7.59, $SD$=0.36) also did not differ significantly from high-spectrum means ($M$=7.58, $SD$=0.45); $t(11)=0.05$, $p= .96$. Finally, in the dominance condition, low-spectrum reversed means ($M$=7.36, $SD$=0.33) did not differ significantly from high-spectrum means ($M$=7.52, $SD$=0.48); $t(11)=-1.32$, $p= .215$. Next, a MANOVA was run to ensure that the respective low and high spectrum means did not differ significantly between trait groups. Indeed it was found that neither the low-spectrum means, $F(2, 33)=1.41$, $p= .26$, or the high-spectrum means, $F(2, 33)=0.08$, $p= .92$, differed

significantly across the three trait categories. An example of a remaining sentence stimulus used in the high-spectrum threat category is as follows:

*"Seth intimidates all those around him with his unpredictable and often violent behaviour."*

The pool of explicit sentences was then created by taking these implicit stimuli and adding brief explicit statements of the implied traits at the beginning of each sentence. For example:

*"Seth is a threatening person, intimidating all those around him with his unpredictable and often violent behaviour."*

For the full list of trial sentences, see Appendix A.

**Presentation.**

Stimuli were presented using E-prime 2.0 on a 24" BenQ XL2420T monitor set at a resolution of 1920 x 1080 and a 60Hz refresh rate. The program was run on a Windows 7 Professional 64-bit operating system.

**Procedure**

Participants were first given a consent form (see Appendix B) and then asked to provide demographic information. This included age, gender, level of vision (ensuring all had normal or corrected-to-normal eyesight) and first spoken language. They were then tested two at a time, with each participant seated approximately 60 cm from the computer monitor, and screened from the other participant. Instructions for the recognition task were presented on screen as follows:

*"You will be presented with a series of short sentences paired with faces. Each pairing will be followed by two faces presented simultaneously. For each trial, please indicate the face you were shown, pressing 'z' for the face on the left and 'm' for the face on the right."*

Each sentence was presented until the participant had completed reading it, at which point they proceeded with a button press. The subsequent study face was presented for 2000 ms, followed by a 4000 ms fixation cross and finally the pair of test faces which lasted until a button corresponding to the left or right item presented on screen was pressed. All faces were displayed at dimensions of 5x9 cm with test faces spaced 5 cm apart from each other. Upon completing a recognition decision, the next sentence appeared immediately. This process was repeated until all 72 faces and sentences were seen. An example of the trial procedure can be seen in Figure 1.

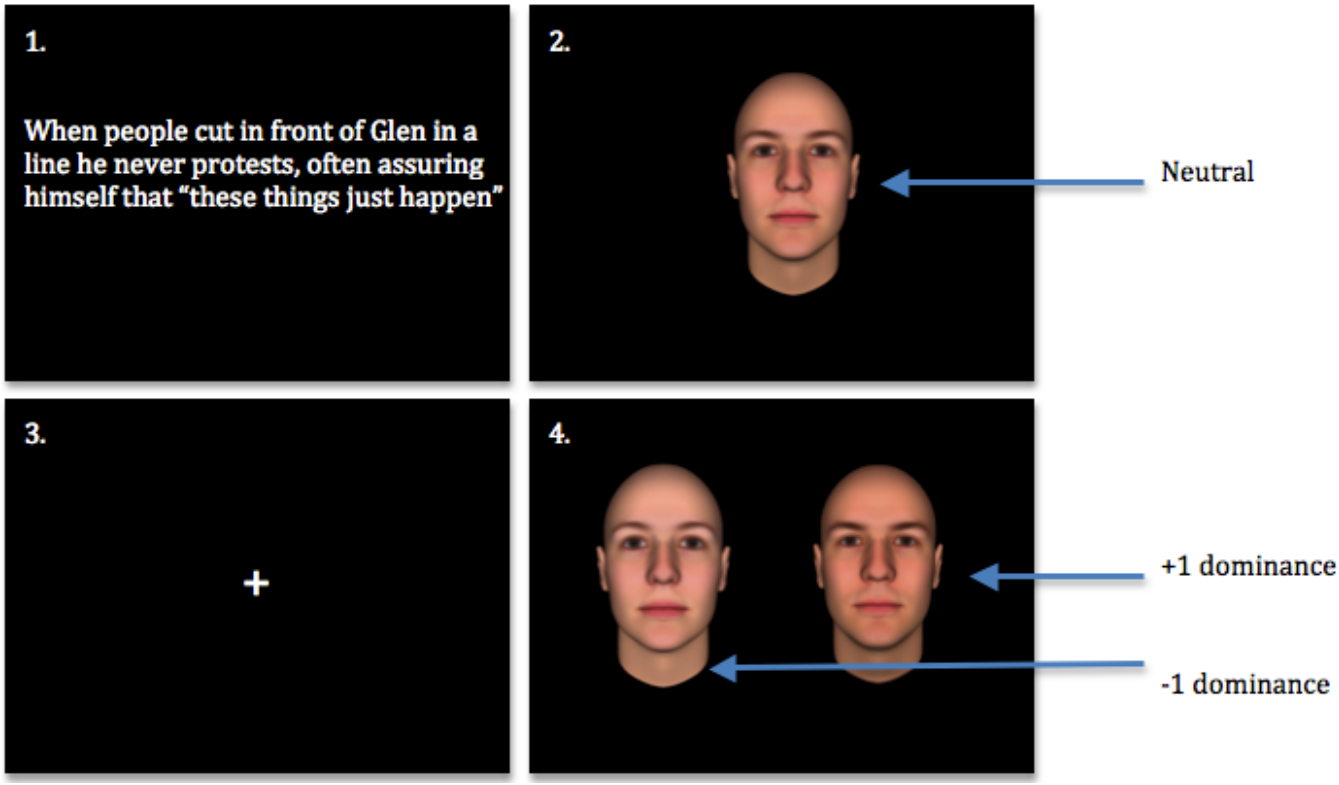


*Figure 1.* An example of a trial including: 1) Sentence stimulus (low dominance), 2) Neutral face (2000 ms exposure), 3) Fixation cross (4000 ms exposure) and 4) Test faces manipulated bidirectionally along the spectrum of dominance (left: less dominant, right: more dominant)

After every 24 trials, instructions for a break were presented on the screen as follows:

*"Break Time! <Please press the space bar when you are ready to continue>"*

Upon completion of the experimental task, participants were debriefed and asked whether they had any questions.

## Results

### The Relationship Between Explicit Trait Information and Facial Recognition Decisions

The first set of analyses was performed on data collected from the explicit trait information condition. This was done in order to determine whether or not past claims of an association between explicit trait-face pairings and perceptual change could ultimately be reinforced using an established perceptual paradigm. A paired-samples t-test was carried out to compare the average responses (i.e. predominately selected faces from the two bidirectional manipulations) of participants across the low and high trait-spectrum conditions. Responses in the low-spectrum condition ($M$=0.45, $SD$=0.12) were found to be significantly lower than those in the high-spectrum condition ($M$=0.53, $SD$=0.14); $t(24)=3.65$, $p= .001$.

This indicates that within the explicit condition, participants were biased to select the positively manipulated face (i.e. the face physiognomically adjusted to convey a higher level of the given trait) in the high-spectrum trait condition significantly more than in the low-spectrum trait condition.

### The Relationship Between Implicit Trait Information and Facial Recognition Decisions

An additional analysis was conducted to assess whether the perceptual effects noted in the above explicit condition were also evident in the implicit condition (i.e. whether trait information derived through a process of STI was powerful enough to constitute comparable perceptual phenomena). As before, a paired-samples t-test was carried out between the average responses of the low and high trait-spectrum conditions. Again, responses in the low-

spectrum condition (*M*=0.47, *SD*=0.14) were found to be significantly lower than those in the high-spectrum condition (*M*=0.56, *SD*=0.12); $t(24)=2.54$, $p= .02$.

This result is consistent with those from the explicit condition, with participants (this time primed with implicit trait information) selecting the positively manipulated face significantly more frequently in the high-spectrum trait condition than they did in the low-spectrum trait condition.

**Comparing the Effects of Explicit and Implicit Trait Information**

The relative effects of explicit and implicit trait information were then compared in determining whether or not one particular form of social stimulus was associated with a notably larger effect size than the other. A mixed-design ANOVA was carried out with the within-subjects factors of trait spectrum level (high, low) and trait category (threat, trustworthiness, dominance) and the between-subjects factor of information conveyance type (explicit, implicit). No significant difference was found between the effects of the implicit and explicit conditions, $F(1, 48)=0.74$, $p= .40$, $\eta_p^2= .02$, indicating that both methods of trait conveyance were as effective as one another in eliciting the aforementioned effect of trait spectrum level on face selection. Additionally, no significant interactions were found between information conveyance type and trait spectrum, $F(1, 48)=0.08$, $p= .79$, $\eta_p^2 = .00$, or trait category $F(1.6, 76.54)=0.39$, $p= .63$ $\eta_p^2= .01$. The three-way interaction between trait information conveyance type, trait spectrum and trait category also proved insignificant, $F(2, 96)=0.73$, $p= .49$, $\eta_p^2= .02$.

As expected based on the above analyses, there was a main effect of trait level, $F(1, 48)=16.56$, $p= .00$, $\eta_p^2= .26$ (see Figure 2).

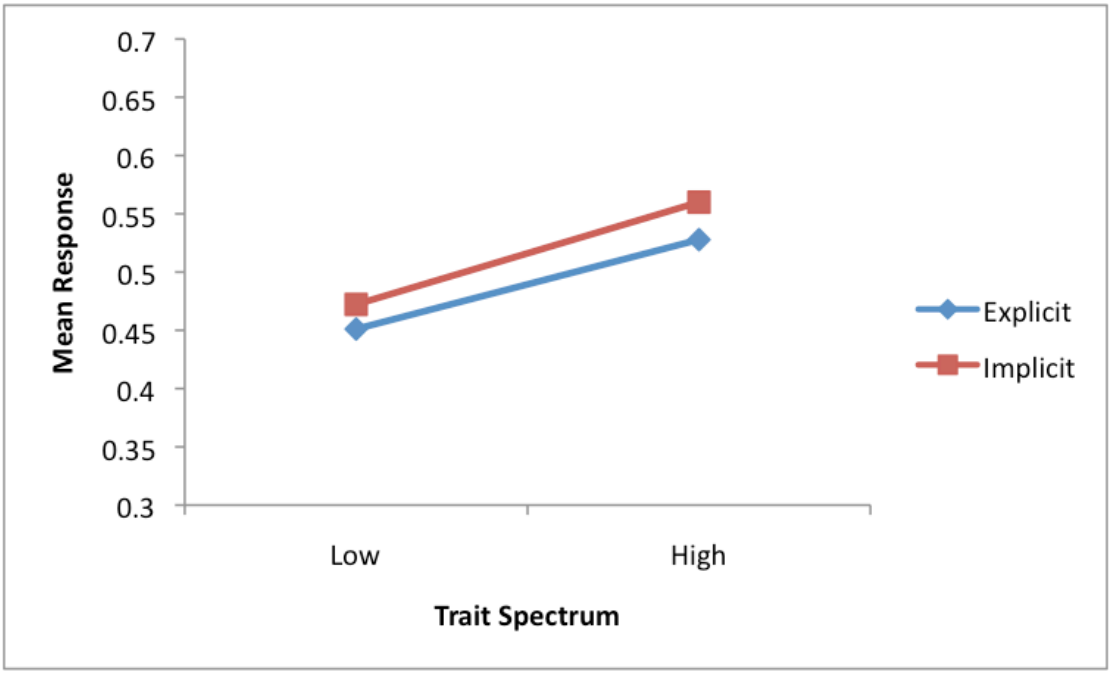


*Figure 2.* Mean response by trait spectrum across information conveyance types

**Other Findings**

For the within-subjects variable of trait category, Mauchly's test indicated that the assumption of sphericity had been violated ($\chi^2(2)=17.70$, $p= .00$), therefore degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon= .80$). A significant main effect was found for this factor, $F(2, 76.54)=9.85$, $p= .00$, $\eta_p^2= .17$, although it's interactions with trait information conveyance, $F(1.6, 76.54)=0.39$, $p= .63$, $\eta_p^2= .01$, and trait spectrum level, $F(2, 96)=0.27$, $p= .77$, $\eta_p^2= .01$, failed to reach significance. To investigate this main effect, post hoc pairwise comparisons were conducted across the three trait categories using Bonferroni adjusted alpha levels of .0167 per test (.05/3). Results indicated that the average of responses in the trust condition ($M=0.43$, $SD=0.11$) was significantly lower than those of both the threat condition ($M=0.55$, $SD=0.18$), $p= .00$, and dominance condition ($M=0.52$, $SD=0.18$), $p= .02$. The pairwise comparison of the threat condition and dominance condition was non-significant, $p= .42$.

# Discussion

## The Results

The results supported the first hypothesis, with scores in the high-spectrum group being significantly higher than those in the low-spectrum group, across both explicit and implicit conditions. Specifically, this means that sentences conveying high-spectrum traits were, on average, followed by significantly more recognitions of the positively adjusted face compared to those made after exposure to low-spectrum sentence depictions of that same trait. Within the context of the explicit condition, this finding lends support to the 'reading into faces' phenomenon proposed by Hassin and Trope (2000). That is, despite their study's limitation of attempting to capture a perceptual effect using a non-perceptual method (i.e. measuring information-induced changes to face perception with an arbitrary Likert scale of discrete features), it appears their drawn conclusions are still corroborated by this study's findings. Therefore, the potential confound of decisional bias (i.e. a cognitive middle-step informing participant ratings) that pulled the validity of their claims into question has largely been controlled for through the use of a common experimental perception paradigm (i.e. the recognition task).

The significance of this discerned effect in the implicit condition seems to indicate that traits inferred from behavioural information alone are also capable of producing a considerable 'reading into faces' effect. That is, the automatic process of STI appears to be adequately efficient to sift through implicit accounts and extract a relevant trait concept which is then available for pairing with a given face stimulus. Ultimately, this pairing and its subsequently noted perceptual effect lend support to the notion that trait concepts activated through STI are bound to the relevant person (in this case represented by a face stimulus) and not just their behaviour (Todorov & Uleman, 2003).

The second hypothesis however was disconfirmed, with the results conveying no significant difference between the effects of trait information on recognition decisions in the explicit and implicit groups. This would suggest that the trait-face pairings made throughout the course of the experiment were similar in effectiveness, regardless of information conveyance type. Such a finding is inconsistent with the existing literature surrounding explicit/implicit stimuli used as a basis for the unsupported hypothesis. This literature suggests that perceived attempts to force interpersonal impressions onto participants (i.e. explicit trait sentences) will be met with more skeptical evaluations and automatic resistance compared to information housed in implicit stimuli (i.e. trait-imbued behavioural sentences), which can purportedly bypass such defenses (Skowronski, Carlston & Isham, 1993; Petty & Cacioppo, 1986). While this lack of significant difference between the effects of explicit and implicit trait associations on perceptual judgments about faces may indicate that such claims of resistance to experimental influence are unfounded, it is possible too that participants were as aware of the interpersonal impressions being imposed upon them by behavioural (i.e. implicit) sentences as they were in the case of the explicit trait-face pairings. Alternatively, it is also possible that under the instructions of a facial recognition task (i.e. a seemingly objective measure of memory), participants perceived neither the implicit/explicit information as overt attempts to exert impression-based influence on them but rather as unrelated information to be remembered for testing at a later stage in the experiment (thus not hindering the binding of information with face stimuli).

The unpredicted main effect of trait category indicates that participants were more inclined to select the negatively manipulated faces in the trustworthiness condition than they were in the threat and dominance conditions. This may suggest that across both high and low trait-spectrum conditions, participants were more likely to perceive and encode the neutral faces in the trustworthiness condition as already possessing physiognomic characteristics

linked to lower levels of trustworthiness, thereby leading to a greater recognition of low-trustworthiness faces regardless of the provided trait information. Todorov, Baron and Oosterhof (2008) provide a possible explanation for this phenomenon in their model-based approach to evaluating face trustworthiness. Specifically, a functional Magnetic Resonance Imaging study was used to measure brain activity during participant exposure to novel faces of varying trustworthiness (manipulated through associated facial cues). They found a negative linear response in the right amygdala, with face untrustworthiness being associated with significant increases in amygdala activity. This would suggest that the amygdala, a significant neural component in face evaluation, demonstrates higher sensitivity levels to cues of low trustworthiness. This notion may account for the discerned main effect of trait category, with participants being more attuned to potential cues of low trustworthiness inherent in the neutral faces.

**Implications**

Overall, the findings of this study indicate that socially charged information, when paired with a given face, leads us to associate that same individual with physiognomic features innately linked with the underlying trait category assigned to them. Furthermore it seems that these associations function at a perceptual level, with certain physiognomically adjusted face representations (i.e. those with key trait-related facial cues accentuated) more readily recognised than others. This effect appears to hold true regardless of whether such personality traits are conveyed in an explicit or implicit medium.

The wider implications of such an effect primarily surround its practical application in daily social functioning. That is, it provides further evidence of gossip's complex and substantial impact on the many exposed to it. While previous research has shed light on its efficient creation of enduring valenced impressions and endowment of faces with perceptual

salience, this study lends support to the idea that gossip also shifts the way we perceive these given faces and their component features. Hassin and Trope (2000) suggest that this effect initiates a dialectical process involving the interplay of 'reading into faces' and 'reading from faces' phenomena. Specifically, they assert that social information associated with an individual automatically inclines us to perceive trait-related physiognomic features (i.e. the main effect noted in this study), with this adjusted percept forming the new frame in which the relevant face is interpreted. The traits subsequently inferred from this interpretation go on to further revise perception of that face and so on. Thus if this dialectical process holds true, the effect of physiognomy grows rapidly over time in creating enduring impressions of others, steeped in both perceptual and cognitive biases. While, from an evolutionary perspective, this gossip-induced cycle would form a useful adaptive mechanism in tailoring optimal social networks through informed avoidance and approach behaviours (i.e. avoiding people perceived to be dangerous and approaching those who seem to possess qualities useful in the aid of daily functioning), it would also be considerably problematic in light of the false information such gossip often perpetuates.

Once targeted by gossip and bound to positive/negative trait information (whether true or false), it may prove difficult to break such associations due to this ongoing dialectical process and its inherent biases. Within a given social environment (e.g. a school or workplace), it is likely that the propagation of said biases is critical to an individual's social functioning and development. This notion is supported by Wentura, Rothermund and Bak (2000) who assert the existence of a universal attention mechanism, sensitive to interpersonal trait adjectives that may signal safe or risky environments (e.g. 'friendly', 'ruthless'). They found that mere exposure to such words triggered automatic avoidance and approach behaviours, with participants withdrawing their finger from a key significantly more when presented with 'risk' adjectives and pressing the key significantly more when shown 'safe'

adjectives. Thus, mere pairing with negative trait information may elicit avoidance-type behaviours from others while positive information parings may evoke approach-type behaviours instead. Similarly, Oosterhof and Todorov (2008) note that certain physiognomic features can automatically trigger these avoidance and approach behaviours. They implicate a process of spontaneous face evaluation (akin to the 'reading from faces' phenomenon), wherein certain visual cues (i.e. features resembling expressions such as anger or happiness) are rapidly processed in determining whether a person should be approached or avoided. Together these findings suggest that gossip's perceptual and cognitive biases may determine the nature and quality of our regular interactions (via the elicitation of approach and avoidance behaviour), thereby defining interpersonal networks and imposing the parameters of our social development.

Some wider implications of this study's discerned perceptual effect (and the subsequently initiated dialectical process) are thus embedded in the importance of effective social functioning and development. For instance, a significant link has been found between social rejection in early life and the development of antisocial/aggressive behaviour patterns over the course of only two years (Dodge et al., 2003). Contrastingly, a path analysis run on self-report scores of a national U.S. sample uncovered a significantly negative association between 'social capital' (defined as resources embedded in social networks) and psychological distress (Song, 2011). It is apparent therefore, that social functioning, as determined by the quality of our established networks (shown to be significantly shaped by gossip and its perceptual/cognitive effects), is vital to personal health and wellbeing.

At a less personal level, the effect of trait information on visual perception can unconsciously influence our decision-making ability, despite attempts to maintain objectivity. For example, propaganda is a widely used method of conveying exaggerated social information about political candidates. While we may be able to accurately evaluate the

validity of these messages at a conscious level, it is possible that the mere trait-face pairings are sufficient to produce perceptual changes which in turn bias our views/opinions of the given candidate (i.e. the initiation of the dialectical process) and inform voting behaviour. In an examination of the inherent perceptual biases in voting, Chiao, Bowman and Gill (2008) found that a sample of American university students voted significantly more for hypothetical presidential candidates whose faces were rated higher in traits such as competence, attractiveness and approachability, regardless of political policy. This would suggest that trait information derived from face perception alone (with these percepts potentially being affected by precursory propagandist trait information via the 'reading into faces effect') plays an influential role in decision-making, even when such decisions are intended to reflect objective appraisal (e.g. the careful consideration of political policy).

## Possible Limitations of the Study and Future Research Directions

### Design.

While the use of a perceptual recognition task would likely have attenuated the cognitive middle-step that past research methods were vulnerable to (i.e. participant reliance on conscious deliberation rather than mere perception to make task decisions), it is possible that such biases still crept into the current study's results. Specifically, when participants were unable to confidently retrieve and recognise a trial face, they may have employed representative heuristics in reaching their subsequent decision. Outlined in a paper by Tversky and Kahneman (1974), this heuristic, or mental shortcut, is supposedly one of many decisional biases called upon by humans to make judgments in times of uncertainty. Specifically it involves the selection of an outcome that is most representative of a given input. In this case, the 'input' would be the trait information and the 'outcome' the face deemed to best match (i.e. represent) such a description of character. That is, when uncertain,

participants may have relied solely on the provided information by selecting a face on the basis of its perceived congruence with the given personality type (e.g. a description of a highly threatening individual eliciting the selection of an angrier, coarser looking face stimulus). In this case, the recorded results would indicate the deliberate accessing of trait schema (i.e. mental stereotypes of people according to personality type) rather than confident recognition decisions grounded in significant shifts in visual perception.

In order to minimise this conscious interference component, future research efforts should aim to ensure that participants are unable to explicitly recall trait-face pairings. This would ultimately prevent the conscious use of a social description in selecting a face according to its perceived representativeness. In the event of uncertainty in a trial, participants would thus be forced to randomly guess, with result trends more accurately indicating the magnitude of perceptual effects without noise from cognitively derived decisions. In order to achieve this, a priming experimental design could be employed with distinct learning and test phases. The former would consist of exposure to the full series of neutral faces paired with trait information while the latter would successively show, in a randomised order, the manipulated face pairs (i.e. the bidirectional physiognomic adjustments of the neutral stimuli) and require participants to nominate the faces that they can recall. A potential problem of this design however, lies in its demands on memory. That is, past research has demonstrated only that valenced impressions (i.e. attributions of positive/negative value to a given actor) can be retrieved for faces primed with social information (Bliss-Moreau et al., 2008). However, the information required to activate key physiognomic concepts (i.e. trigger perceptual change) needs to contain richer detail, enabling the target individual to be evaluated and placed on a two-dimensional spectrum of valence/trustworthiness and power/dominance (Todorov et al., 2008). Thus the results of such a study may not only reflect changes to perception but also the limitations of memory capacity.

Another limitation in the current study's design can be found in the potential effect of accidental pairings between trait information and test faces. That is, it is possible that trait concepts activated by the sentence stimuli not only affected perception of the paired neutral face but also of the two physiognomically adjusted faces, to which the information was automatically and unintentionally paired as well. This notion is supported by Ferguson and Bargh (2004) who suggested that the social categories activated by priming stimuli (e.g. African American racial stereotypes) extend significant influence over subsequent judgments of items not explicitly linked to the priming object (e.g. the categorisation of race-ambiguous faces). In the context of the current study, a trait information sentence may have shifted participant perception of all three trial faces by accentuating relevant physiognomic cues (e.g. a high dominance sentence enhancing the dominant features of the face stimuli), thereby reducing the recorded effect size. By making the aforementioned design amendment of a two-phase priming task, a different trait category can be activated for each neutral face stimulus without intermediary exposure to the adjusted pair of test faces. In addition to compensating for this potential limitation, the modified experimental design would also enable future researchers to investigate the duration of the induced perceptual change by manipulating the time interval between learning and test phases. This is an important factor to note in further assessing the overall power and importance of the 'reading into faces' effect.

**Sentence stimuli.**

Within the implicit condition, sentences may have been tapping into numerous trait inferences above and beyond the single intended trait type (e.g. high dominance incidentally activating aggression and arrogance social categories). As a result, perception may have been shifted across the physiognomic dimensions in significantly different ways from the matched explicit trials. If this were true, the effect-size comparison between explicit and implicit conditions would be rendered largely invalid as the trials would not have been appropriately

matched across groups, with different trait-face pairings eliciting different perceptual effects. However, this limitation is likely insignificant in light of the widely credited spreading-activation theory of semantic processing. This theory, often used to explain semantic priming effects (e.g. faster response times to target words when preceded by a semantically related concept), suggests that associative neural networks are established so that the activation of one node (i.e. semantic concept) efficiently spreads out in activating other linked nodes as well (Collins & Loftus, 1975; Bodner & Masson, 2003). Applying this framework, the activation of multiple related trait categories likely occurred in both the explicit and implicit conditions, thus maintaining the validity of the intergroup effect comparison performed in the current study.

Another potential limitation of the derived sentence stimuli is the lack of linguistic-structure control across implicit and explicit groups. That is, implicit trait statements were translated to explicit ones through the simple addition of a short trait statement before the subsequent behavioural description. This method was selected in order to alter as little of the sentence content as possible, thus ensuring the trials matched as closely as possible across the explicit and implicit groups for the sake of later comparison. In the process however, a systematic difference between sentence lengths was introduced across conditions. Marton, Schwartz, Farkas and Katsnelson (2006) demonstrated that increases to sentence length and grammatical complexity (both syntactic and morphological) negatively correlate with working memory performance. As a result, the effect size of the current study's explicit condition may have been significantly reduced due to slightly higher memory demands weakening the face-trait pairings. In future research efforts, new explicit items can be created and matched with their implicit counterparts on the basis of linguistic structure.

**Face stimuli.**

As previously discussed, the discerned effect of trait information on perception appears to be an adaptive mechanism used by humans to trigger avoidance/approach behaviours in maximizing survival ability. Because of this, it is possible that the effect is only fully initiated in a more realistic context, when the stimuli (i.e. propagated trait information and faces) are evolutionarily salient. A limitation of this study would thus be the use of computer-generated faces instead of real-life faces in trial tasks. Todorov et al. (2008) however show that this might not be the case, with a principle components analysis revealing that participant trait judgments of computer-generated faces (the same ones used in the current study) demonstrated remarkable similarity to those made about real faces.

A final potential limitation can be seen in the use of a forced-choice task to gauge perceptual change. The omission of the initial neutral faces from the subsequent recognition options was primarily carried out for the sake of analysis (i.e. the enabling of dichotomous coding for 'positive' and 'negative' selections). As a result of this decision, scores may have reflected a deceptively high effect size, with every trial response indicating the recognition of a physiognomically adjusted face. This however should not have occurred, as the absence of an underlying effect would have prompted randomised response patterns, with scores averaging out to indicate an equal tendency of selecting either test face regardless of condition (i.e. a null effect). In the future however, this experiment should be run with the inclusion of the neutral face for recognition, enabling participants to actively select the initially paired face and more accurately indicate their stored perceptions.

**Conclusions**

Overall, this study succeeded in discerning an association between trait information and visual perception. Specifically, the pairing of neutral face stimuli with high-spectrum traits inclined participants to 'recognise' positively manipulated faces (i.e. the learned neutral

faces tweaked positively on a number of trait-specific physiognomic cues) more frequently than when paired with low-spectrum traits, regardless of whether this information was conveyed implicitly or explicitly. This finding supports the 'reading into faces' effect found in previous research, wherein the efficient binding of faces with valenced trait information (via the common social ritual of gossip) ultimately shifts perception of that given face in line with innate trait-linked physiognomies. While these past efforts have measured the said effect using non-perceptual means (e.g. the use of Likert scales for arbitrary ratings of facial features), the current study employed the perceptual paradigm of a recognition task, thus lending credence to the notion that the phenomenon in question is perceptually based and not a result of conscious thought processes and decisional biases. However, in further reducing the potential that such biases crept into the results (e.g. participant reliance on the representativeness heuristic when uncertain), future research should employ a priming task with distinct learning and test phases.

In the context of daily social functioning, the discerned visual bias can serve to create enduring impressions (whether true or false), further consolidated by a dialectical process between trait information and physiognomic cues. Through the elicitation of avoidance or approach behaviours, such biases would likely influence our social networks and consequently the nature and extent of our interpersonal interactions. All in all, it would seem that this socially vital faculty of face perception is not quite as reliable as many would believe, with what we know (or think that we know) about others ultimately influencing the way we see them.

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# Appendix A

## Sentence Stimuli

Table A1

*Low-spectrum Dominance Sentences*

| Sentence number | Implicit | Explicit |
|---|---|---|
| 1 | John doesn't like to lead others, usually allowing them to walk all over him. | John is a submissive person, usually allowing people to walk all over him. |
| 2 | Harry tends to back down quickly when he is confronted by others. | Harry is a submissive person, usually backing down quickly when he is confronted by others. |
| 3 | Dean hates bossing people around, instead preferring to follow orders. | Dean is a submissive individual. He hates bossing people around, instead preferring to follow orders. |
| 4 | Lawrence doesn't feel the need to make his presence known, usually blending into the crowd instead. | Lawrence is not a dominant person. He doesn't feel the need to make his presence known, usually blending into the crowd instead. |
| 5 | Frank usually speaks at a low volume, not wanting to attract attention in a group of people. | Frank is not at all dominant. He usually speaks at a low volume, not wanting to attract attention in a group of people. |
| 6 | Daniel never raises his hand to be the project leader in class assignments, believing that others are better suited to the position than him. | Daniel is not a dominant person. He never raises his hand to be the project leader in class assignments, believing that others are better suited to the position than him. |
| 7 | When people cut in front of Glen in a line he never protests, often assuring himself that "these things just happen". | Glen is not at all dominant. When people cut in front of him in a line he never protests, often assuring himself that "these things just happen". |
| 8 | Sean doesn't enjoy playing competitive | Sean has a submissive |

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| | sports, he usually ends up getting pushed around and told what to do by everyone. | personality. He doesn't enjoy playing competitive sports, usually ending up getting pushed around and told what to do by everyone. |
| 9 | When it comes to making plans, Adam likes to 'go with the flow', mostly doing what his friends suggest. | Adam is submissive. When it comes to making plans, he likes to 'go with the flow', mostly doing what his friends suggest. |
| 10 | Most of the time Lewis keeps his opinions to himself, avoiding all debates/disagreements with others. | Lewis is not a dominant person. Most of the time he keeps his opinions to himself, avoiding all debates/disagreements with others. |
| 11 | When meeting new people Brian is very quiet, allowing everyone else to do the talking. | Brian is not at all a dominant individual. When meeting new people he is very quiet, allowing everyone else to do the talking. |
| 12 | George makes very little commission in his retail job because he lets all the other employees steal his sales. | George is a submissive person. He makes very little commission in his retail job because he lets all the other employees steal his sales. |

Table A2

*High-spectrum Dominance Sentences*

| Sentence number | Implicit | Explicit |
|---|---|---|
| 1 | Mike always wants to boss everyone around, keeping them all 'in line'. | Mike is a dominant person, bossing everyone around in order to keep them all 'in line'. |
| 2 | Tim hates to lose an argument, often carrying on until the other person admits they're wrong. | Tim is always dominant; he hates to lose an argument and often carries on until the other person admits that they're wrong. |
| 3 | Jack can't stand being bossed around; he prefers to control the actions of others. | People agree that Jack is a dominant person. He can't stand being bossed around, preferring to control the actions of others. |

| | | |
|---|---|---|
| 4 | Max hates to go unnoticed in crowds, instead being loud and making sure that people know exactly who he is. | Max has a dominant personality. He hates to go unnoticed in crowds, instead being loud and making sure that people know exactly who he is. |
| 5 | James makes sure to speak the loudest in a group of people so that his voice is always heard. | James enjoys being dominant. He makes sure to speak the loudest in a group of people so that his voice is always heard. |
| 6 | In class projects, Charlie always nominates himself to be the group leader. | Charlie is a dominant individual. In class projects, he always nominates himself to be the group leader. |
| 7 | Chad is an excellent soccer player; he is always striving to prove that he is faster and more skilled than others. | Chad is a dominant person and excellent soccer player; he is always striving to prove that he is faster and more skilled than others. |
| 8 | Jake is a high-powered salesman. He does whatever it takes to make the most the sales and prove that he is superior to the other members of staff. | Jake has a dominant personality and is a high-powered salesman. He does whatever it takes to make the most the sales and prove that he is superior to the other members of staff. |
| 9 | People don't like inviting Darren to friendly poker matches, he always gets overly competitive and aggressive to show that he is the best. | Darren is dominant. People don't like inviting him to friendly poker matches, he always gets overly competitive and aggressive to show that he is the best. |
| 10 | At parties, Benjamin is always striving to be the centre of attention, usually perceiving the other popular guys as 'competition'. | Benjamin is a dominant person. At parties, he is always striving to be the centre of attention, usually perceiving the other popular guys as 'competition'. |
| 11 | Joel is aggressive towards people who try to exert authority over him; in his eyes he is the one 'in charge'. | Joel is dominant. He is aggressive towards people who try to exert authority over him; in his eyes he is the one 'in charge'. |
| 12 | Guy spends most of his free time in the | Guy is a dominant |

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| | gym, using his physical size to intimidate and control others. | individual. He spends most of his free time in the gym, using his physical size to intimidate and control others. |

Table A3

*Low-spectrum Threat Sentences*

| Sentence number | Implicit | Explicit |
|---|---|---|
| 1 | People often say that Cameron has a gentle heart that makes him easier to approach and be around. | Cameron is a non-threatening person, people say he has a gentle heart that makes him easier to approach and be around. |
| 2 | When a situation is tense, Mark likes to calmly talk through and solve the problems at hand. | Mark poses no threat to others. When a situation is tense, he likes to calmly talk through and solve the problems at hand. |
| 3 | Jim is always happy to help others, demonstrating great patience and understanding when doing so. | Jim is a non-threatening individual. He is always happy to help others, demonstrating great patience and understanding when doing so. |
| 4 | Aaron channels his aggression productively into art, hardly ever feeling hostile towards others. | Aaron is not threatening at all. He channels his aggression productively into art, hardly ever feeling hostile towards others. |
| 5 | People enjoy being in Jackson's company; he loves telling jokes and rarely gets tense. | Jackson is a non-threatening person. Others enjoy being in his company; he loves telling jokes and rarely gets tense. |
| 6 | Barry is always relaxed, never responding aggressively to others even when provoked. | Barry is not a threatening person. He is always relaxed, never responding aggressively to others even when provoked. |
| 7 | Brandon does not have a temper, he always 'keeps his cool' under stressful situations. | Brandon is not a threatening person. He does not have a temper and always 'keeps his cool' under stressful situations. |
| 8 | Brett hates violence; he avoids conflict as | Brett is an unthreatening |

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|---|---|---|
| | much as possible by staying on everyone's 'good side'. | person. He hates violence and avoids conflict as much as possible by staying on everyone's 'good side'. |
| 9 | Eli is afraid of confrontation, often taking measures to avoid such situations. | Eli is not a threatening individual. He is afraid of confrontation, often taking measures to avoid such situations. |
| 10 | When Devan feels physically threatened by others he responds by running away as quickly as possible. | Devan is not a threatening person. When he feels physically threatened by others he responds by running away as quickly as possible. |
| 11 | Simon is not easily provoked, even when harshly insulted by others he tends to shrug it off. | Simon is an unthreatening person. He is not easily provoked, even when harshly insulted by others he tends to shrug it off. |
| 12 | Jay is considered to be an easygoing person, he enjoys the company of others and never gets angry. | Jay is not at all threatening. He is considered to be an easygoing person, enjoying the company of others and never getting angry. |

Table A4

*High-spectrum Threat Sentences*

| Sentence number | Implicit | Explicit |
|---|---|---|
| 1 | Seth intimidates all those around him with his unpredictable and often violent behaviour. | Seth is a threatening person, intimidating all those around him with his unpredictable and often violent behaviour. |
| 2 | Terry doesn't respond well to criticism, often resorting to physical violence. | Most people feel threatened by Terry, he doesn't respond well to criticism and often resorts to physical violence. |
| 3 | Phil does not like helping others; he is impatient with their problems and often gets aggressive when his frustration grows. | Phil is a threatening figure. He does not like helping others; becoming impatient with their problems and often getting |

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| | | aggressive when his frustration grows. |
| 4 | Will keeps his aggression pent up for long periods of time, often unleashing them in sudden displays of rage. | Will is a threatening person. He keeps his aggression pent up for long periods of time, often unleashing them in sudden displays of rage. |
| 5 | People tend to avoid Clay; he makes situations tense by harshly insulting and staring at others. | Clay has a threatening personality. Others tend to avoid him; he makes situations tense by harshly insulting and staring at others. |
| 6 | It doesn't take much to spark Tom's temper, with even the slightest provocation setting him off. | Tom is a threatening person. It doesn't take much to spark his temper, with even the slightest provocation setting him off. |
| 7 | Gavin doesn't like to take threats 'lying down'. Instead, he responds quickly with physical violence. | Gavin is a threatening person. He doesn't like to take threats 'lying down', instead responding quickly with physical violence. |
| 8 | Johnny is considered to be a tense person, he does not like to be in the company of others and easily gets irritated. | Johnny is a threatening individual. He is considered to be a tense person who does not like to be in the company of others and easily gets irritated. |
| 9 | Jamie enjoys confrontation, often starting trouble with others for no apparent reason. | Jamie is a threatening figure. He enjoys confrontation, often starting trouble with others for no apparent reason. |
| 10 | Kevin has a mean temper, often lashing out at others when in high-stress situations. | Kevin poses a threat to others. He has a mean temper, often lashing out when in high-stress situations. |
| 11 | Luke goes through sudden inexplicable mood shifts, calm and collected one moment and aggressive the next. | Luke is threatening individual. He goes through sudden inexplicable mood shifts, calm and collected one moment and aggressive the next. |
| 12 | Jerry is usually quite tense around others, | Jerry is a threatening |

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| | making his behaviour very unpredictable and hostile. | person. He is usually quite tense around others, making his behaviour very unpredictable and hostile. |

Table A5

*Low-spectrum Trustworthiness Sentences*

| Sentence number | Implicit | Explicit |
|---|---|---|
| 1 | Jason likes to talk behind people's backs and frequently shares his friend's secrets with others. | Jason is not a trustworthy person, talking behind people's backs and sharing his friend's secrets with others. |
| 2 | Sam manipulates others to his own advantage, including friends. | Sam is untrustworthy. He manipulates others to his own advantage, including friends. |
| 3 | Stan's actions, even when they appear good, are often guided by ulterior motives. | Stan is not trustworthy. His actions, even when they appear good, are often guided by ulterior motives. |
| 4 | People don't like to confide in Tristan, he enjoys gossiping on a regular basis. | Tristan is not a trustworthy person. People don't like to confide in him as he enjoys gossiping on a regular basis. |
| 5 | Gary was given $100 to deposit in his friend's savings account but instead deposited $80 and kept the remaining amount for himself. | Gary is untrustworthy. He was given $100 to deposit in his friend's savings account but instead deposited $80 and kept the remaining amount for himself. |
| 6 | Karl asked for his classmate's essay as a guide to help him write his own but then plagiarized the whole thing. | Everyone knows that Karl is not trustworthy. Once he asked for his classmate's essay as a guide to help him write his own but then plagiarized the whole thing. |
| 7 | Kieran promised to deliver a letter between two friends without opening it but didn't hesitate to read through it in privacy. | Kieran is not a trustworthy person. He promised to deliver a letter between two friends without opening it but didn't hesitate to read through it in privacy. |

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| 8 | Pat is known to be a liar, frequently deceiving friends and family to achieve his own ends. | Pat is untrustworthy and known to be a liar, frequently deceiving friends and family to achieve his own ends. |
| 9 | Richard sold his expensive car to a couple even though he knew it was malfunctioning. | Richard isn't a trustworthy individual. He sold his expensive car to a couple even though he knew it was malfunctioning. |
| 10 | Rob took his friend's book manuscript and tried to sell it off to publishers as his own work. | Rob is not trustworthy. He took his friend's book manuscript and tried to sell it off to publishers as his own work. |
| 11 | Saul was asked to take care of the house whilst his parents were away but instead held a destructive party. | Saul is untrustworthy. He was asked to take care of the house whilst his parents were away but instead held a destructive party. |
| 12 | Rowen borrowed a bunch of his friend's CD's and sold them without permission. | Rowen is an untrustworthy person. He borrowed a bunch of his friend's CD's and sold them without permission. |

Table A6

*High-spectrum Trustworthiness Sentences*

| Sentence number | Implicit | Explicit |
|---|---|---|
| 1 | Josh is always willing to keep a secret and look after his friend's best interests. | Josh is a trustworthy person, always willing to keep a secret and look after his friend's best interests. |
| 2 | Chris rarely takes advantage of other people, often acting to further their interests as well as his. | Chris is considered to be a trustworthy person. He rarely takes advantage of other people, often acting to further their interests as well as his. |
| 3 | David's actions are driven by good intentions, never by hidden agendas. | David is trustworthy. His actions are driven by good intentions, never by hidden agendas. |
| 4 | Ryan doesn't engage in gossip, he respects everyone's privacy. | Ryan is trustworthy. He doesn't engage in gossip, |

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| | | instead respecting everyone's privacy. |
| 5 | Blake never cheats at board games, even when he is left alone. | Blake is a trustworthy individual. He never cheats at board games, even when he is left alone. |
| 6 | Eric never dobs his friends in, even when it would benefit him to do so. | Eric is definitely a trustworthy person. He never dobs his friends in, even when it would benefit him to do so. |
| 7 | When Zack found a $50 note that his friend had left behind, he promptly returned it. | Zack is trustworthy. When he found a $50 note that his friend had left behind, he promptly returned it. |
| 8 | RJ is known to keep all the promises he makes to others, no matter what. | RJ is a trustworthy person. He is known to keep all the promises he makes to others, no matter what. |
| 9 | When a friend or family member loans Tony money he always pays it back as soon as possible. | Tony is known to be trustworthy. When a friend or family member loans him money he always pays it back as soon as possible. |
| 10 | When Bruce's parents went overseas, he looked after the house well and resisted the temptation to host a party. | Bruce is a trustworthy individual. When his parents went overseas, he looked after the house well and resisted the temptation to host a party. |
| 11 | When Clark is asked to do a favor for someone, he makes an effort to get the job done right. | Clark is always trustworthy. When asked to do a favor for someone, he makes an effort to get the job done right. |
| 12 | Logan does what he's supposed to at work, even when there's no one around to monitor him. | Logan is trustworthy. He does what he's supposed to at work, even when there's no one around to monitor him. |

Appendix B

Consent Form

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Faculty of Human Sciences
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Fax: +61 (0)2 9850 8062
Email: psy@psy.mq.edu.au

## Information and Consent Form

Name of Project: "How does what you know about someone impact your ability to recognise them?"

Thank you for your interest in this research project. The purpose of our research is to examine memory for information about people and how it might impact your ability to recognize them. The study is being conducted by Dane Smith (dane.smith@students.mq.edu.au) to meet the requirements of Bachelor of Psychology (Honours) under the supervision of Dr. Kim Curby (02 9850 4153, kim.curby@mq.edu.au) of the Department of Psychology.

If you decide to participate, you will be asked to make a series of simple judgments about faces and to learn some information about these faces. The stimuli will be presented on a display and you will respond by pressing keys on a keyboard. The study will take place over a single session of approximately 60 minutes, including several short breaks. Participants will be assigned 2 credit points for their time. The risks involved in this study are minimal – similar to those associated with working at a computer for an equivalent duration.

Any information or personal details gathered in the course of the study are confidential, except as required by law. No individual will be identified in any publication of the results. Only the researchers in this study will have access to your data. A summary of the results of the data can be made available to you on request via email to Dane Smith (dane.smith@students.mq.edu.au).

Participation in this study is entirely voluntary: you are not obliged to participate and if you decide to participate, you are free to withdraw at any time without having to give a reason and without consequence. Your course credits will not be forfeited if you choose to withdraw.

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I have read and understand the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep.

Participant's Name (Block letters):_____

Participant's Signature:_____ Date:_____

Investigator's Name (Block letters):_____

Investigator's Signature:_____Date:_____

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics (telephone (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

**(PARTICIPANT'S COPY/ RESEARCHER'S COPY)**