

# Impact of the compensation effect on facial representations

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**Master en Sciences Psychologiques, à finalité approfondie**

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*“At fifty, everyone has the face he deserves”*

– George Orwell



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## Table of contents

|                                                            |          |
|------------------------------------------------------------|----------|
| <b>I. INTRODUCTION .....</b>                               | <b>1</b> |
| <b>II. THEORETICAL FRAMEWORK .....</b>                     | <b>3</b> |
| CHAPTER 1: Social perception.....                          | 3        |
| 1. Fundamental dimensions of social perception .....       | 3        |
| 2. The Stereotype Content Model .....                      | 6        |
| 3. Relations between warmth and competence .....           | 8        |
| 4. Experimental work on the compensation effect .....      | 9        |
| 5. Conclusion.....                                         | 16       |
| CHAPTER 2: Face processing.....                            | 17       |
| 1. Face processing and personality perception.....         | 17       |
| 2. Core dimensions of face processing.....                 | 19       |
| 3. Facial representations.....                             | 21       |
| 4. Linking facial model and Stereotype Content Model ..... | 23       |
| 5. Conclusion.....                                         | 25       |
| CHAPTER 3: The present work .....                          | 27       |
| 1. Theoretical rationale.....                              | 27       |
| 2. Study 1 .....                                           | 29       |
| 3. Study 2 .....                                           | 30       |

|                                                            |           |
|------------------------------------------------------------|-----------|
| <b>III. EMPIRICAL STUDIES .....</b>                        | <b>33</b> |
| CHAPTER 1: Study 1 .....                                   | 33        |
| 1. Method .....                                            | 33        |
| 2. Results .....                                           | 38        |
| 3. Discussion .....                                        | 41        |
| CHAPTER 2: Study 2 .....                                   | 45        |
| 1. Method .....                                            | 46        |
| 2. Results .....                                           | 49        |
| 3. Discussion .....                                        | 54        |
| <b>IV. GENERAL DISCUSSION AND FURTHER DISCUSSION .....</b> | <b>57</b> |
| 1. Integration of both studies.....                        | 57        |
| 2. Limitations .....                                       | 60        |
| 3. Furthers directions.....                                | 60        |
| <b>V. GENERAL CONCLUSION.....</b>                          | <b>63</b> |
| <b>VI. REFERENCES .....</b>                                | <b>67</b> |
| <b>VII. APPENDICES .....</b>                               | <b>81</b> |





## **I. INTRODUCTION**

The human being is a social being. In our daily life, we go through a massive amount of social interactions, with familiar or unfamiliar individuals or groups. These interactions are influenced by the impression we form about the social targets. For instance, one decides to sit or not to sit next to someone in the bus or the metro based on his/her impression of the person already sitting. This impression could be “this person seems nice/do not seem to pose a threat” or “this person seems mean/seems dangerous”. The same goes for groups, as one may decide or not to cross the street when passing a group of young people during nighttime.

Some of these impressions about social groups are commonly shared in our culture. It is generally agreed that lawyers are competent, hard-working people, and that elderly people are nice and kind. These descriptions of social groups often end up referring to two major poles, such as the ones presented above. One usually refers either to the agreeableness or kind nature of group members, or their efficiency or smartness. Interestingly, most groups are described using a negative combination of these two dimensions. This phenomenon has been called the compensation effect.

Human beings seem to form robust impressions about social groups based on this negative pattern. For instance, doctors usually are depicted as skilled but not really as the kind of people you would want to invite to a party. On the contrary, housewives are often perceived as being welcoming and warm, but also as foolish. When comparing groups to one another, this differentiation of each group on one of the two dimensions is frequently mentioned. This illustrates well that compensation is at the heart of social representation of groups.

Research on compensation has shown that even when comparing our own social groups to other groups, we often admit the superiority of these other groups on one of the two dimensions. But how come we agree upon the fact that a lot of social groups are either more competent or warmer than other groups?

Two possibilities might explain this common agreement on the superiority of many groups on one of the two dimensions. The first possibility is that people truly and deeply agree with the fact that many groups are being superior to other groups on one of the two dimensions. Thus, when being asked to evaluate social groups, their answer

reflects their genuine, less controlled impression. The second possibility is that people agree with this fact on the surface – that is, when asked their opinion about other groups – because they feel like it is what society wants to hear. Indeed, if people believe that they are expected to show some fairness, this will impact their answers: they will grant a superiority on one dimension to many groups in order to appear equitable. However, deep down inside they do not truly agree with this statement and feel as they are more groups that are either high or low on both dimension than what they admit.

The objective of this master's thesis is to examine which of these two possibilities is true, by assessing the compensation effect at the implicit level with a reverse correlation measure. We used an implicit measure to reduce participants' control over their responses, allowing us to investigate how they feel about groups in an automatic manner. The presence of compensation at the implicit level would support the first possibility by showing that compensation is at work even with less control, while the absence of compensation at the implicit level would support the second possibility by showing that compensation is a deliberated process.

## **II. THEORETICAL FRAMEWORK**

In this first section, we provide our theoretical framework as well as the objectives and hypotheses of this master's thesis.

In the first chapter, we review the state of the art regarding the two fundamental dimensions underlying social perception. We detail their relations and expound a growing body of research that focused on the negative relation between the two dimensions.

In the second chapter, we examine the processes behind face perception and face representation. We develop the importance of these processes in social life and detail the core dimensions at play. We then discuss the link between the social perception and the face processing dimensions.

Finally, the third chapter develop the objectives and hypotheses of the two empirical studies we conducted.

### **Chapter 1**

#### **Social perception**

Our work focuses on the compensation effect in social psychology, which is the negative relation between the two fundamental dimensions of social perception, competence and warmth. In this chapter, we provide the reader with a thorough review of the history of these two dimensions. We then present the most influential model in the intergroup relations domain, built around the two dimensions. Next, we set out the early works on the compensation effect derived from this model and develop the experimental line of research that has been conducted since. Finally, we end this chapter with recent studies investigating the underlying mechanisms of the compensation effect.

#### **1. Fundamental dimensions of social perception**

Social judgments are at the center stage of human life, and have been studied for decades on different levels, such as group perception, interpersonal perception or self-perception. While earlier efforts focused on the processes underlying the social perception, quite a few studies investigated the content of these perceptions. Across

multiple domains, the scientific literature agrees upon the existence of two elemental dimensions in the social perception, commonly referred as “The Big Two” (for a review, see Yzerbyt, 2016). According to Wojciszke (1994), these two dimensions are linked to the queries that one considers when meeting someone for the first time. The first dimension is related to the question of intent: we seek to determine whether the target’s intentions are good or bad. The answer to this interrogation provides us with information relative to a target’s will to cooperate with us or to compete against us. The second dimension is related to the question of abilities. A target may want to cooperate, but its inability to fulfill primordial tasks would make it a liability. Alternatively, a target may want to compete, but its inability to carry on its goals would make it a mediocre competitor. Together, these two dimensions are considered fundamental to the social perception. As a matter of fact, research has shown that traits pertaining to these dimensions account for 82% of the variance in social judgments (Wojciszke, Bazinska, & Jaworski, 1998).

The study of Rosenberg, Nelson and Vivekananthan (1968) is considered the first study on impression formation to identify and label the two dimensions in an explicit manner. Rosenberg and colleagues (1968) formed a list of 64 traits often used in impression formation. Later, they asked participants to describe people they knew using these traits. Using multi-dimensional scaling analysis, they found that a two-dimension model offered the best fit to the data. When looking at the scattering of the 64 traits on these two dimensions, they noticed that one axis seemed to refer to social abilities, and the other axis to intellectual abilities. Thus, they labelled these dimensions “Social good-bad” and “Intellectual good-bad” respectively.

Since then, these two dimensions have been studied extensively in various domains, such as interpersonal projection (Toma, Yzerbyt, & Corneille, 2012), marketing (Bratanova, Kervyn, & Klein, 2015), negotiation (Demoulin & de Dreu, 2010) or organizational psychology (Cuddy, Glick, & Beninger, 2011) to only cite a few. Depending on these domains, they have been labelled differently, such as other-profitability and self-profitability (Peeters, 1992), warmth and competence (Fiske, Cuddy, Glick, & Xu, 2002), social desirability and social utility (Dubois & Beauvois, 2005), morality and competence (Wojciszke, 2005), communion and agency (Abele & Wojciszke, 2007), or socio-morality and taskability (Ybarra et al., 2008). Although their names differ, their core characteristics remain the same, with the first dimension referring

to cooperation or competition, and the second dimension referring to abilities. Given that our work focuses on group perception, from now on we will refer to these dimensions as warmth – being the first dimension – and competence – being the second dimension –, as proposed by Fiske and colleagues (2002).

Although warmth and competence are both considered as fundamental dimensions of social perception, they both possess unique characteristics. First, the literature on this topic suggests a primacy of warmth: information about warmth explains more variance in traits assessment, is perceived and identified quicker, carries more weight, is more sought after, and produces more reliable judgments than information about competence (Abele & Wojciszke, 2007, Wojciszke et al., 1998; Ybarra, Chan, & Park, 2001; Willis & Todorov, 2006). Furthermore, negative information on warmth seems to be considered more surprising than any other kind of information. In Kervyn, Dolderer, Mahieu and Yzerbyt's study (2010), participants acquainted themselves with a group characterized by a negative relation between these two dimensions – that is, high(low) on competence but low(high) on warmth. Following this group description, the authors displayed test results that a random member of this group supposedly obtained. These results concerned the competence and the warmth dimension, and followed a positive relation, with the group member scoring high(low) on both dimensions. This setting resulted in four conditions, with two conditions presenting incongruent information on competence – being either positive or negative –, and two conditions presenting incongruent information on warmth – being either positive or negative. The results showed that when the group member's test described him/her as being less warmth than his/her group average, participants evaluated this information as more surprising than in the three other conditions.

All in all, these results make sense in a theoretical way, as survival largely depends on a quick and precise appraisal of a target's intents. The primacy of warmth thus seems to be driven by an evolutionary aspect. As for competence, this dimension seems to be linked to status perception in a bidirectional way. The more a group is considered as competent, the higher its perceived status (Durante, Capozza, & Fiske, 2010). Conversely, the higher its status attribution, the more a group is considered as competent (Fiske et al., 2002).

Even though they are known as The Big Two (Yzerbyt, 2016), these two dimensions can each be divided further into two sub-dimensions (Abele, Cuddy, Judd, &

Yzerbyt, 2008; Brambilla, Sacchi, Rusconi, Cherubini, & Yzerbyt, 2012; Abele et al., 2016). Warmth is considered to comprise sociability on the one hand – which is described by traits such as kind or nice for the positive pole and cold or unfriendly for the negative pole – and morality on the other – which is described by traits such as honest or sincere for the positive pole and deceitful or untrustworthy for the negative pole. As their names suggest, sociability refers to the friendliness of a target while morality refers to its honesty or ethics, which seems to be especially important for the evaluation of one's own group<sup>1</sup> (Leach, Ellemers, & Barreto, 2007; Brambilla & Leach, 2014).

The competence dimension is considered to comprise ability – which is described by traits such as smart or capable for the positive pole and inefficient or clumsy for the negative pole – and assertiveness – which is described by traits such as ambitious or determined for the positive pole and lazy or indecisive for the negative pole. The ability is linked to a target's aptitudes – considered stable over time – whereas the assertiveness reflects its motivation and confidence (Carrier, Louvet, Chauvin, & Rohmer, 2014). According to Abele and colleagues (2008), the assertiveness is of more importance when investigating self- or interpersonal perception rather than group perception. Having said this, the scientific literature on group perception revolves around the labels of warmth and competence, with few direct references to their sub-dimensions – even though the traits that are being used often includes some if not all sub-dimensions. We shall therefore only refer to warmth and competence as encompassing labels throughout this literature review.

## **2. The Stereotype Content Model**

As mentioned above, the two dimensions have been around for quite a few years, but they have been formally theorized in the group perception domain rather recently. Fiske and her colleagues (2002) made a major contribution by focusing on group stereotypes and by exploring the principles underlying their content. They suggested that the content of stereotypes would revolve around two dimensions, namely warmth and competence, and that these dimensions would be linked to competition and perceived status, respectively. Moreover, these authors proposed that many stereotypes would be mixed, with groups being described as high on one dimension and low on the other

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<sup>1</sup> One's group is generally called the *ingroup*, as opposed to the *outgroup*.

dimension. These assumptions went counter to the main vision at the time, namely that stereotypes are mostly fully negative (low on both dimension) or fully positive (high on both dimension), but most importantly that they are largely unpredictable.

|        |      | Competence                                                                                                            |                                                                                                       |
|--------|------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|        |      | Low                                                                                                                   | High                                                                                                  |
| Warmth | High | <b>Paternalistic stereotype</b><br>low status, not competitive<br>(e.g., housewives, elderly people, disabled people) | <b>Admiration</b><br>high status, not competitive<br>(e.g., ingroup, close allies)                    |
|        | Low  | <b>Contemptuous stereotype</b><br>low status, competitive<br>(e.g., welfare recipients, poor people)                  | <b>Envious stereotype</b><br>high status, competitive<br>(e.g., Asians, Jews, rich people, feminists) |

Figure 1. Graphical representation of the four clusters found in the Stereotype Content Model<sup>2</sup>

In their initial study on the *Stereotype Content Model* (SCM), Fiske and colleagues (2002, Study 1) asked participants to rate 23 groups using items relative to warmth, competence, status, and competitiveness. The authors' findings fully supported their hypothesis: group stereotypes are indeed captured by the two fundamental dimensions, warmth and competence. They also found that these two dimensions create four clusters (see Figure 1), that many stereotypes fell into the so-called *mixed* clusters (high in one dimension but low on the other), and that the perceived status(competitiveness) of a group predicts its competence(warmth) ratings. They replicated their findings with different groups and samples (Fiske et al., 2002, Study 2 & Study 3), and found that each cluster

<sup>2</sup> Source: Wikipedia contributors. (2018, July 6). Stereotype content model. In Wikipedia, The Free Encyclopedia. Retrieved from [https://en.wikipedia.org/w/index.php?title=Stereotype\\_content\\_model&oldid=849085099](https://en.wikipedia.org/w/index.php?title=Stereotype_content_model&oldid=849085099).

triggered different affective reactions (Fiske et al., 2002, Study 4): groups high in both dimension elicited admiration, groups low in both dimension elicited contempt, groups high on competence but low on warmth elicited envy, and groups high on warmth but low on competence elicited pity. These two dimensions have been found to be pancultural (Cuddy et al., 2009).

### 3. **Relations between warmth and competence**

The SCM has stressed the fundamental nature of the two dimensions in the group perception domain, and the initial proposal has been largely supported by the scientific community (Fiske et al., 2002; Fiske, Cuddy, & Glick, 2007; Yzerbyt, 2016). But beyond the importance of warmth and competence in the social judgments, the question of their relationship remained.

In their study, Rosenberg and colleagues (1968) observed that these dimensions were not quite orthogonal, but rather presented a 65° angle between each other, which was associated to a positive correlation of .42. This positive correlation suggested that the positive (negative) judgment of a target on a dimension was somewhat predictive of the positive (negative) judgment of this target on the other dimension. For instance, when participants considered a target as kind, they also tended to consider this target as skillful. On the contrary, when participants considered a target as cold, they also tended to consider this target as incompetent. This kind of positive relation has been called a halo effect by Thorndike (1920), who describes it as “a marked tendency to think of a person in general as rather good or rather inferior and to color the judgment of the separate qualities by this general feeling” (p. 25).

Next to the findings suggesting halo, some evidence supports the existence of a negative relationship, not the least the *mixed* stereotypes clusters identified by Fiske and colleagues (2002). As yet another example, Cuddy and her colleagues (Cuddy, Fiske, & Glick, 2004) presented participants with the curriculum vitae of a young working woman. In one condition, this young woman was described as having children, whereas in the other condition she was presented as childless. Cuddy and colleagues (2004) found that when introduced as a mother, the young woman was perceived as warmer but less competent than when described without children. Participants also tended to hire, promote or train her less when described as a mother. The same goes with elderly people

(Cuddy, Norton, & Fiske, 2005), who are stereotypically perceived as being warm but not so competent (Fiske et al., 2002). Yet, when described as rather competent, an elderly target was evaluated as less warm than an incompetent elderly target.

As it turns out, the first study investigating this negative relation *per se* has been conducted by Yzerbyt, Provost and Corneille (2005). Using a full-crossed design, they collected the stereotypes of Belgian and French about each other. Members of these two groups were asked to rate their own group as well as the other group on traits diagnostic of warmth and competence (Yzerbyt et al., 2005, Study 1). They found that both groups agreed that the French were more competent than the Belgian, while being less warm. This consensus was also found in a third, neutral group, namely French-speaking Swiss (Yzerbyt et al., 2005, Study 2). The authors called this negative relationship the *compensation effect*, as it appears that when a target is described as higher than another on one dimension, people seem to perceive this target as lower on the other dimension, in a compensatory manner.

#### **4. Experimental work on the compensation effect**

The work by Yzerbyt and colleagues (2005) provides evidence of a negative relation between warmth and competence by offering correlational evidence. Building on these findings, Judd and collaborators (Judd, James-Hawkins, Yzerbyt, & Kashima, 2005) wanted to explore this pattern in a more controlled setting. They hypothesized that this pattern of compensation would also occur without the existence of pre-existing stereotypes. To test their hypothesis, these authors presented participants with two fictitious groups. By means of behaviors allegedly performed by members of these two groups, the authors described one of the two groups as being rather competent – displaying six competence-related behaviors and two incompetence-related behaviors – and the other group as being rather incompetent – displaying six incompetence-related behaviors and two competence-related behaviors. The two groups were described as neutral on the warmth dimension, with two warm and two cold behaviors displayed for each group. Participants were then asked to rate the groups using traits related to warmth or competence. As predicted, the results showed that participants perceived the competent group as more competent than the incompetent one, but also that they perceived the competent group as less warm than the incompetent one (Judd et al., 2005, Study 1).

In addition to this compensation at the mean level, they also found evidence of this negative relation at the correlation level: the higher a group was perceived on one dimension, the lower it was perceived on the other dimension. They extended their findings by manipulating warmth, but with a smaller effect size<sup>3</sup> (Judd et al., 2005, Study 2), and found that this compensatory pattern is present when judging groups as much as when judging individuals (Judd et al., 2005, Study 3).

Strictly speaking, their hypothesis test was quite conservative given the halo effect obtained when pretesting the behaviors. The authors gathered the ratings of each behavior on warmth and competence to select behaviors that were diagnostic of one dimension while being neutral on the other. As it turns out, they did not find such behaviors, as the ratings presented a positive correlation: the behaviors that were considered as high on one dimension were also considered as high on the other dimension. Despite the presence of this halo effect during the pretest, the results clearly showed that a negative pattern emerged. Hence, this demonstration is considered as a strong support for the existence of the compensation effect.

#### *Necessary conditions, facilitators and characteristics*

After finding support for the existence of this compensatory pattern, a series of questions needed to be addressed. More specifically, when and why this negative relation emerges. As for the when, several studies allowed highlighting some facilitating factors and boundary conditions.

First, when presenting a single group high on competence but neutral on warmth, Judd and colleagues (2005, Study 4) found a halo effect rather than a compensation effect. These findings partially account for the halo effect found by Rosenberg et al. (1968) and present during the pretest made by Judd et al. (2005), as no comparison was involved. However, although required most of the time (Kervyn, Yzerbyt, & Judd, 2010), a comparative setting is not always necessary in an explicit manner. In fact, when provided with positive information about a single dimension only, people show an *innuendo* effect (Kervyn, Bergsieker, & Fiske, 2012): they seem to infer that if a dimension has been omitted, it must be because the target has something less positive about this very

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<sup>3</sup> This larger effect when manipulating competence has often been encountered, and supposedly linked to a more constrained reality of this dimension compared to the warmth dimension (Yzerbyt, 2016).

dimension, and therefore make negative assumptions about this unmentioned dimension<sup>4</sup>. In addition, Cuddy et al. (2004, 2005) reported this compensatory pattern without any explicit comparison involved. Therefore, the comparison context seems to be a facilitator rather than a necessary condition.

In addition, this negative relation seems to be unique to the two fundamental dimensions of warmth and competence. Empirical support for this assumption comes from the work of Yzerbyt, Kervyn and Judd (2008). Using the same design as Judd and colleagues (2005), these authors presented participants with two fictitious groups. This time, the second dimension was neither warmth nor competence, but the dimension of *healthiness*. This dimension had been pretested to be as independent of the two fundamental dimensions as possible. This design allowed the authors to investigate whether some intrinsic characteristics pertaining to the two dimensions is at play to produce compensation.

The results supported their hypothesis. When rating groups that were high(low) on one of the two dimensions but neutral on the dimension of *healthiness*, participants presented a halo effect instead of a compensation effect (Yzerbyt et al., 2008, Study 1). However, when presented with information concerning the three dimensions at the same time – one manipulated and two unmanipulated –, participants did produce a compensation pattern between warmth and competence but a halo effect between the *healthiness* dimension and the dimension that was manipulated (Yzerbyt et al., 2008, Study 2). Therefore, the compensation effect seems to derive from the very nature of the two fundamental dimensions.

Another aspect that moderates the emergence of compensation resides in the perceived difference of status between groups. This difference must be perceived as sizable, stable and legitimate, the relation between groups must be barren of conflicts, and the groups boundaries must be hardly permeable (Cambon, Yzerbyt, & Yakimova, 2015, Dang, Liu, Liang, & Ren, 2017). When these conditions are not met, the compensation effect might not emerge. All in all, these conditions suggest that the warmth-competence tradeoff corresponding to compensation seems to help maintaining

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<sup>4</sup> The opposite pattern has also been found: when trying to convey positive information on one dimension, people convey less positive information on the other dimension (Fiske et al., 2015).

the hierarchical relations as they stand (Cambon et al., 2015; Yzerbyt & Cambon, 2017, Cambon & Yzerbyt, 2018, Durante et al., 2013).

These aspects – comparison, uniqueness of the two dimensions and perception of status difference – work together to regulate the compensation effect. Another characteristic worth mentioning is the identity of the target to which a group is compared to. For instance, Kervyn, Yzerbyt, Demoulin and Judd (2008) asked Belgian participants to evaluate two groups on a scale ranging from 1 to 7. In a first condition, participants had to evaluate Belgians and Germans – considered as stereotypically competent but cold compared to Belgians –, whereas in a second condition they had to evaluate Belgians and Italians – considered as stereotypically incompetent but warm compared to Belgians. They found that Belgians were evaluated as warmer (Mean = 5.55) than competent (M = 1.3) when compared to Germans but as more competent (5.08) than warm (4.44) when compared to Italians. They replicated their study with an outgroup – Canada – being compared to either Japan – stereotypically competent but cold – or Brazil – stereotypically incompetent but warm –, and found the same pattern (Kervyn et al., 2008, Study 2). These results suggest that the compensatory relation may completely switch direction depending on the target of the comparison.

### *Cognitive and behavioral consequences*

Beyond the questions concerning its emergence, compensation also leads to a panel of cognitive or behavioral outcomes that have been studied in multiple domains, such as impression management (Holoien & Fiske, 2013; Swencionis, Dupree, & Fiske, 2017), interpersonal communication (Fiske et al., 2015), or in the domain of person with special needs (Rohmer & Louvet, 2012, 2016). An example of a cognitive outcome is the tendency of people to rate more extremely groups that are incongruent on the two dimensions rather than groups that are congruent (Kervyn, Judd, & Yzerbyt, 2009), and that these ratings of mixed targets are more extreme when scarce information are presented (Kervyn, Bergsieker, Grignard, & Yzerbyt, 2016).

Kervyn, Yzerbyt, Judd and Nunes (2009, Study 1) investigated the impact of compensation on behavior. These authors based their manipulation on Judd et al. (2005) and presented participants with two fictitious groups. One group was described as rather competent and the other group was described as relatively less competent, with both

groups being described as equal on warmth. After the impression formation phase, they asked participants to create two questionnaires, one for each group. They explained to participants that these questionnaires would later be used during interviews to collect information about the members of the two groups, and thus that their task was to select the questions that would allow interviewers to obtain the most relevant information. They found that participant did perceive the groups in a compensatory manner, so that the more competent group was perceived as less warm than the less competent group. But of greater interest, they found that participants manifested a hypothesis confirmation bias, by choosing questions that were in line with their impressions of the two groups. That is, they selected questions that would give rise to answers reflecting competence but lack of warmth for the competent group, and questions that would lead to answers reflecting a lack of competence but warmth for the incompetent group.

In a follow-up experiment, Kervyn, Yzerbyt et al. (2009, Study 2) asked independent participants to answer the questions that have been selected for each group. Next, they asked a new panel of participants to evaluate these two groups based exclusively on these answers. They found that participants in Study 2 rated the groups the same way as participants in Study 1, even though they only had information based on the questions selected during Study 1. They reproduced these findings in a more ecological context, though it remained a minimal group paradigm (Kervyn, Yzerbyt et al., 2009, Study 3). Thus, beyond biasing the question selection through a hypothesis confirmation bias, compensation effect also affects how new targets are perceived solely based on their answers to these biased questions, and *in fine* leads to hypothesis confirmation.

### *Structural foundations*

As shown in the expanding literature about compensation, this negative relation is far from being a laboratory-exclusive effect but seems to underlie the relations between social groups (Cambon et al., 2015; Cambon & Yzerbyt, 2017; Yzerbyt & Cambon, 2017, Cambon & Yzerbyt, 2018). Since it has first been investigated, compensation is thought to serve the maintenance of the social hierarchy (Yzerbyt et al., 2005, Kervyn et al., 2008). Cambon and colleagues (2015) investigated this hypothesis by examining the processes at the heart of the compensation effect. In line with the Social Identity Theory (Tajfel & Turner, 1979), these authors hypothesized that compensation would be driven by a need for positive differentiation between high-status groups – perceived as cold but competent

– and low-status groups – perceived as warm but incompetent. More specifically, they predicted that to achieve this positive differentiation, low-status groups would display *social creativity* strategies (Tajfel & Turner, 1979) while high-status groups would display a *noblesse oblige* effect (Vanbeselaere, Boen, Van Avermaet, & Buelens, 2006).

The *social creativity* is the strategy proposed by Tajfel and Turner (1979) to explain the way low-status groups maintain a positive social identity while admitting that they are in a low-status condition. When there are no conflicts and the difference of status is perceived as stable and legitimate, status is considered as objective and undeniable (Tajfel & Turner, 1979). Therefore, low-groups members cannot claim a high-status position since they cannot claim economic success and/or intellectual realizations. To ensure a positive appraisal of their social identity, they must find a way to enhance the social perception of their own group. The easiest way is to claim superiority on the second dimension, i.e. warmth. By doing so, they allow the high-status groups to claim superiority on the competence dimension while keeping a dimension on which they may claim their own superiority.

Turning to high-status groups, a possible explanation resides in the *noblesse oblige* effect (Vanbeselaere et al., 2006). To the extent that signs of competence are more objective than signs of warmth (Yzerbyt, 2016) – at least in our societies, with prizes, awards or grants being the major signs –, high-status groups may easily claim a superiority on the competence dimension. Since they may shine on the competence dimension, high-status groups are willing to let the low-status groups take the warmth dimension. By conceding superiority on warmth to the low-status groups while keeping the superiority on competence, high-status groups ensure that every group has some positive features to put forth. Therefore, low-status groups will be satisfied and will not threaten the established social structure. Yzerbyt and Cambon (2017) hypothesized that the relation between compensation and positive differentiation would be mediated by a pressure towards non-discrimination: by granting the low-status groups the possibility to claim a form of superiority on the warmth dimension, the high-status groups respect this perceived norm of non-discrimination and appear magnanimous.

As predicted, the results suggested that both high- and low-status groups seek this positive differentiation, and that the *social creativity* and the *noblesse oblige* seems to underlie this process, with the *noblesse oblige* being mediated by the pressure towards

non-discrimination. Yzerbyt and Cambon (2017) found evidence for a causal relation by manipulating the possibility for a group to claim superiority on one of the two dimensions. When a group had a chance to claim a superiority on its preferred dimension – i.e. competence for the high-status group, warmth for the low-status group –, members subsequently evaluate themselves as lower than the other group on the unpreferred dimension, thereby showing the compensation pattern. However, when group members were not given this opportunity, both groups tended to produce an ingroup bias: they denied the superiority of the other group on their unpreferred dimension and continued to claim a superiority of their group on their preferred dimension.

Relying on previous works (for details, see Cambon & Yzerbyt, 2018), these authors manipulated the antecedents of these two processes and then asked participants to rate groups. The *social creativity* strategy is thought to allow low-status groups to protect their self-esteem when admitting superiority of the outgroup by claiming some superiority of their own on warmth. In line with this conjecture, the authors hypothesized that the *social creativity* strategy would not show up when participants can self-affirm before evaluating both groups. Presumably, this is because the self-affirmation would work as a protective shield between the positive outgroup evaluation and the self-esteem. Low-status group members in the self-affirmation condition should acknowledge the superiority of the high-status group on competence but should not claim a superiority on warmth, while low-status group members in the control condition should compensate. High-status members should not be affected by this manipulation and should compensate in any condition.

The *noblesse oblige* strategy is thought to be the result of a perceived norm of non-discrimination from high-status groups: it is permitted to openly say that we are more competent as long as we give other groups some credit on an alternative dimension. Accordingly, by establishing a norm of honesty (“hiding a negative opinion about a group is hypocritical”) and thus overriding the perceived norm of non-discrimination, high-status group members should claim a superiority on competence but not grant any superiority on warmth, leading to an ingroup bias. High-status group members in the control condition should compensate, and low-status members should not be affected by this manipulation and should compensate in any condition.

The results clearly confirmed their hypothesis, as all participants rated groups in a compensatory manner except for low-status group members in the self-affirmation condition and the high-status group members in the honesty norm condition. This suggests that the compensation effect is driven by – at least – two distinct processes: a boost of self-esteem for the low-status groups – *social creativity* – and a perceived norm of non-discrimination for the high-status groups – *noblesse oblige*.

## 5. **Conclusion**

Social perception is driven by two fundamental dimensions that are warmth and competence. Under specific circumstances, these two dimensions display a negative relation, called compensation. This compensation is fueled by a need for positive differentiation coming from both high- and low-status groups, and seems to serve as a justification for the whole system: low-status groups may stand out from high-status groups by claiming a superiority on the warmth dimension through a *social creativity* strategy, while high-groups status are allowed to claim their superiority on the competence dimension as long as they agree to the superiority of the low-status groups on warmth, displaying some *noblesse oblige*.

In the next chapter, we will discuss the importance of face perception, its core components and its link with the fundamental dimensions of social perception.

## **Chapter 2**

### **Face processing**

In this chapter, we discuss the prime importance of faces as sources of information in social interactions and we examine the central dimensions that underlie the visual information. We then detail the characteristics associated with facial representations and present a technique to assess them, known as the *reverse correlation*. Finally, we integrate the work on face perception and the work on the Stereotype Content Model.

#### **1. Face processing and personality perception**

Faces are central when it comes to social interactions. They are among the most readily accessible and most quickly processed stimuli when meeting a person for the first time (Bar, Neta, & Linz, 2006, Willis & Todorov, 2006). In fact, it takes as few as 38-ms for someone to form an impression of a neutral face (Bar et al., 2006), and people tend to automatically process visual cues provided by these faces (Todorov & Engell, 2008). Because of their importance, faces have been at the heart of an important amount of research and theories. During centuries, they have been thought to reflect one's personality (Oosterhof & Todorov, 2008). These beliefs led to the foundation of a science called *physiognomy* during the 19<sup>th</sup> century, whose purpose was to investigate the link between the face and the personality. These "scientists" claimed that we could relate specific types of crimes to specific facial characteristics. They asserted that looking at one's facial appearance allowed distinguishing criminals, due to a link between faces and a genetic predisposition for crimes (Ducros, 1998). The leader of this school of thought, Cesare Lombroso, went to the point of testifying during trials (Oosterhof & Todorov, 2008).

Although most of the physiognomists' assumptions ended up being wrong, it remains a fact that faces are a vector of information on which people rely in order to draw inferences. Whether or not these inferences are proven correct remains a debated issue. Some authors believe that faces do carry information related to one's personality. The assumption of a positive link between one's face and one's personality is known as the *kernel of truth* hypothesis (Berry, 1990; Penton-Voak, Pound, Little, & Perrett, 2006),

and some evidence support this hypothesis (Berry & Brownlow, 1989; Berry, 1991; Penton-Voak et al., 2006). For instance, Berry (1990, Study 2) asked participants to evaluate themselves using a few scales. They then photographed these participants' faces. Next, a sample of independent judges rated these faces on various scales. The results showed a positive relation between a participants' own evaluation and the way his/her face had been evaluated. This link also shows up at a behavioral level: Bond, Berry and Omar (1994) found that the more a participant's face came across as dishonest, the more he/she was likely to participate deliberately in a task that would involve deception. This correlation between face and personality is thought to be driven by a self-fulfilling prophecy (Todorov, Said, Engell, & Oosterhof, 2008). For example, if an individual is perceived as honest because of his/her face, people will likely interact with him/her as if he/she was honest. These interactions might lead this person to become more and more honest in reaction, generating this link between his/her face and his/her personality.

However, some findings suggest that there is no link between face and personality or even that this link is negative (Zebrowitz, Voinescu, & Collins, 1996; Zebrowitz, Andreoletti, Collins, Lee, & Blumenthal, 1998). Oosterhof and Todorov (2008) argued that, in the absence of clear emotional expressions, people use facial traits as a proxy to infer a person's intentions and abilities. Given that neutral facial cues do not convey the same meaning as emotional cues, these inferences are mostly wrong. The authors postulate that this *overgeneralization* hypothesis explains best the discrepancy between faces' assessments and personality's assessments.

Despite the fact that the literature displays mixed evidence regarding the accuracy of traits inferences based on faces, 75% of respondents in a poll believed that facial traits may serve to infer personality traits (Hassin & Trope, 2000). People seem to rely on these inferences, thereby giving them some predictive power concerning social outcomes. For instance, authors found that these inferences predict electoral outcomes. Ballew and Todorov (2007, Study 1) briefly presented participants with pair of faces of gubernatorial elections candidates and asked them to compare and evaluate these candidates with respect to their competence. These pairs of faces contained each the face of someone who won the election and someone who did not. They found that participants perceived the winner as more competent than the runner, even if they did not know who won. They replicated their experiment but this time it took place 2 weeks before the election – thus each pair contained two runners and no winner. They found that the evaluation of the

participants predicted the elections (Ballew & Todorov, 2007, Study 3). The same results emerged when trying to predict the congressional election exclusively based on facial traits (Todorov, Mandisodza, Goren, & Hall, 2005). This predictive power has been highlighted in various domains such as criminal sentencing (Blair, Judd, & Chapleau, 2004, Eberhardt, Davies, Purdie-Vaughns, & Johnson, 2006) or military ranking (Mazur, Mazur, & Keating, 1984).

## **2. Core dimensions of face processing**

People tend to infer personality traits solely based on facial appearance. These inferences, whether correct or not, are then used as heuristics to make decisions. However, a key question concerns the specific cues that people use to make these inferences. In other words, what are the information that are conveyed by, and that people perceive from, faces? According to Oosterhof and Todorov (2008), people call upon multiple dimensions when evaluating faces, such as facial maturity (Sacco & Hugenberg, 2009), masculinity or femininity (Buckingham et al., 2006), self-resemblance (Verosky & Todorov, 2010), or baby-facedness and attractiveness (Zebrowitz & McDonald, 1991). In two studies, Todorov, Dotsch, Porter, Oosterhof and Falvello (2013) found support for the use of seven dimensions concerning facial judgments. However, evaluations on all the aforementioned dimensions are often highly related (Oosterhof & Todorov, 2008, Todorov et al., 2013).

To disentangle these interlinked evaluations and to provide a clear overview of the dimensions underlying face evaluation, Oosterhof and Todorov (2008) asked a first set of participants to write whatever came to their mind when looking at neutral artificially-created faces. Next, researchers read the content of these texts and regrouped it into fourteen trait categories. Finally, a second set of participants was asked to evaluate the same faces as in the first step but this time using the fourteen categories plus the dominance dimension<sup>1</sup>. Once all the data was gathered, they submitted it to a principal components analysis<sup>2</sup>. They found that two dimensions accounted for most of the variance with the first dimension referring to trustworthiness/valence evaluation and the second dimension referring to dominance. Although variations on dominance do not seem

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<sup>1</sup> Authors justified the addition of the dominance dimension with regards to its importance in interpersonal perception.

<sup>2</sup> Authors dropped two dimensions due to a poor interrater agreement.

to impact the perceived emotions from a face, variations on trustworthiness do (Todorov & Oosterhof, 2011). Within a certain range of trustworthiness, faces are perceived as emotionally neutral. However, the more(less) a face is perceived as trustworthy, the more it is perceived as happy(angry). Thus, trustworthiness does seem to carry information that can be related to emotional cues.

Though quite compelling, this model did not come without its critics. Sutherland and colleagues (Sutherland et al., 2013) argued that a third dimension – attractiveness – should probably be taken into consideration given its importance in the literature (for details, see Sutherland et al., 2013), but that participants could not emit this kind of judgments when presented with artificially-created faces. Thus, their study had two objectives: (1) investigate whether facial cues driving trait inferences are steady or not<sup>3</sup>, and (2) investigate whether a third factor – attractiveness – could be found when presenting real faces rather than artificially-created faces. To do so, they collected ratings of 1000 pictures on thirteen traits – trustworthiness, approachability, degree of smiling, dominance, skin-tone, sexual dimorphism, intelligence, confidence, aggressiveness, age, attractiveness, health and baby-facedness<sup>4</sup> (Sutherland et al., 2013, Study 1). Based on these ratings, they then morphed the faces to obtain a gradation for each trait, and asked participants to rate these morphed faces. They expected a high correlation between the manipulated characteristics – the place of the face on the continuum – and the participants' evaluations, meaning that intrinsic features within faces consistently play a role in social inferences. The results showed that there is indeed a high correlation, and thus that facial cues are steady.

Turning to the second objective, the authors ran a factor analysis using the traits evaluations of the 1000 pictures (Sutherland et al., 2013, Study 2). Their analyses indicated the presence of three factors. Given the loadings of the traits on these factors, the first factor was interpreted as the valence/trustworthiness dimension and the third factor was interpreted as the dominance dimension, replicating the findings of Oosterhof and Todorov (2008). The most interesting result of this study, however, lies within the second factor. This factor has been interpreted as being the youthful-attractiveness dimension, due to the high loadings of traits such as age or attractiveness. In a final study,

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<sup>3</sup> If the facial cues were found to be inconsistent, that would undermine the utility of a dimensional model.

<sup>4</sup> The first nine traits were included because of the work of Oosterhof and Todorov (2008), and the last four traits were included because of their importance in other face perception studies.

the authors cross-validated this three-dimensional model using morphed faces (Sutherland et al., 2013, Study 3). The face perception thus seems to be driven by three major dimensions, that is, trustworthiness, dominance, and youthful-attractiveness.

### 3. **Facial representations**

As seen above, there are many studies on face processing that focused on the visual cues used to judge or make inferences. However, another interesting aspect of face processing resides in the opposite pattern: picturing facial representations based on other sources of information. To compute these facial representations, researchers have been relying on the so-called reverse correlation technique<sup>5</sup> (Kontsevich & Tyler, 2004; Mangini & Biederman, 2004). This technique allows researchers to capture an approximation of the visual representation of a target by repeatedly asking participants to choose which face looks the most like the target among pairs of stimuli. For instance, Dotsch, Wigboldus, Langner and van Knippenberg (2008) investigated the potential effect of prejudice on facial representation. They found that Moroccan faces produced by high-prejudiced participants were evaluated as more criminal and less trustworthy than Moroccan faces produced by low-prejudiced participants. This reverse correlation technique has been used to obtain participants' facial representation of Mona Lisa expressing different emotions (Kontsevich & Tyler, 2004), ingroups and outgroups (Imhoff, Dotsch, Bianchi, Banse, & Wigboldus, 2011), Tom Cruise and John Travolta (Mangini & Biederman, 2004), women subgroups (Hinzman & Maddox, 2017) or rapists and lifesavers (Busching & Lutz, 2016).

Concerning the two dimensions of facial perception, Éthier-Majcher, Joubert and Gosselin (2013) explored the facial representations of trustworthiness and showed that there is a discrepancy between young and old adults on their facial representation of trustworthiness: while trustworthiness is linked to both happiness and anger for older adults, it is mostly linked with happiness for young adults. In their study, Dotsch and Todorov (2012) examined both dimensions. They asked participants to repeatedly choose the face that seemed to possess either the most trustworthiness, untrustworthiness,

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<sup>5</sup> Another technique exists, called the *Bubbles* technique. However, while the Bubbles technique allows to capture which diagnostics information are used for specific judgments, reverse correlation allows to capture a perceiver's facial representation on its whole, which is more suitable for our objectives (for more details, see Todorov, Dotsch, Wigboldus, & Said, 2011).

dominance or submissiveness traits. By averaging each face that had been selected by the participants, they obtained a final visual representation – called *classification image* (CI) – of a trustworthy, untrustworthy, dominant or submissive face. They also averaged each face that had not been selected by the participants to obtain the anti-classification images, resulting in eight faces. They then asked a set of independent participants to rate these eight faces on scales of trustworthiness, dominance, and threat ranging from 1 (not trustworthy/dominant/threatening) to 9 (very trustworthy/dominant/threatening). They found that when asked to select the most trustworthy face, the resulting classification image was indeed rated as more trustworthy than an untrustworthy face, and that the same goes when asked for dominance. Interestingly, faces that had been judged as high on trustworthiness(dominance) were judged as low on dominance(trustworthiness). An explanation given by the authors is that a potential compensation effect might be present at the facial level, even if the dimensions involved were trustworthiness and dominance.

The dimensions of social perception have also been investigated through the prism of facial representations. By means of the reverse correlation, Imhoff, Woelki, Hanke and Dotsch (2013) sought to know whether warmth and competence were spontaneously used when mentally representing faces. They did so by firstly selecting two professions that are perceived as ambivalent on the two dimensions, that is nursery teacher – judged as warmer than competent – and manager – judged as more competent than warm. Next, participants were asked to select among two faces the one that looked the most like either one of the two professions. By averaging these selections across participants, Imhoff and colleagues obtained a classification image for both a nursery teacher and a manager, representing an approximation of the visual encoding of the stereotypes associated with these two professions. They then asked an independent set of participants to judge these two classification images, as well as the classification images at the participant level – i.e. the face produced by each participant. They found that the independent judges evaluated the nursery teacher classification image as warmer but less competent than the manager classification image, hence reproducing the stereotypical pattern. Furthermore, the authors compared the classification images of the two professions with classification images obtained when participants were asked to select the warmer or the more competent face. They found a stronger correlation between the nursery CI and the warmth CI than between the nursery CI and the competence CI, and the opposite for the manager CI.

These findings suggest that people spontaneously call upon the fundamental dimensions when mentally representing the face of a target.

Although the above study did not aim to test compensation *per se*, the negative relation perceived within the nursery teacher and manager CIs suggests that a compensation effect could be present at the facial level. However, these results alone are not enough. Imhoff et al. (2013) relied on existing stereotypes, which are tainted by previous knowledge and thus prevent investigating the role of the two dimensions in a controlled manner. Before further conclusions, this question should be addressed by means of novel, fictitious groups.

#### **4. Linking facial model and Stereotype Content Model**

Faces appear to convey cues that individuals use to draw inferences. These cues seem to revolve around the dimensions of trustworthiness, dominance, and youthful-attractiveness (Oosterhof & Todorov, 2008; Sutherland et al., 2013). However, numerous dimensions that can describe faces, and some studies investigating face perception refer to the fundamental dimensions of social perception, that is warmth and competence (Fiske et al., 2002). For instance, when focusing on the cues that determine electoral success, researchers referred to the competence of the candidates (Todorov et al., 2005; Ballew & Todorov, 2007; Olivola & Todorov, 2010). Concerning warmth, this label can be found in multiple studies (Keating, Randall, & Kendrick, 1999; Johns & Shephard, 2007, Todorov et al., 2008; Olivola, Eubanks, & Lovelace, 2014, Rudert, Reutner, Greifeneder, & Walker, 2017). A relevant question is to know whether and how warmth and competence can be related to trustworthiness, dominance or youthful-attractiveness.

Oosterhof and Todorov (2008) defined the dimensions of valence/trustworthiness and dominance as follow: “Functionally, the valence and dominance related facial cues give rise to inferences about the person’s intentions, harmful vs harmless, and the person’s ability to implement these intentions, respectively” (p. 11091). These definitions are strikingly similar to those of warmth and competence – that is, one’s intentions and one’s ability to carry on these intentions, respectively (Fiske et al., 2002) – and suggest that there might be some overlapping between the two pairs of dimensions, with both models being linked to threat appraisal (Oosterhof & Todorov, 2008; Sutherland et al., 2013). Yet, Sutherland and colleagues (Sutherland, Oldmeadow, & Young, 2016) noted a few

discrepancies between facial and social models of perception. For instance, where competence is related to group status and social structure in the social model, dominance is related to physical strength and facial maturity in the facial model. These discrepancies led them to investigate whether the two models encompass a common core or not. In a series of studies, they found that the dimensions of trustworthiness and warmth display a high positive relation, meaning that they are highly related. However, dominance and competence do not show the same high positive relation, and thus seem to be less related to one another.

These findings are not surprising given the central components of each dimension. Whereas trustworthiness and warmth seem to share common features, dominance and competence have been associated with different characteristics. While both have been related to ability, power, and status, they do not share the same roots (Sutherland et al., 2016; Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013). High status can be attained through prestige – which is related to competence – or through dominance. Depending on the context, visual cues of competence/prestige or dominance are preferred. For instance, in a political context, competence/prestige predicts a target's success but not dominance (Chiao, Bowman, & Gill, 2008), whereas the converse is observed in a military context (Mueller & Mazur, 1996).

Considering the subdivisions of the competence dimension in social perception, dominance seems to be more linked to assertiveness than ability. This makes sense at a theoretical level, given that assertiveness carries more importance in the interpersonal perception (Abele et al., 2008). When judging faces, participants are in front of stimuli that refer to an individual on its own, and thus are more in a context of interpersonal perception than group perception. Furthermore, ability has been associated with behaviors such as “X has recently been commended for the quality of his/her work” (Carrier et al., 2014). This kind of behavior seems to reflect a more prestigious/competent image than a dominant one, suggesting that ability would be more related to the prestige/competence dimension in face processing models. As for the assertiveness sub-dimension, it has been associated with behaviors such as “X is the kind of person who gives advice but doesn't like to be given any”. This kind of behavior seems to reflect a more dominant image than a prestigious/competent one, therefore indicating the possibility of a link between the assertiveness sub-dimension and the dominance dimension. However, these assumptions have yet to be empirically tested.

## 5. **Conclusion**

Faces are of utmost importance when it comes to impression formation and social interactions in general. When processing faces, people seem to rely on three dimensions, both at the perceptual and the representational level: trustworthiness, dominance, and youthful-attractiveness. However, the two dimensions of the Stereotype Content Model also serve as cues both to infer traits from faces or to mentally represent them. While trustworthiness and warmth show a high correlation, implying that they share common features, dominance and competence are somewhat more distinct, reflecting the fact that dominance may have more to do with assertiveness than with ability per se. In the next chapter, we will present the rationale of our work, building on this face processing literature.



### **Chapter 3**

#### **The present work**

In this chapter, we present the two studies we conducted. We develop our goals and our hypotheses and present the theoretical rationale and the arguments underlying our hypotheses.

The first study tackles the question of whether the compensation effect emerges at the implicit level by means of a reverse correlation technique, and when manipulating the competence dimension. The second study is designed to be an extension of the first study with a few minor improvements, and when manipulating the warmth dimension.

#### **1. Theoretical rationale**

As explained in the first chapter, there are many pieces of evidence supporting the existence of the compensation effect, whether with real or fictitious groups. This effect is thought to be driven by a need for positive differentiation felt by both high- and low-status groups (Cambon et al., 2015; Yzerbyt & Cambon, 2017). Cambon and Yzerbyt (2018) found that when they manipulate the antecedents of the strategies used by groups to reach this positive differentiation, the compensation does not emerge anymore. These results are in line with the motivational hypothesis, which postulates that the negative relation between warmth and competence is underlain by motivational mechanisms. These mechanisms would allow the perpetuation of mixed stereotypes, therefore granting most groups a superiority on one dimension and at the same time maintaining the *status quo* (Yzerbyt et al., 2008).

This motivational account raises the question of the role of social desirability in the emergence of the compensation effect. The work of Cambon and Yzerbyt (2018) shows that when they find no interest in compensating, group members tend not to do so. This lack of compensation suggests that this process is not automatic but rather controlled and motivated. One plausible explanation would be that each group grants the other group superiority on the unpreferred dimension in order to feel legitimate when claiming superiority on the preferred dimension. Thus, they would not really consider the other group as higher than their own group on that unpreferred dimension but feel somehow

compelled to say so due to some form of social desirability. One way to shed light on this question is to examine the compensation effect at the implicit level, something that very little research has done.

Implicit measures lessen participants' control over their answers, allowing researchers to get a grasp on the more automatized processes at work (Gawronski & De Houwer, 2014). For instance, Rohmer and Louvet (2012) used a lexical decision task to assess the implicit representations about persons with disability. They found that although disable people are associated with low competence and high warmth at the explicit level, they are associated with low competence and low warmth at the implicit level. This discrepancy is thought to be due to societal pressures: persons with disability are perceived as lower on both dimensions, but because of pressures towards nondiscrimination, they are ascribed positive traits on warmth on explicit measures.

As it happens, this study did not aim to investigate the compensation effect per se. To our knowledge, only one research effort looked at the compensation effect directly using implicit measures. In their first study, Kervyn, Yzerbyt and Judd (2011, Study 1) relied on a causal attribution measure. They presented two groups to their participants. By means of written behaviors, one group was described as high on the manipulated dimension while the other group was described as low, but both were given similar information on the unmanipulated dimension. After this phase, participants received a new set of behaviors for each group and were instructed to assess whether the cause of each behavior was dispositional – thus giving information concerning the actor's personality and characteristics – or not. The authors found that when behaviors were confirming the compensation pattern, participants displayed mostly dispositional attributions. However, when the behaviors were disconfirming the compensation pattern, participants reported mostly situational attributions.

In their second study (Kervyn et al., 2011, Study 2), the authors relied on the Linguistic Category Model (for details, see Kervyn et al., 2011). They presented participants with information about groups following the same pattern as in the first study. They then showed pictures representing positive or negative behaviors on both dimensions. For each picture, participants had to choose between four sentences ranging from concrete to abstracts to describe each behavior. They hypothesized that, in line with the LCM, behaviors being at variance with the compensation pattern would be mostly

described with concrete sentences, and the reverse would be observed for behaviors endorsing the compensation. The findings support this hypothesis. Together, these two studies suggest that the compensation effect is present at the implicit level. It should be noted that participants were not members of any group in these experiments. As such, their self-esteem was thus not at stake when judging both groups. Possibly, the fact that compensation effect is highly present in our everyday life (Cambon & Yzerbyt, 2017) could make it an automatic process when no personal stakes are at play.

## **2. Study 1**

Study 1 aimed at expanding the literature concerning the compensation at the implicit level. We therefore sought to investigate whether compensation effect would be present at a visual level. To do so, we split our experiment in two distinct phases. During the first phase, we based our manipulation on the work of Judd et al. (2005) and presented participants with two fictitious groups by means of written behaviors: one was described as more competent than the other while both were given similar level of warmth. Turning to the implicit measure, we chose to use a reverse correlation technique, which allows capturing an approximation of participants' facial representation (Mangini & Biederman, 2004; Dotsch et al., 2008). Reverse correlation is considered an implicit measure as participants are not aware of what is being assessed and have less control over their responses due to the time pressure induced by our instructions (Petty, Fazio & Briñol, 2009). Furthermore, reverse correlation has already been used to assess compensation at the visual level, even though it relied on preexisting stereotypes – and thus did not provide a controlled set of stimuli (Imhoff et al., 2013). At the end of the face presentation, participants assessed the two groups at the explicit level, by means of traits rating scales. In a second phase, a set of independent judges evaluated the average facial representations of each group produced during the first phase by means of traits rating scales.

Building on previous work (Kervyn et al., 2011; Imhoff et al., 2013), we hypothesized that a compensation effect would be present within the participants' facial representations, namely that the facial representation of the more competent group would be perceived as more competent but less warm than the facial representation of the less competent group by the independent judges. We used fictitious groups – meaning that no preconception existed – and participants were not members of these groups – meaning that their self-esteem was not entering the picture. Therefore, to the extent that the

compensation effect is indeed automatic under these conditions – as discussed above –, it should be perceived within the facial representations produced through the reverse correlation.

In summary, our hypotheses are as follows:

H1: Participants in the first phase will show a compensation effect at the explicit level, that is the more competent group will be evaluated as less warm than the less competent group on traits rating scales in the first phase.

H2: Participants in the first phase will show a compensation effect at the implicit level, that is the facial representation of the more competent group will be perceived as less warm than the facial representation of the less competent group by independent judges in the second phase.

### **3. Study 2**

Study 2 was designed to extend the findings of Study 1 with warmth being the manipulated dimension and the addition of some improvements driven from the limitations of study 1. The first phase was identical to the first phase of Study 1, except for the group descriptions: one group was described as warmer than the other group, but both were given similar level of competence. Concerning the second phase, a few modifications were made to improve the design. First, assertiveness-related traits were added for the trait-rating task of the two average classification images. Second, judges also evaluated the classification images at the individual level rather than only at the group level. Finally, evaluations on warmth and competence were separated. These two modifications took place as follows: we asked judges to categorize each classification image produced during the first phase into one of two groups, namely, the faces that looked the less competent and the faces that looked the most competent. Once they were done, they evaluated the two classification images at the group level – one for each group – on competence using rating traits scales. Next, we asked them to perform the exact same two tasks but this time with the warmth dimension.

The first change was made to further investigate if the compensation pattern could also emerge at the individual level. Moreover, we could examine the correlation between the strength of a participant's compensation during the first phase and his/her

classification image's categorization at the second phase. This modification, as well as the second modification, also allowed us checking whether the compensation was present within each participant's facial representation.

In summary, our hypotheses are as follows:

H1: Participants in the first phase will show a compensation effect at the explicit level, that is, the warmest group will be evaluated as less competent than the coldest group on traits rating scales in the first phase.

H2: Participants in the first phase will show a compensation effect at the implicit level, that is, the facial representation of the warmest group will be perceived as less competent than the facial representation of the coldest group by independent judges in the second phase.

H3: Participant's individual classification images produced in the first phase will be sorted in the categories in accordance to a compensation pattern by independent judges in the second phase.

H4: A participant's assessment of both groups on explicit measures in the first phase will be correlated with his/her facial representation's categorization by independent judges in the second phase.



### III. EMPIRICAL STUDIES

#### Chapter 1

#### Study 1

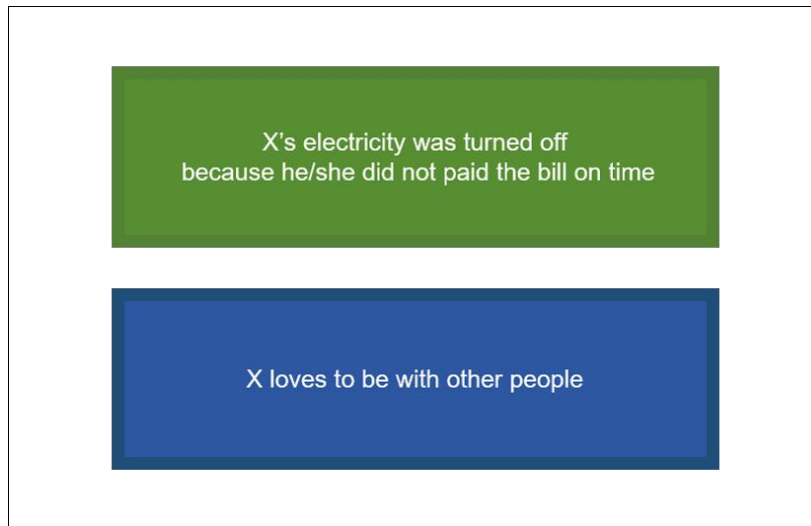
##### 1. Method

###### *Participants and design*

All data were collected via the crowdsourcing platform Prolific Academia. A total of 146 participants completed the 18-minute task in exchange for 1.5£. We excluded 10 participants from the analysis because of duplicate answers ( $n=2$ ), missing responses ( $n=3$ ), reaction time or variability in answers below a fixed threshold ( $n=3$ ) or lack of demographic data ( $n=2$ ). The final sample comprised 136 participants (79 female,  $M_{\text{age}} = 37.69$ ,  $SD_{\text{age}} = 14$ ). We had a 2 (target group: high vs low) X 2 (evaluated dimension: competence vs warmth) design, with both factors varying within participants.

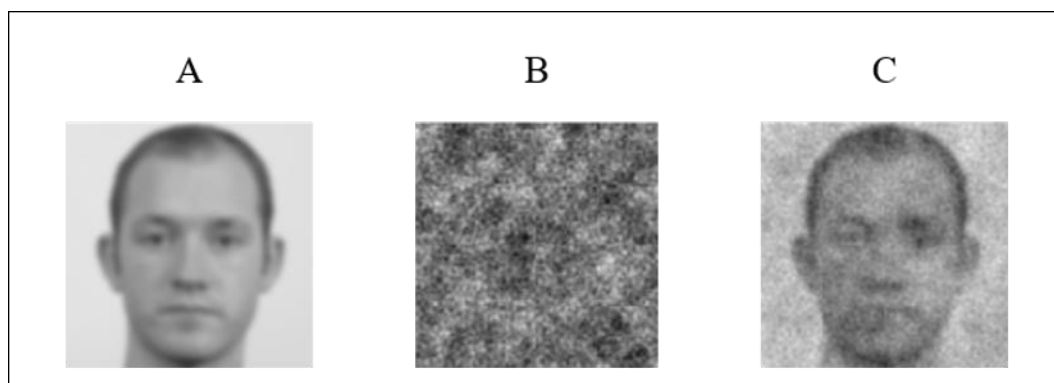
###### *Materials*

We manipulated the perception of two fictitious groups by using short statements, each associated with a blurred face. We displayed the statements inside colored rectangles (green or blue) to refer to one of the two groups (see Figure 1). To create the blurred faces for the impression formation phase (see Figure 2), we selected six images from the Radboud Face Database (Langner et al., 2010) and split them in two sets of three images. Using R and the *rcicr* package (Dotsch & Todorov, 2012), we generated four stimuli from each face by adding a superimposed random noise pattern (for more details see Dotsch & Todorov, 2012), resulting in two sets of 12 stimuli.

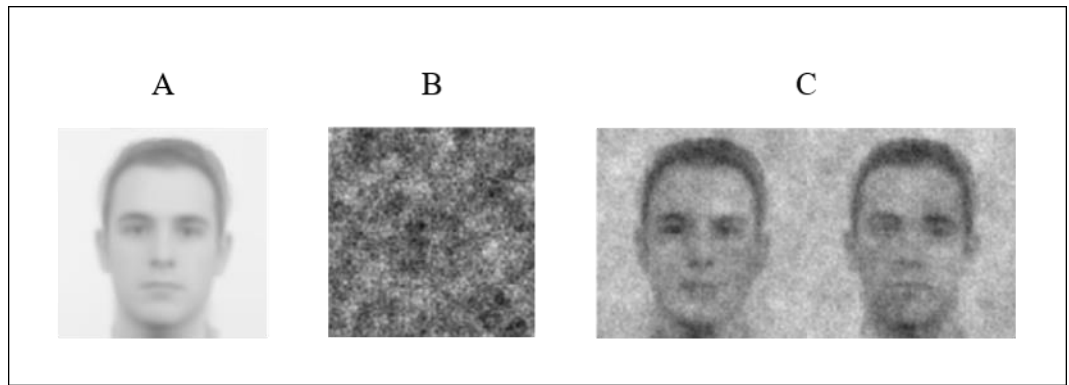


*Figure 1.* Examples of statements displayed during the manipulation phase

We produced stimuli for the 2-image forced choice task by first combining the six previously used images from the Radboud Face Database into a single morph using Psychomorph (Tiddeman, Stirrat, & Perrett, 2005). We then created pairs of stimuli by adding both a superimposed random noise pattern and the negative of this noise on the morph (see Figure 3). Both the manipulation phase and the 2-image forced choice task were built using PsyToolkit (Stoet 2010, 2017).



*Figure 2.* Base image (A), example of random noise pattern (B) and example of stimuli with random noise superimposed (C)



*Figure 3.* Morph of the six images (A), example of random noise pattern (B) and example of a pair of stimuli produced by adding noise (left) or adding the negative of noise (right) upon the morphed image (C)

### *Procedure*

On the first page of the experiment, we informed participants that their data would be strictly confidential and anonymous, that it would not be possible for unauthorized third parties to identify them, that they could contact the researchers for any questions or suggestions, and that they could terminate their participation without any justification or prejudice.

After the participants agreed to voluntarily take part in the study, the experiment started. We sought to manipulate the perception of two novel groups, by describing an objective difference on competence while remaining ambiguous on the warmth dimension. To do so, we relied on the methodology of Judd et al. (2005), with minor modifications. In this first task, we informed participants that they were about to undertake an impression formation task (see Appendix 1). We asked them to read a series of statements describing behaviors allegedly performed by members belonging to one of two groups (“BLUE GROUP” or “GREEN GROUP”). The two groups were presented to the participants as real groups that were anonymized. Participants were told that their task was to simply have a look at the face on the screen and read each statement. They were then shown 24 statements in colored rectangles, 12 by group, paired with blurred faces to add a visual component to the task.

We randomly assigned each blurred face set to one of the two groups for every participant. Each group was also randomly assigned to the *high* or *low* condition, with the *high* group being high on the manipulated dimension – i.e. competence –, as opposed to the *low* group. The statements were colored to match the group color, and the color of the group being *high* was randomized across participants. The 12 statements were composed of 8 behaviors being diagnostic of the competence, with 6 being high(low) for the *high(low)* group and 2 being low(high) for the *high(low)* group, and 4 behaviors being diagnostic of the warmth with 2 being high and 2 being low for both groups. As in Kervyn, Yzerbyt et al. (2009), we chose not to use the neutral behaviors as their presence or absence does not seem to have an impact.

The order of the behaviors was randomized, and each behavior started with “*X, member of the Y group*”, with *Y* being the group color. Participants had 6 seconds to read the behavior and look at the blurred face before the program proceeded to the next stimulus. Once the participants had read all the statements, they had to read them once again, but this time behaviors were grouped by color. This was made to ensure that the participants formed a group impression rather than an individual impression. Once again, participants had 6 seconds to read and watch each stimulus. When participants were done reading for the second time, they had to write a small paragraph about their impression of each group.

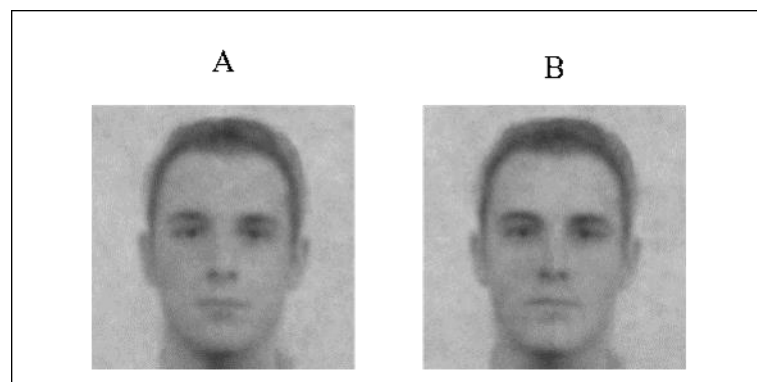
They were then presented with the 2-images forced choice (2IFC) task (Dotsch et al., 2008). This task allows to collect a participant’s visual representations of a specific target by asking him/her to select the face that best fits his/her own representation. Using the “*s*” and “*l*” keys, participants were asked for each pair of stimuli (*i.e.*, 350 trials) to select intuitively and as quickly as possible the face that looked the most like the *Y* group, with *Y* being a randomly selected color between blue or green, randomized across participants (see Appendix 1). The pairs of stimuli appeared in a random order. If the participant did not select any of the two faces before 99 seconds, the trial counted as a timeout and the experiment went on with the next trial.

Once the participants had completed the 2IFC task, they were redirected to a Qualtrics survey to fulfill an explicit questionnaire about their impression of each of the two groups. We assessed explicit measures by asking participants “Please indicate how well a series of traits describe your impression about the *Y* group”, with *Y* being either

GREEN or BLUE. The traits were four traits diagnostic of the competence dimension (i.e. competent, efficient, capable, intelligent,  $\alpha = .88$ ) and four traits diagnostic of the warmth dimension (i.e. sociable, nice, warm, caring,  $\alpha = .85$ ). The scale was a 7-point Likert-type scale ranging from 1 (= *Strongly disagree*) to 7 (= *Strongly agree*). Both the traits order and first group to appear (block BLUE or block GREEN) were randomized across participants, and the traits order was randomized for each block. Finally, participants were asked demographic data as well as their Prolific ID, and we briefly explained them the purpose of the study.

### *Data processing*

We compiled each participant's 350 choices from the 2IFC task using the *rcicr* package (Version 0.3.4.1; Dotsch, 2016). This package extracts and averages the noise of each selected face from a single participant and superimpose this averaged noise upon the base image. We therefore obtained 136 images, one for each participant, that are called *classification image* (CI). These CI depict participants' visual representation of a prototypical group member at an individual level. Next, we compiled the CI based on the condition (selection of *high* vs *low* group), to obtain two faces which are the visual representations of both group at a group level (see Figure 4).



*Figure 4.* Classification images obtained at the group level by merging all participants' selections for the low competence group (A) and for the high competence group (B)

## Classification images rating

The data from 62 independent French speaking judges were gathered by sending the link of a Qualtrics survey using social networks, resulting in a snowball sampling. First, the judges read the informed-consent form (see Appendix 2). Then, these judges rated the two group level classification images resulting from the image construction phase. Three of them invariably provided the same answer and were therefore discarded from the analysis, resulting in a total of 59 judges. The ratings were assessed by asking judges “Please indicate how well a series of traits describe your impression about face A and face B shown above” (see Appendix 3). The two faces were presented side by side. The traits were six traits diagnostic of the competence dimension (i.e. efficient, hard-worker, capable, skilled, competent, organised,  $\alpha = .91$ ) and six traits diagnostic of the warmth dimension (i.e. kind, warm, nice, friendly, sociable, caring,  $\alpha = .86$ ). The scale was a 7-point Likert scale ranging from *Totally disagree* to *Totally agree*. Both the traits order and identity of face A (high group CI or low group CI) were randomized across participants.

## 2. Results

### *Ratings of groups*

We recoded the ratings of the *BLUE* and *GREEN* groups in terms of *high* and *low* groups since the color of the *high* and *low* group was randomized. We submitted these data to a 2 (target group: high vs low) X 2 (evaluated dimension: competence vs warmth) repeated measures ANOVA. The results suggest that, on average, the *high* group was rated more positively on both dimensions than the *low* group with a significant target effect,  $F(1,135) = 13.5$ ,  $p < .001$ ,  $partial \eta^2 = .091$  ; and that more positive competence than warmth ratings were given with a significant evaluated dimension effect,  $F(1,135) = 13.88$ ,  $p < .001$ ,  $partial \eta^2 = .093$ . We also found a significant *target group* X *evaluated dimension* interaction,  $F(1,135) = 52.07$ ,  $p < .001$ ,  $partial \eta^2 = .278$ .

As stated in Judd et al. (2005), this significant interaction alone is not enough to ensure that our manipulation worked. We therefore ran pairwise comparisons. The simple target-group difference on the competence dimension was significant,  $F(1,135) = 62.73$ ,  $p < .001$ , suggesting that participants evaluated the *high* group as more competent than

the *low* group. This pattern confirms the success of our manipulation. The simple target-group difference on the warmth dimension was also significant,  $F(1,135) = 4.18, p < .05$ , confirming that participants evaluated the *high* group as less warmth than the *low* group. Relevant means and standards deviations can be found in Table 1. These results support our hypothesis, as participant manifested a compensation pattern (for graphical illustration, see Figure 5).

| Evaluated Dimension | Target Group |             |
|---------------------|--------------|-------------|
|                     | Low          | High        |
| Competence          | 3.15 (1.34)  | 4.40 (1.11) |
| Warmth              | 3.77 (1.33)  | 3.41 (1.26) |

Table 1. Means and SD of trait ratings by Target Group and Evaluated Dimension

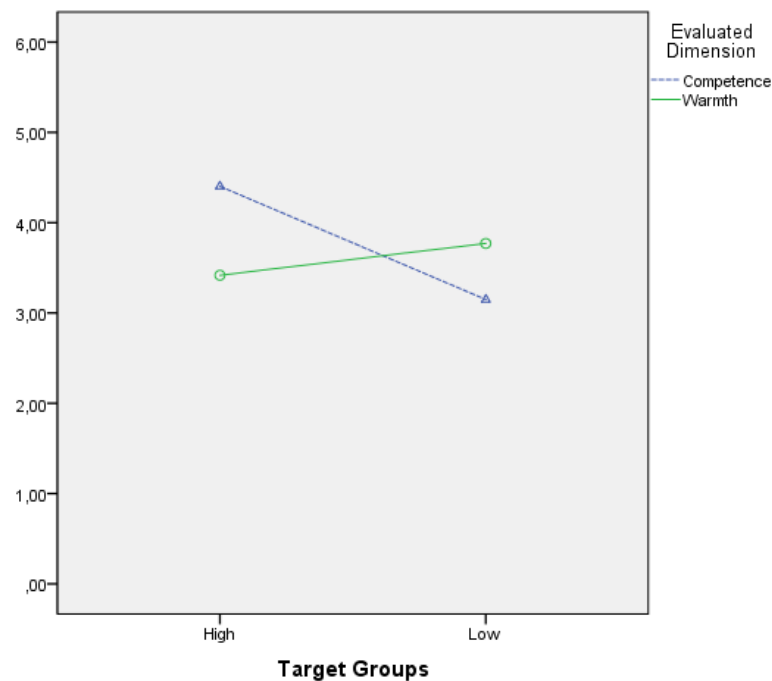


Figure 5. Plot of the mean of trait ratings by Target Group and Evaluated Dimension.

### *Ratings of Classification Images*

To examine whether the compensation pattern found at the explicit level - i.e. high(low) group was perceived as higher(lower) on competence and lower(higher) on warmth – manifests itself at the level of the visual representations, we analyzed the ratings from the external judges by means of the same repeated measures ANOVA. The analysis revealed the presence of a significant target CI effect,  $F(1,58) = 36.57, p < .001$ , *partial*  $\eta^2 = .387$ , a significant evaluated dimension effect,  $F(1,58) = 13.17, p = .001$ , *partial*  $\eta^2 = .185$ , and a significant *target CI X evaluated dimension* interaction,  $F(1,58) = 72.15, p < .001$ , *partial*  $\eta^2 = .554$ .

Pairwise comparisons indicate that although the difference of ratings between the *high* classification image and the *low* classification image on the competence dimension was marginally significant,  $F(1,58) = 3.41, p = .07$ , the difference of ratings on the warmth dimension was significant,  $F(1,58) = 95.51, p < .001$ . Relevant means and standard deviations are presented in Table 2, for a graphical illustration, see Figure 6.

| Evaluated Dimension | Target CI   |             |
|---------------------|-------------|-------------|
|                     | Low Group   | High Group  |
| Competence          | 4.43 (1.22) | 4.77 (1.33) |
| Warmth              | 5.24 (1.15) | 3.24 (1.22) |

*Table 2.* Means and SD of trait ratings by Target CI and Evaluated Dimension

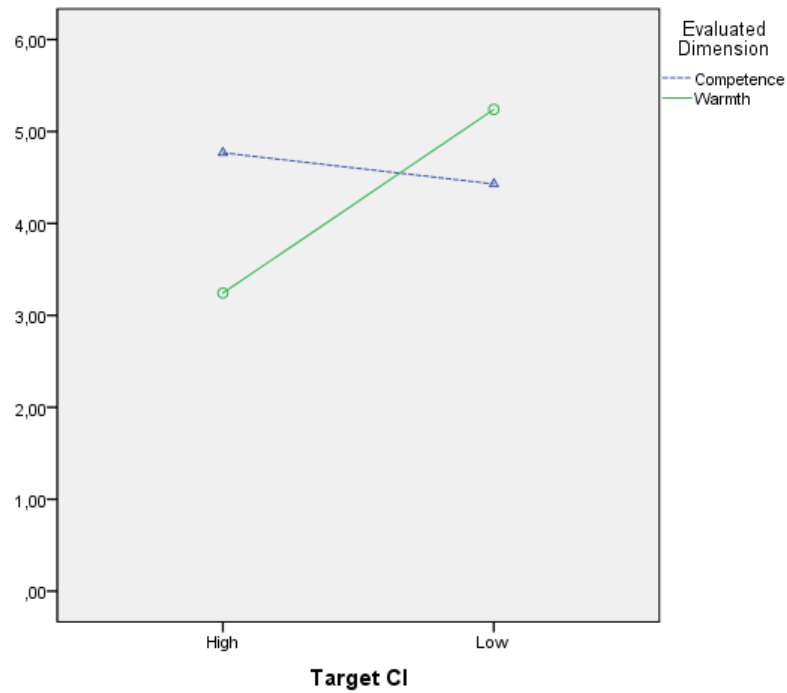


Figure 6. Plot of the mean of trait ratings by Target CI and Evaluated Dimension.

### 3. Discussion

Using behaviors allegedly performed by members of two fictitious groups, we described the high group as being more competent than the low group, while being both equal on the warmth dimension. Then, participants completed a reverse correlation task and assessed these two groups on competence- and warmth-related traits. Finally, we asked a set of new judges to assess the classification image of each group that had been produced by the previous participants, on competence- and warmth-related traits as well. Results from the first phase show that participants perceived the *high* group as more competent but less warm than the *low* group, confirming the success of our manipulation (H1). Turning to the results from the second phase, the classification image of the high group is perceived as more competent than the classification image of the low group, although the difference is marginal. Of more interest, the classification image of the high group is perceived as less warm than the classification image of the low group, even though both group's behaviors were ambiguous on this dimension during the impression formation phase.

The results support our hypothesis, namely that compensation is present in the participants' visual representations (H2). When described as equal on warmth, participants still mentally represent typical group members' faces as conveying discriminant information on this dimension, even when these facial representations are assessed implicitly. Indeed, we asked participants to select the faces that looked the most like one of the two groups, but we never referred to any of the two dimensions at any time during these tasks. Furthermore, participants were instructed to go fast, and mentioned that each trial should not take them more than one to two seconds. Therefore, it is safe to assume that participants had no control over the outcome of their responses.

These findings are in accordance with those from Kervyn et al. (2011) and suggest that compensation is an automatic process when forming an impression of new groups. It may be due to the importance of compensation in our societies (Cambon & Yzerbyt, 2017; Kervyn et al., 2010). Given that we rely daily on compensation, this process might have become automatic.

Concerning the assessment of the visual representations on competence, we found a marginally significant difference. This could be explained by the discrepancy between the dominance and the competence dimensions (Sutherland et al., 2016). When forming an impression of both groups, participants referred to the information concerning the competence dimension. Yet, the stimuli that participants had to select during the two-images forced-choice task were faces. Even though we asked participants to select these faces using information about groups – thus more of an intergroup perception context –, the nature of the stimuli may have partly made some characteristics of an interpersonal perception context more accessible. Participants may have therefore used both visual cues of competence and dominance.

However, when presenting the classification images to the independent judges, we only included ability-related traits in the evaluation scales. Given that dominance may be more related to the assertiveness than to the ability (cf. Chapter 2), it is possible that independent judges could have wanted to express their perception by means of assertiveness-related traits but were not given the opportunity, thus reducing the difference between the two classification images. This limitation has been addressed in the second study by adding assertiveness-related traits in the evaluation scales.

One limitation of our study resides in the fact that it is impossible to determine whether the compensation emerges within the classification images or if it has been produced by the independent judges. Participants who produced the classification images rated the two groups in a compensatory manner. Next, independent judges assessed these classification images, also in a compensatory manner. If a difference of competence between the classification images has been perceived, it is safe to assume that this is linked to the difference of competence in the group's descriptions. Thus, this leads us to suppose that warmth-related traits were perceived within the classification images as well.

However, when assessing the classification images, the independent set of judges was confronted with a context of comparison that included both fundamental dimensions. It could be the case that the objective difference on competence in the first phase has been inscribed within the classification images, while the difference on warmth has not. Rather, this difference on warmth may have been produced by the independent judges as a result of the comparative context, relying on the competence difference. We addressed this issue in the second study by requesting a different task from the judges.



## **Chapter 2**

### **Study 2**

Given the findings of the previous study, we wanted to extend this effect but this time by manipulating warmth instead of competence. It should be noted that the literature has shown that compensation may be observed when manipulating each dimension, even though the effect size of the compensation is smaller (or inexistent) when manipulating warmth rather than competence (Judd et al., 2005; Kervyn et al., 2011; Yzerbyt 2016). However, we used a measure that has never been used to investigate compensation before. Therefore, we found it important to empirically test if compensation may also be observed on this measure when manipulating warmth. Furthermore, we improved our design to test whether the findings of the first study were conditioned to the comparison context.

We implemented three modifications. First, we added assertiveness-related traits for the evaluation of the classification images at the group level. Second, the ratings of the classification images at the group level were split in two, with a series of ratings on competence-related traits being assessed first and another series on warmth-related traits being assessed last. Third, we coupled each of these ratings to a categorization task using the classification images at the individual level. The two latter modifications have both been made to test whether the compensation observed with the classification images is produced or not by the judges during the second phase, due to a context of comparison including the two fundamental dimensions. The categorization tasks allowed us to test the correlation between a participant's assessment of both group at the explicit level during the first phase and the perception of these traits in his/her classification image by a set of independent judges. A positive correlation between these two variables would suggest that compensation resides in participants' classification image. As for the split between warmth and competence tasks, it allowed us to examine whether compensation is perceived within the facial representations or if the effect is facilitated by the comparison context, and thus produced by the independent judges.

## 1. **Method**

### *Participants and design*

A total of 66 Belgian – French speakers – participants completed the task in exchange for 5€ or partial course credits (51 female,  $M_{\text{age}} = 22$ ,  $SD_{\text{age}} = 2.5$ ). We had a 2 (target group: high vs low) X 2 (evaluated dimension: competence vs warmth) design, with both factors varying within participants.

### *Materials*

We manipulated the perception of the groups by means of the same written behaviors used in the first study. We got rid of the blurred face at the impression formation phase, as it has been shown that behavioral information alone is enough to impact visual representations (Dotsch, Wigboldus, & van Knippenberg, 2013). Statements were shown inside colored rectangles (green or blue) to refer to one of the two groups, and stimuli for the 2-images forced choice task were the same as the ones used during the first study. Both the manipulation phase and the 2-image forced choice task were built using PsyToolkit (Stoet 2010, 2017).

### *Procedure*

First, participants filled the informed-consent form (see Appendix 4). Next, participants were told that they were about to perform an impression formation task, as in Study 1 (see Appendix 5). We slightly changed the instructions and added the following sentences to induce a high sense of entitativity, as in Dotsch et al. (2013): “Among a group (GREEN or BLUE), members are very similar to each other and do not differ in many ways from each other. The members come from similar backgrounds and have the same opinions, similar important beliefs, and similar personalities. Across a variety of situations, members of a group (GREEN or BLUE) will act in a similar manner”. We displayed the same statements as in Study 1, describing both the GREEN and BLUE groups.

We randomly assigned each group as the *high* or *low* group, with the *high* group being high on the manipulated dimension – i.e. warmth in this study –, as opposed to the

low group. Thus, this time the 12 statements were composed of 8 behaviors being diagnostic of warmth, with 6 being high(low) for the *high(low)* group and 2 being low(high) for the *high(low)* group, and 4 behaviors being diagnostic of competence with 2 being high and 2 being low for both groups. Again, the color of the *high* group as well as the order of the behaviors were randomized across participants. The procedure was the same as in Study 1. Participants saw each behavior twice for 6 seconds, once in a random order and once grouped by color to give a group impression, and wrote a few lines concerning their impressions of each group.

Then, we presented the participants with the 2-images forced choice task (see Appendix 5). The number of trials was the same as in Study 1. Again, we randomized which group was referred to in the instructions as well as the order of the stimuli between participants. Next, we asked participants to give their impression of both groups using 7-point Likert-type scales ranging from 1 (= *Strongly disagree*) to 7 (= *Strongly agree*) (see Appendix 6). The traits were four traits diagnostic of the competence dimension (i.e. competent, efficient, capable, hardworking,  $\alpha = .83$ ) and four traits diagnostic of the warmth dimension (i.e. friendly, agreeable, warm, sociable,  $\alpha = .85$ ). Once again, we randomized the group order between participants, and the traits order both between participants and blocks. Finally, participants fulfilled demographic data (age, gender, higher diploma), were debriefed and thanked.

### *Data processing*

We obtained 66 classification images at the individual level. Then, we compiled these classification images based on which group the participant had to select (high vs low group) to obtain the classification images at the group level (see Figure 1).

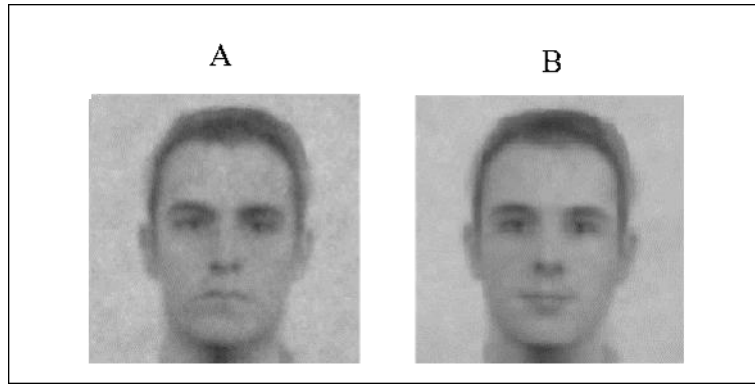


Figure 1. Classification images obtained at the group level by merging all participants' selections for the low warmth group (A) and for the high warmth group (B)

### *Classification images rating*

We gathered the data of 15 Belgian independent judges in exchange for 5€ (10 female,  $M_{\text{age}} = 23.6$ ,  $SD_{\text{age}} = 3.1$ ). First, judges filled the informed-consent form (see Appendix 4). Next, we informed judges that they were going to undertake a facial recognition task. As a cover story, we told judges that there exist interindividual differences in the ability to accurately perceive facial traits, and that our purpose was to evaluate these differences. We gave judges a set of small cards with the 66 classification images at the individual level printed on it and told them that these faces had been scientifically produced to vary on specific traits related to a *competence* profile – being described as someone looking competent, determined, ambitious, hard-working, confident, and efficient (see Appendix 7). Specifically, we told judges that 33 faces were scientifically produced to resemble the most a competence profile, and 33 faces were scientifically produced to resemble the less a competence profile. Their task was to sort the 66 faces into two categories (*the less* and *the most*), each of which must contain 33 faces.

Once judges had sorted the 66 faces on the competence profile, we asked them to evaluate the two classification images at the group level (see Appendix 8). We explained judges that unlike the previous set of faces these two faces had not been scientifically produced, and therefore we were interested in their own perception. The instructions were stated as follow: “*According to you, face X looks*”, with X being either A or B, a labelling

letter for each face. The two faces were presented side by side, and the traits were six traits diagnostic of competence ( $\alpha = .85$ ), with three of them being related to ability (i.e. efficient, hard-working, competent) and three of them being related to assertiveness (i.e. confident, determined, ambitious).

Next, we presented once more the judges with the 66 faces and the same instructions as in the first step, except for the nature of the profile (see Appendix 9). This time, we told judges that the faces were scientifically produced to vary on specific traits related to a *warmth* profile – being described as someone looking warm, trustworthy, sociable, moral, friendly, and honest. Again, we asked judges to sort 33 of these faces in the *less* category and 33 of these faces in the *most* category.

Once judges were done sorting, we asked them once again to evaluate the two classification images at the group level (see Appendix 10), but this time on six traits diagnostic of warmth ( $\alpha = .74$ ), with three of them being related to the sociability sub-dimension (i.e. warm, sociable, friendly) and three of them being related to the morality sub-dimension (i.e. trustworthy, moral, honest). The scales were also 7-point Likert-type scales ranging from *Totally disagree* to *Totally agree*. Both the localization of the faces (high group CI being A vs low group CI being A) and the order of traits were randomized between participants for the two evaluations. We knew that our sample would be reduced, and we were mainly interested in the competence dimension given that it was our unmanipulated dimension. Therefore, we decided not to randomize the order of the dimensions since it has been shown that order may have an impact on compensation (Yzerbyt & Cambon, 2017). Finally, participants filled the demographic data questionnaire (see Appendix 11).

## 2. Results

### *Ratings of groups*

As in Study 1, we recoded the ratings of the *BLUE* and *GREEN* groups to *high* and *low* groups. We submitted these data to a 2 (target group: high vs low) X 2 (evaluated dimension: competence vs warmth) repeated measures ANOVA. We found a significant target group effect,  $F(1,65) = 32.23, p < .001, \text{partial } \eta^2 = .331$ , indicating that on average participants rated the *high* group more positively than the *low* group on both dimensions,

and a significant evaluated dimension effect,  $F(1,65) = 32.36, p < .001, \text{partial } \eta^2 = .332$ , indicating that, on average, participants gave more positive competence than warmth ratings. Of greater interest is the significant *target group X evaluated dimension* interaction,  $F(1,65) = 65.12, p < .001, \text{partial } \eta^2 = .500$ .

We ran pairwise comparisons and observed a significant difference between the two groups on the manipulated dimension,  $F(1,65) = 89.33, p < .001$ , indicating that participants evaluated the *high* group as warmer than the *low* group, and thus confirming the success of our manipulation. The simple target-group difference on the competence dimension was significant as well,  $F(1,65) = 9.35, p = .003$ , indicating that participants perceived the *high* group as less competent than the *low* group. These results support our hypothesis, as participant manifested a compensation pattern when manipulating the warmth dimension. Relevant means and standards deviations can be found in Table 1, for a graphical illustration see Figure 2.

| Evaluated<br>Dimension | Target Group |             |
|------------------------|--------------|-------------|
|                        | Low          | High        |
| Competence             | 4.23 (0.99)  | 3.56 (1.13) |
| Warmth                 | 2.32 (1.13)  | 4.57 (1.15) |

*Table 1.* Means and SD of trait ratings by Target Group and Evaluated Dimension

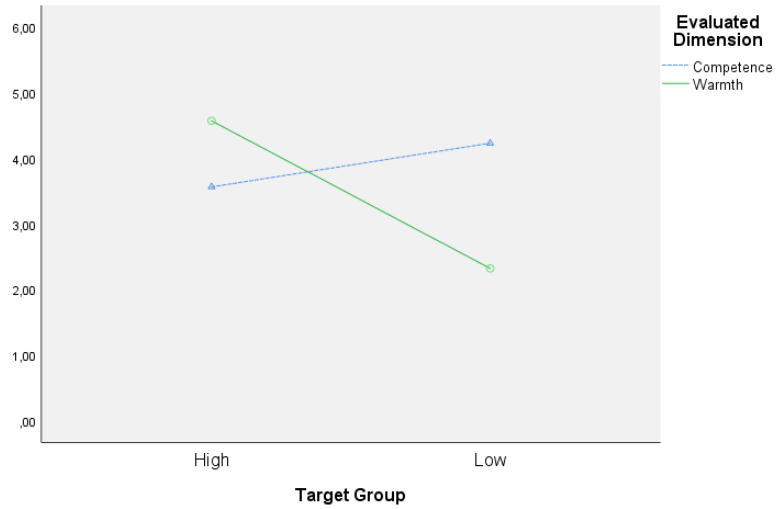


Figure 2. Plot of the mean of trait ratings by Target Group and Evaluated Dimension.

#### Ratings of classification images

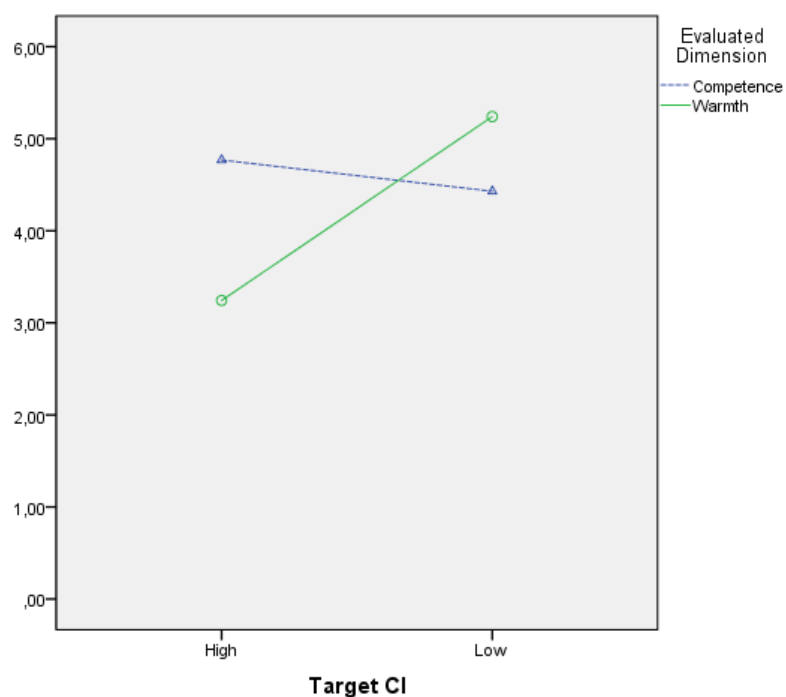
We submitted the ratings of the two classification images at the group level to a 2 (target classification image: high vs low) X 2 (evaluated dimension: competence vs warmth) repeated measures ANOVA. We found a significant target effect,  $F(1,14) = 30.64, p < .001, \text{partial } \eta^2 = .686$ , a significant evaluated dimension effect,  $F(1,14) = 15.17, p = .002, \text{partial } \eta^2 = .520$ , and a significant *target CI X evaluated dimension* interaction,  $F(1,14) = 19.73, p = .001, \text{partial } \eta^2 = .585$ .

Turning to the pairwise comparisons, the difference of ratings between the *high* classification image and the *low* classification image on the manipulated dimension was significant,  $F(1,14) = 104.15, p < .001$ , indicating that the *high* group classification image was perceived as warmer than the *low* group classification image. However, the difference of ratings on the unmanipulated dimension was not significant,  $F(1,14) = .01, p = .912$ . This lack of difference between the group CI holds when analysis is performed on the two competence subscales, i.e. ability and assertiveness<sup>1</sup>. Relevant means and standards deviations are presented in Table 2. For a graphical illustration, see Figure 3.

<sup>1</sup> For the analyses on sub-scales, see Appendices 12-15.

| Evaluated Dimension | Target CI   |             |
|---------------------|-------------|-------------|
|                     | Low Group   | High Group  |
| Competence          | 3.69 (1.30) | 3.74 (0.95) |
| Ability             | 3.51 (1.30) | 3.56 (0.97) |
| Assertiveness       | 3.87 (1.44) | 3.93 (1.33) |
| Warmth              | 1.78 (0.88) | 4.54 (0.55) |
| Sociability         | 0.89 (0.81) | 5.29 (0.72) |
| Morality            | 2.67 (1.18) | 3.80 (0.75) |

*Table 2.* Means and SD of trait ratings on Competence, Warmth and their subdivisions by Target CI and Evaluated Dimension



*Figure 3.* Plot of the mean of trait ratings by Target CI and Evaluated Dimension.

### *Sorting of individual classification images*

Judges sorted each of the 66 face in one of two groups twice, once for each dimension, resulting in a total of 132 sortings by judge – 66 sortings on competence and 66 sortings on warmth. We compared these sortings to the expected sorting if the face contained compensatory traits. For instance, if a face was produced by a participant who had to select the *high* group during the 2IFC, we expect this face to be sorted in the category “the less” on competence and in the category “the most” on warmth, and we expect the opposite for a face produced by a participant who had to select the *low* group. We compared the actual sorting to the expected sorting and coded 1 when the actual sorting matched the expected sorting (meaning that judges perceived traits in line with the compensation) and 0 when the actual sorting did not match the expected sorting (meaning that judges did not perceived traits in line with the compensation). For ease of reading, the scores indicating a (mis)match between the actual sorting and the expected sorting will be called (in)correct scores.

We summed up the number of correct scores by judges and by dimension to obtain a number varying between 0 and 66 and indicating how many faces this judge sorted in the expected way, and we did the same with the number of incorrect scores. Then, we subtracted the sum of the correct scores to the sum of the incorrect scores, resulting in a difference score varying between -66 and 66. This difference score is positive when a judge sorted more faces in an expected way, and it is negative when a judge sorted more faces in an unexpected way.

We hypothesized that the compensatory pattern found during the face production phase would be subsequently perceived within the individual classification images. Thus, the differences score should be significantly higher than zero, suggesting that judges in the face evaluation phase did perceive compensatory traits within the classification images. To test this hypothesis, we submitted the two differences – one for the sorting on competence and the other for the sorting on warmth – to mean comparison t-tests. Results indicate that the difference score for the warmth sorting is significantly different from 0 and positive ( $M = 32.93$ ,  $SD = 5.55$ ),  $t(14) = 22.99$ ,  $p < .001$ , suggesting that judges perceived *high* individual CIs as warmer than *low* individual CIs. However, the difference score for the competence sorting is significantly different from 0 but negative ( $M = -$

11.60, SD = 19.76),  $t(14) = -2.27$ ,  $p = .04$ , suggesting that judges perceived *high* individuals CIs as more competent than *low* individual CIs.

### *Correlations*

Our design allowed us to investigate whether a correlation exists between the perception of both groups by a participant during the face production phase and the sorting of this participant's classification image during the face evaluation phase. To do so, we first computed the perceived difference between the two groups on each dimension for each participant in the face production phase. In line with the compensation, a positive difference on competence(warmth) indicates that the *high* group has been perceived as lower(higher) on this dimension than the *low* group. Next, we computed the rates of correct sortings during the face evaluation phase by dimension for each individual classification image. We added the amount of correct sorting (coded 1) and divided this sum by the total amount of sortings by dimension (i.e. 66 sortings by dimension). This resulted in numbers representing the rate of correct sortings and varying from 0 (the classification image has never been correctly sorted) to 1 (the classification image has always been correctly sorted).

We hypothesized that if the compensation was perceived within the classification images, a positive correlation should be observed between the perceived difference and the rates of correct sorting. That is, the more a participant perceived a difference between the two groups on a dimension, the more this difference should be noticeable within this participant's classification image, thus leading to a higher rate of correct sortings. Results supported our hypothesis for the warmth dimension: we found a positive significant correlation,  $r = .47$ ,  $p < .001$ , indicating that when a participant perceived a greater difference between the two groups during the face production phase, this participant's classification image was more often sorted in an expected way. However, we did not find a significant correlation for the competence dimension,  $r = .18$ ,  $p = .15$ . For plots of both correlations, see Appendix 16.

### **3. Discussion**

This second study had two objectives. First, we sought to extend the findings of the first study – that is, the presence of compensation within the classification images –

while manipulating the warmth dimension. Second, we addressed a series of methodological limitations to minimize the possibility that the results found in the first study were due to a comparison context including the two fundamental dimensions in the eyes of the judges. To do so, we first presented judges with all the tasks related to the competence dimension, and only then we presented judges with all the judgments related to the warmth dimension. Moreover, we included a task using the classification images at the individual level to allow for a more in-depth investigation of the presence of compensation within classification images.

The results from the first phase show that participants perceived the *high* group as being warmer and less competent than the *low* group when asked explicitly. This compensatory perception at the explicit level confirms the success of our manipulation (H1). Concerning the implicit level, our results grant support for a manipulation check. We found a difference between the classification images at the group level on warmth-related traits, suggesting that judges perceived warmth-related traits within the classification images in the direction of our manipulation. That is, judges evaluated the *high* classification image as warmer than the *low* classification image at the group level.

Furthermore, judges sorted more often the classification images at the individual level in the expected way, suggesting that the difference between the two groups on the manipulated dimension had an impact on the classification images. Finally, we observed a positive correlation between the perceived difference between groups and the rate of correct sortings, supporting the evidence that warmth-related traits are present within the classification images. All in all, these results showed that our manipulation impacted the visual representations of participants, and that this impact was in turn perceived by independent judges.

However, our results did not support our hypothesis concerning the competence dimension. Neither did we find a difference between the classification images at the group level on competence-related traits (H2), nor a higher rate of correct sorting (H3) or a significant correlation (H4). Surprisingly, we found a significant tendency to sort classification images at the individual level in an unexpected way. That is, *high(low)* classification images were more often sorted as being more(less) competent. Possible explanations for the presence of this (modest) halo effect will be discussed in the next section.



## IV. GENERAL DISCUSSION AND FURTHER DIRECTIONS

In this section, we review and interpret the results of the two studies conducted for this master's thesis. Then, we discuss the limitations of these studies. Finally, we propose a few recommendations for next studies on this topic.

### 1. Integration of both studies

Building on the literature about compensation (Judd et al., 2005; Yzerbyt et al., 2005), we decided to investigate whether this compensation pattern would be present at the implicit level or not. To do so, we decided to use a reverse correlation technique (Mangini & Biederman, 2004, Dotsch et al., 2008). This measure can be considered as implicit because of the specific instructions we set up. First, participants are unable to guess what is being assessed in our study, unlike some of the previous works using a reverse correlation technique (Dotsch & Todorov, 2012). They might guess that we are interested in their facial representations of some groups or category, but the fundamental dimensions are never mentioned during the 2-images forced choice task. Second, our instructions induced a time pressure, which in turn reduces the control over participant's responses (Petty et al., 2009).

In the first study, we manipulated the competence of two groups (one being *high* and the other being *low*) while describing them as equal on warmth. We then collected facial representations of these two groups and asked independent judges to evaluate the two classification images produced at the group level using competence- and warmth-related traits. We found that the participants who produced the classification images did compensate, that is, they perceived the *high* group as more competent but less warm than the *low* group (H1). We also found that, when evaluating both classification images at the group level using both competence- and warmth-related traits, independent judges assessed these classification images in a compensatory way (H2). That is, they perceived the *high* group classification image as more competent but less warm than the *low* group classification image.

As such, these results suggest that compensation impacts facial representations in an automatic and spontaneous way and are in line with the findings of Kervyn et al. (2011). However, independent judges evaluated the two classification images at the same

time, using both fundamental dimensions simultaneously. It could be the case that the comparison context calling on the fundamental dimensions produced a compensation in these judges' mind, and that compensation is not actually carried within the classification images.

We set up a second experiment to extend previous findings by manipulating the warmth dimension and checking if compensation was present at the individual level. Using the same design as in the first study, we manipulated the warmth of two groups (one being *high* and the other being *low*) while describing them as equal on competence, and we collected the facial representations of these two groups. To prevent the potential effect of the comparison context, we assessed each dimension separately. We also added a sorting task using the classification images at the individual level to investigate whether compensation can be perceived at the individual level, and if a correlation exists between a participant's perception when producing a classification image and this classification image's perception from independent judges.

We found support only for our hypothesis related to the success of our manipulation (H1): participants in the first phase assessed the *high* group as warmer and less competent than the *low* group at the explicit level. However, we did not find support for any of our three implicit-related hypotheses. When fulfilling competence-related tasks first, judges did not display any compensation. On the contrary, participants displayed a tendency to sort more often *high(low)* group classification images in the more(less) competent category, suggesting the presence of a halo effect for the competence dimension.

However, results concerning warmth indicate that this dimension has been encoded within the classification images in an automatic manner: judges seem to have perceived a difference on warmth between *high* or *low* classification images, both at the individual- and the group. Furthermore, we found that the perception of a group being higher on warmth when producing a classification image is linked to a higher perception of this facial warmth.

A few hypotheses may explain the pattern of results of our second study. First, it could be the case that compensation is not present at the implicit level, but rather a halo effect. Indeed, when suppressing the comparison context, we found no support for the presence of compensation at the implicit level, but we found support for the presence of

a halo effect at the implicit level in one of the tasks. However, this assumption goes against the findings of Kervyn et al. (2001) and suggest that compensation would not be observed in a spontaneous manner, even when confronted with novel, fictitious groups. Given the importance of compensation in our daily life (Cambon & Yzerbyt, 2017; Kervyn et al., 2010; Yzerbyt 2018), we find hardly believable that this process would not spontaneously affect impression formation when nothing important – such as positive differentiation – is at stake.

Another possible explanation could be that warmth is indeed encoded within the classification images, while competence is not. Warmth and trustworthiness seem to share the same core, while competence and dominance are less related to one another (Sutherland et al., 2016). It is thus possible that the perception of a difference between the two groups on the warmth dimension has been closely transposed to a difference on the trustworthiness dimension within the facial representations, which in turn has been interpreted by judges as a difference between the classification images on the warmth dimension. However, since our manipulation strictly referred to ability, it is possible that the perception of a difference between the two groups on that dimension could not have been fully transposed to a difference on the dominance dimension in facial representations, thus leading to a loss of information concerning the competence dimension within the classification images.

While this explanation makes sense at a theoretical level, it does not account for the halo effect found on the sorting task. These results could be explained by recent work (Judd, Garcia-Marques, & Yzerbyt, *in prep*) showing that when participants judge a series of faces on two dimensions separately, a halo effect emerges. In contrast, when participants judge a series of faces on two dimensions at the same time, a compensation effect emerges, such as the one we obtained in Study 1. Thus, the difference on the competence dimension could be overwritten by this halo effect. The difference on the warmth dimension could be preserved for two reasons. First, because of its strong relation with trustworthiness. Second, because the warmth-related tasks always came after the competence-related tasks. Thus, when fulfilling the warmth-related tasks, judges were already primed to the competence dimension, potentially compensating the absence of a direct comparison context. This was not the case for the competence-related tasks, as no references were made to the warmth dimension before.

## **2. Limitations**

Like any empirical effort, this work has a few methodological limitations worth mentioning. First, the sample from the face production phase in Study 1 is mostly American, while every other samples are mostly Belgian. Even though compensation has been found both with American and Belgian samples (Judd et al., 2005; Yzerbyt et al., 2008; Kervyn, Yzerbyt et al., 2009), the relation between trustworthiness and dominance on one hand and warmth and competence on the other hand has only been studied with British samples (Sutherland et al., 2016). Competence and dominance could be more closely related for American people, allowing these participants to express the perceived difference between the two groups in terms of facial dominance. This facial dominance could have been slightly interpreted as competence from the independent judges in Study 1, leading to the marginally significant difference between the classification images. Another issue related to sampling lies within the small size of the sample for the face evaluation phase of Study 2, due to time constraints.

Another limitation is the fact that, despite our best efforts, none of the two studies conducted for this master's thesis allowed to clearly state if compensation is encoded in an automatic and spontaneous way within facial representations. However, this work has opened new possibilities, and we will give below indications to go beyond our current work.

## **3. Further directions**

The objectives of future works should primarily focus on clearly defining whether compensation is automatically encoded within facial representations or if a halo effect or even no relation between the two fundamental dimensions are encoded. We suggest two ways in which this could be possible. First, order of the competence- and warmth-related tasks in the face evaluation phase of Study 2 should be manipulated, and more data should be gathered. Given that judging faces on a single dimension tends to produce a halo effect (Judd, Garcia-Marques, & Yzerbyt, in prep.), this effect could totally suppress the perceived difference of competence due to compensation. However, the difference on warmth could be so strong – due to the strong link between warmth and trustworthiness – that the perceived difference on warmth could stand.

The presence of the difference on warmth could also be maintained partly through the fact that judges had always a clear reference to the competence dimension in head when fulfilling the warmth-related tasks, possibly simulating a comparison context. Therefore, when the order of the competence- and warmth-related tasks is reversed, we should fully observe the compensation: the difference on warmth should not be suppressed by the halo effect because of its strong link with trustworthiness, while the difference on competence should emerge.

Second, data from the face production phase of Study 1 should be analyzed using the same design as proposed above. Given that effect sizes for compensation are often higher when manipulating competence (Yzerbyt 2016; Kervyn et al., 2010), perceived differences between groups could be more strongly encoded within facial representations, and thus the perceived difference between classification images could hold against the halo effect.

Finally, if and when future works will have clearly defined that compensation is automatically encoded within visual representations, an interesting question would be the influence of group membership. Indeed, when presenting two novel and fictitious groups, participants are not member of any of those groups. Hence, if they perceive a difference between these groups on the unmanipulated dimension, there is no strong reason for them not to display this difference on less controlled measures. If we were to manipulate participants' group membership – using a minimal group paradigm –, we would probably observe a compensation pattern at the explicit level, based on previous works (Cambon & Yzerbyt, 2016; Yzerbyt & Cambon, 2017; Cambon & Yzerbyt, 2018). However, since people use compensation as a strategy to preserve a positive differentiation (Cambon & Yzerbyt, 2018), it is reasonable to think that as a group member, people will demonstrate an ingroup bias with less controlled measures. In the case of the reverse correlation technique, they would perceive their ingroup's typical facial representation as being high both on competence and warmth. This would suggest that compensation is a well-motivated strategy that has become automatic only when no positive differentiation for the self is needed.



## **V. GENERAL CONCLUSION**

The objective of this master's thesis was to investigate if a negative relation between warmth and competence – i.e. the compensation effect – would be present when measuring it at the implicit level, that is, in a spontaneous and less controlled way.

To achieve this objective, we began by summarizing the state of the art concerning the compensation effect. Our review highlighted the prime importance of the two dimensions considered as fundamentals in social perception. In the group perception domain, these two dimensions have been labelled warmth and competence, and refers to the questions of one's intent and ability, respectively. Researchers have found that under certain conditions, such as the presence of a comparison context, these two dimensions display a negative relation: a target perceived as comparatively higher on one dimension than another target is perceived as comparatively lower on the other dimension. Over the years, this pattern – called the compensation effect – has been found to be robust, and to be driven – at least partly – by a need for positive differentiation.

We also reviewed the literature pertaining to face processing and brought forward the key role of face processing in the social perception context. For instance, people draw conclusions from faces concerning one's personality, even though the evidence regarding the veracity of these conclusions is mixed. These inferences lead to cognitive or behavioral consequences, such as choosing whom to vote for. The reverse is true as well: people rely on non-facial information to picture the typical face of a target. These processes seem to be underlain by three major dimensions: trustworthiness, dominance, and youthful-attractiveness. While trustworthiness is highly related to the warmth dimension, it does not seem to be the case for dominance and competence. However, we have argued that dominance might be linked to the assertiveness – a sub-dimension of competence.

From this theoretical frame, we hypothesized that compensation would be present at the implicit level, using a reverse correlation measure. Specifically, we hypothesized that participants who judge two fictitious groups in a compensatory manner would produce a facial representation displaying compensatory traits. That is, the face of the high group should be perceived as high on the manipulated dimension and low on the unmanipulated dimension, while the opposite would be found for the low group.

We tested this hypothesis in two studies. In Study 1, we manipulated the competence of two fictitious groups while describing them as equal on warmth in a first phase. We then produced participants' facial representation of a typical member of these two groups by means of a reverse correlation measure. In a second phase, we asked an independent set of judges to evaluate these two facial representations using warmth- and competence-related traits. We found that participants in the first phase did perceive the two groups in a compensatory manner at the explicit level, and that this compensation was perceived by the set of independent judges. However, the comparison context induced in the second phase did not allow knowing whether compensation was perceived in the facial representations themselves or if it was produced by the independent judges.

The second study was designed both to investigate this phenomenon while manipulating warmth and to further test if compensation is indeed perceived in the facial representations. During the first phase, we relied on the exact same design as in Study 1, but this time warmth was the manipulated dimension. For the second phase, we assessed each dimension separately and added a sorting task to allow measuring and correlation testing at the individual level. We did not find evidence for the perception of compensation within facial representations: while the facial representations were perceived as different on warmth, they were not perceived as being different on competence – even when assessing the sub-dimensions of competence. In fact, we found evidence for the presence of a halo effect on the sorting task.

In our opinion, these results could be explained by a combination of two theoretical findings. First, the link between warmth and trustworthiness could allow a warmth difference between groups to be encoded within facial representations as a trustworthiness difference, which *in fine* could be perceived as a warmth difference by independent judges. The difference between competence and dominance drastically reduces the encoding of a competence difference as a dominance difference within facial representations, explaining the lack of difference perception in the eyes of the independent judges.

Second, recent works showed that when judging faces on the two social perception dimensions separately, a halo effect tends to occur, while a compensation effect tends to occur when judging faces on both dimensions simultaneously (Judd et al., in prep.). In line with these findings, it could be the case that the difference on warmth is strong

enough to overcome the halo effect induced by the setting of our second study. However, the difference on competence could be less strongly encoded within facial representations, allowing the halo effect to suppress the perception of the difference.

Although we did not find clear evidence to support our hypothesis, we believe that this work allowed for further questioning regarding the emergence of compensation within facial representations. While these two studies have set the trails, more work should be conducted on this issue to clearly define whether compensation is encoded within facial representations in an automatic and spontaneous way.



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## **Appendices**

|                     |
|---------------------|
| Table of appendices |
|---------------------|

|                                                                                                            |    |
|------------------------------------------------------------------------------------------------------------|----|
| Appendix 1: Instructions for first phase of Study 1 .....                                                  | 82 |
| Appendix 2: Informed-consent form for second phase of Study 1 .....                                        | 84 |
| Appendix 3: Example of trait-rating task for second phase of Study 1 .....                                 | 85 |
| Appendix 4: Informed-consent form for both first and second phases of Study 2 .....                        | 86 |
| Appendix 5: Instructions for first phase of Study 2 .....                                                  | 87 |
| Appendix 6: Example of Competence- and Warmth-related Traits rating scale<br>for phase one of Study 2..... | 89 |
| Appendix 7: Questionnaire for Sorting Task of Study 2 – Competence dimension .....                         | 90 |
| Appendix 8: Example for the Competence-related rating scale.....                                           | 91 |
| Appendix 9: Questionnaire for sorting task of Study 2 – Warmth dimension .....                             | 92 |
| Appendix 10: Example for the Warmth-related rating scale.....                                              | 93 |
| Appendix 11: Questionnaire for demographic data for second phase of Study 2.....                           | 94 |
| Appendix 12: Analysis of the ability sub-scale – SPSS Output.....                                          | 95 |
| Appendix 13: Analysis of the assertiveness sub-scale – SPSS Output .....                                   | 96 |
| Appendix 14: Analysis of the sociability sub-scale – SPSS Output .....                                     | 97 |
| Appendix 15: Analysis of the morality sub-scale – SPSS Output .....                                        | 98 |
| Appendix 16: Plots of the correlations between perceived difference<br>and rates of correct sorting .....  | 99 |

## Appendix 1: Instructions for first phase of Study 1

### IMPRESSION FORMATION TASK

In this task we will present you a series of statements describing behaviors that have been performed by individuals belonging to one of two groups:

GREEN GROUP or BLUE GROUP

Each statement will be accompanied by a blurred face of the author who performed the behavior as well as a colored background, indicating the group membership of this person.

Your task is to simply have a look at the face and read each statement. The objective of this task is for you to try to form an impression about these two groups.

Note that this is not a memory task so you do not have to memorize the statements.

Please stay concentrated.

press

<SPACEBAR>

to begin the task

### IMPRESSION FORMATION TASK

In this task we will again present you each of the statements from both groups.

Your task is to look at the face, read the statement and then to classify it according to the group of the person who performed the behavior.

To do so simply use your mouse and click on the button corresponding to the correct group. The task will only proceed if you select the correct button.

Go at your own pace, this is not a reaction time task.

While you perform this task try to form an impression of the

GREEN GROUP and the BLUE GROUP.

press

<SPACEBAR>

to begin the task

## IMPRESSION FORMATION TASK

We will now present you a last time each statement and face.

You will first see all the statements from one group and then from the other group.

Your task is to simply have a **look at the face** and **read** each statement. Try to **form an impression** about these two groups.

Note that this is not a memory task so you do not have to memorize the statements.

press

<SPACEBAR>

to begin the task

## FACES SELECTION TASK

In this task you will be asked several times which of two faces looks the most like [GREEN | BLUE] members. Make your choice by pressing the <S> or <L> keys.

The task looks like this:

Select the face that looks the most like [GROUP] members



S



L

Answer as **quickly** and **intuitively** as possible. The whole task takes about 8 minutes, please remain concentrated.

press

<SPACEBAR>

to begin the task

## Appendix 2: Informed-consent form for second phase of Study 1

Nous vous remercions de participer à notre étude réalisée dans le cadre d'un mémoire.

Dans cette unique tâche, il vous sera demandé d'**évaluer deux visages** sur certains traits. Cette tâche ne vous prendra pas plus de **2 minutes**. Répondez de façon **spontanée**.

Pour **commencer**, cliquez sur le bouton rouge en bas à droite. En cliquant, vous acceptez que vos données soient utilisés dans le cadre de ce mémoire. Celles-ci seront strictement confidentielles et anonymes. Vous pouvez mettre fin à votre participation à tout moment en quittant la page.

Antoine Vanbeneden (mémorant)

Sous la supervision du Pr.Vincent Yzerbyt et de Mathias Schmitz (doctorant)

A red rectangular button with the white text '&gt;&gt;' inside, indicating a 'next' or 'continue' action.

### Appendix 3: Example of trait-rating task for second phase of Study 1



**VISAGE A**



**VISAGE B**

Veuillez indiquer dans quelle mesure une série de traits décrivent votre impression à propos du **VISAGE A** et du **VISAGE B** présentés ci-dessus.

Veuillez utiliser l'échelle suivante:

1 = Pas du tout d'accord

7 = Tout à fait d'accord

|             | VISAGE A              |                       |                       |                       |                       |                       |                       | VISAGE B              |                       |                       |                       |                       |                       |                       |
|-------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|             | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     | 7                     | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     | 7                     |
| Attentionné | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Compétent   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Habile      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chaleureux  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Capable     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Efficace    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sympathique | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Organisé    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Travailleur | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Agréable    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Aimable     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sociable    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |



## **Appendix 4: Informed-consent form for both first and second phases of Study 2**

NOTE: For students rewarded with partial-course credits, only the line about the money retribution was missing.

### **Formulaire de consentement éclairé**

Université catholique de Louvain  
Institut de recherche en sciences Psychologiques  
10 Place du Cardinal Mercier 1348 Louvain-la-Neuve



**Titre de la recherche :** Perception des visages II  
**Expérimentateur :** Antoine Vanbeneden  
**Promoteur :** Vincent Yzerbyt

La présente recherche se déroule dans un laboratoire informatique L2 (étage -2) de l'institut IPSY à la Faculté de Psychologie et des Sciences de l'Éducation située à la Place du Cardinal Mercier, 10 – 1348 Louvain-la-Neuve. L'expérience sera administrée par Antoine Vanbeneden sous la supervision du professeur Vincent Yzerbyt. L'expérience durera approximativement 25 minutes. Dans cette expérience vous serez testé.e individuellement. Vous serez rémunéré.e 5.00 euros pour votre participation.

Nous vous rappelons que vous avez le droit de vous retirer de l'expérience à tout moment, sans devoir vous justifier et sans subir aucun préjudice. Dans ce cas, l'expérimentateur est là pour vous aider à gérer cette situation. Nous vous rappelons également que si vous vous retirez de l'étude, vous conserverez la rémunération attribuée pour cette participation. Par ailleurs, nous garantissons également la confidentialité et l'anonymat de vos réponses. Des informations complémentaires peuvent être obtenues à tout moment auprès du chercheur responsable.

**Je, soussigné(e) \_\_\_\_\_ déclare :**

- avoir reçu, lu et compris une présentation écrite de la recherche où figurent le titre et le chercheur responsable
- avoir pu poser des questions sur cette recherche et reçu toutes les informations que je souhaitais.

**Je sais que :**

- je peux à tout moment mettre un terme à ma participation à cette recherche sans devoir motiver ma décision ni subir aucun préjudice que ce soit ;
- je peux contacter le chercheur pour toute question ou insatisfaction relative à ma participation à la recherche ([antoine.vanbeneden@student.uclouvain.be](mailto:antoine.vanbeneden@student.uclouvain.be)) ;
- les données recueillies seront strictement confidentielles et il sera impossible à tout tiers non autorisé de m'identifier.

***Je donne mon consentement libre et éclairé pour participer en tant que sujet à cette recherche.***

Lu et approuvé

Date et signature

## Appendix 5: Instructions for first phase of Study 2

### TÂCHE DE FORMATION D'IMPRESSION

Dans la tâche qui suit, nous vous présenterons une série de comportements (anonymisés) réalisés par les membres de deux groupes :

GROUPE VERT ou GROUPE BLEU

Chaque comportement sera accompagné d'un rectangle de couleur, bleu ou vert, indiquant le groupe d'appartenance de la personne qui l'a réalisé.

Au sein d'un groupe (VERT ou BLEU), les membres sont très similaires entre eux et ne diffèrent pas beaucoup les uns des autres. Les membres viennent de milieux similaires et ont la même opinion, des croyances principales qui se rejoignent et des personnalités similaires. À travers un large éventail de situations, les membres d'un même groupe (VERT ou BLEU) réagiront de la même manière.

appuyez sur

<SPACEBAR>

pour continuer

### TÂCHE DE FORMATION D'IMPRESSION

Votre tâche consiste simplement à lire chacun de ces comportements et à vous **former une impression** de ces deux groupes. Notez qu'il ne s'agit pas d'une tâche de mémorisation. Les comportements défileront de manière automatique.

Veuillez rester concentré.e s'il vous plaît.

appuyez sur

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pour débiter la tâche

## TÂCHE DE FORMATION D'IMPRESSION

Dans cette tâche nous allons à nouveau vous présenter les comportements mais cette fois-ci, les comportements seront triés par groupe.

Comme précédemment, votre tâche consiste à **lire** les comportements et à vous **former une impression** des deux groupes

Les comportements défileront automatiquement.

appuyez sur

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pour débiter la tâche

## TÂCHE DE SÉLECTION DES VISAGES

Durant cette tâche, il vous sera demandé plusieurs fois quel visage parmi les deux présentés ressemble le plus à un membre du groupe **BLEU**. Effectuez votre choix en appuyant sur les touches < **S** > ou < **L** >.

La tâche ressemble à ceci:

Sélectionnez le visage qui ressemble le plus à un membre du groupe **BLEU**



S



L

Répondez aussi **rapidement** et **intuitivement** que possible. Chaque essai ne devrait pas vous prendre plus d'une à deux secondes. L'entièreté de cette tâche prend environ 8 minutes, veuillez rester concentré,e.

appuyez sur

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pour débiter la tâche

## **Appendix 6: Example of Competence- and Warmth-related Traits rating scale for phase one of Study 2**

NOTE: The same scale was used for Blue group, only the name of the group was changed.

Veillez indiquer dans quelle mesure chacune des caractéristiques suivantes décrit votre impression du GROUPE VERT. Pour ce faire, veuillez utiliser l'échelle ci-dessous allant de 0 (signifiant "Pas du tout d'accord") à 6 (signifiant "Tout à fait d'accord").

En général, les membres du GROUPE VERT sont :

| Item         | Pas du tout d'accord  |                       |                       |                       |                       |                       | Tout à fait d'accord  |
|--------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Capables     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Efficaces    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sociables    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Compétents   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Agréables    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Amicaux      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chaleureux   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Travailleurs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## **Appendix 7: Questionnaire for Sorting Task of Study 2 – Competence dimension**

### **EXPÉRIENCE PERCEPTION DE VISAGES**

Merci de prendre part à notre expérience !

La recherche a montré qu'il existait des différences dans la faculté à percevoir les traits de personnalité à partir des caractéristiques faciales des gens. Autrement dit, il existe des différences entre individus dans leur capacité à identifier correctement la présence de certains traits en se basant sur les informations présentes sur les visages. Nous nous intéressons à ces différences individuelles.

Afin de tester votre capacité à identifier les traits de personnalité à partir de caractéristiques faciales, nous vous présentons un total de 66 visages. Les caractéristiques faciales qui composent ces visages ont été concoctées sur base d'algorithmes qui traduisent certains traits de personnalité. Parmi les 66 visages qui vous seront présentés, la moitié (33) a été scientifiquement validée comme présentant plus que l'autre moitié (33) des caractéristiques faciales qui traduisent un profil de personnalité appelé Compétence. Un profil de personnalité de compétence correspond à quelqu'un de *compétent, déterminé, ambitieux, travailleur, sûr de lui et efficace*.

Votre tâche consiste à classer ces 66 visages en deux groupes, d'une part ceux qui laissent entrevoir le moins ce profil de compétence et d'autre part ceux qui à votre avis manifestent le plus ce profil de compétence.

Pour réaliser cette tâche, commencez par trier les visages en deux groupes, les moins et les plus. Le premier groupe intitulé « les moins » contiendra les visages que vous considérez comme révélant le moins les traits *compétent, déterminé, ambitieux, travailleur, sûr de lui et efficace* et le deuxième groupe intitulé « les plus » contiendra les visages que vous considérez manifestant le plus les traits *compétent, déterminé, ambitieux, travailleur, sûr de lui et efficace*. Pour cette étape, vous pouvez déplacer les visages à votre guise.

Une fois les visages triés, regroupez les visages en deux tas : un tas pour le groupe « les moins » et un tas pour le groupe « les plus ». Au final, chaque tas devra contenir exactement 33 visages. L'ordre de classement au sein de chaque tas n'a pas d'importance. Merci d'avance pour votre collaboration.

## Appendix 8: Example for the Competence-related rating scale

Selon vous, le visage **A** semble :

|             | Pas du tout           |                       |                       |                       |                       |                       | Tout à fait           |
|-------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|             | 0                     | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     |
| Efficace    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Travailleur | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sûr de soi  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Compétent   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Déterminé   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Ambitieux   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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Selon vous, le visage **B** semble :

|             | Pas du tout           |                       |                       |                       |                       |                       | Tout à fait           |
|-------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|             | 0                     | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     |
| Efficace    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Travailleur | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sûr de soi  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Compétent   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Déterminé   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Ambitieux   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## Appendix 9: Questionnaire for sorting task of Study 2 – Warmth dimension

### EXPÉRIENCE PERCEPTION DE VISAGES

Voici une autre tâche que nous vous demandons de réaliser. Elle est similaire à la première tâche mais certaines instructions sont différentes. Nous vous demandons donc de lire attentivement les consignes ci-dessous.

Afin de tester votre capacité à identifier les traits de personnalité à partir de caractéristiques faciales, nous vous présentons à nouveau un total de 66 visages. Ces visages sont les mêmes que ceux présentés précédemment, ils ont simplement été remis dans un ordre aléatoire. Les caractéristiques faciales qui composent ces visages ont été concoctées sur base d'algorithmes qui traduisent certains traits de personnalité. Parmi les 66 visages qui vous seront présentés, la moitié (33) a été scientifiquement validée comme présentant plus que l'autre moitié (33) des caractéristiques faciales qui traduisent un profil de personnalité appelé Chaleur. Un profil de personnalité de chaleur correspond à quelqu'un de *chaleureux, digne de confiance, sociable, moral, amical et honnête*.

Votre tâche consiste à classer ces 66 visages en deux groupes, d'une part ceux qui laissent entrevoir le moins ce profil de chaleur et d'autre part ceux qui à votre avis manifestent le plus ce profil de chaleur.

Pour réaliser cette tâche, commencez par trier les visages en deux groupes, les moins et les plus. Le premier groupe intitulé « les moins » contiendra les visages que vous considérez comme révélant le moins les traits *chaleureux, digne de confiance, sociable, moral, amical et honnête* et le deuxième groupe intitulé « les plus » contiendra les visages que vous considérez manifestant le plus les traits *chaleureux, digne de confiance, sociable, moral, amical et honnête*. Pour cette étape, vous pouvez déplacer les visages à votre guise.

Une fois les visages triés, regroupez les visages en deux tas : un tas pour le groupe « les moins » et un tas pour le groupe « les plus ». Au final, chaque tas devra contenir exactement 33 visages. L'ordre de classement au sein de chaque tas n'a pas d'importance. Merci d'avance pour votre collaboration.

## Appendix 10: Example for the Warmth-related rating scale

Selon vous, le visage A semble :

|                    | Pas du tout           |                       |                       |                       |                       |                       | Tout à fait           |
|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                    | 0                     | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     |
| Digne de confiance | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Honnête            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chaleureux         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sociable           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Moral              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Amical             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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Selon vous, le visage B semble :

|                    | Pas du tout           |                       |                       |                       |                       |                       | Tout à fait           |
|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                    | 0                     | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     |
| Digne de confiance | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Honnête            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Chaleureux         | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Sociable           | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Moral              | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Amical             | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## **Appendix 11: Questionnaire for demographic data for second phase of Study 2**

Veillez indiquer votre âge (en chiffres) :

.....

Veillez indiquer votre genre :

- ☐ Homme
- ☐ Femme
- ☐ Autre

Veillez indiquer votre niveau d'étude le plus élevé :

- ☐ Primaire
- ☐ Secondaire inférieur
- ☐ Secondaire supérieur
- ☐ Bachelier
- ☐ Master
- ☐ Doctorat

## Appendix 12: Analysis of the ability sub-scale – SPSS Output

NOTE: “H” stands for *high* group; “L” stands for *low* group; “W” stands for *warmth*; “Abil” stands for *ability*

### Within-Subjects Factors

Measure: MEASURE\_1

| tarGroup | evaDim | Dependent Variable |
|----------|--------|--------------------|
| 1        | 1      | HAbil              |
|          | 2      | HW                 |
| 2        | 1      | LAbil              |
|          | 2      | LW                 |

### Descriptive Statistics

|       | Mean        | Std. Deviation | N  |
|-------|-------------|----------------|----|
| HAbil | 3,555555556 | ,9731854639    | 15 |
| HW    | 4,544444444 | ,5544433311    | 15 |
| LAbil | 3,511111111 | 1,296311413    | 15 |
| LW    | 1,777777778 | ,8766518799    | 15 |

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

| Source                 | tarGroup | evaDim | Type III Sum of Squares | df | Mean Square | F      | Sig. | Partial Eta Squared |
|------------------------|----------|--------|-------------------------|----|-------------|--------|------|---------------------|
| tarGroup               | Linear   |        | 29,634                  | 1  | 29,634      | 23,880 | ,000 | ,630                |
| Error(tarGroup)        | Linear   |        | 17,373                  | 14 | 1,241       |        |      |                     |
| evaDim                 |          | Linear | 2,078                   | 1  | 2,078       | 6,827  | ,020 | ,328                |
| Error(evaDim)          |          | Linear | 4,262                   | 14 | ,304        |        |      |                     |
| tarGroup * evaDim      | Linear   | Linear | 27,789                  | 1  | 27,789      | 19,566 | ,001 | ,583                |
| Error(tarGroup*evaDim) | Linear   | Linear | 19,884                  | 14 | 1,420       |        |      |                     |

### Pairwise Comparisons

Measure: MEASURE\_1

| evaDim | (I) tarGroup | (J) tarGroup | Mean Difference (I-J) | Std. Error | Sig. <sup>b</sup> | 95% Confidence Interval for Difference <sup>b</sup> |             |
|--------|--------------|--------------|-----------------------|------------|-------------------|-----------------------------------------------------|-------------|
|        |              |              |                       |            |                   | Lower Bound                                         | Upper Bound |
| 1      | 1            | 2            | ,044                  | ,530       | ,934              | -1,093                                              | 1,182       |
|        | 2            | 1            | -,044                 | ,530       | ,934              | -1,182                                              | 1,093       |
| 2      | 1            | 2            | 2,767 <sup>*</sup>    | ,271       | ,000              | 2,185                                               | 3,348       |
|        | 2            | 1            | -2,767 <sup>*</sup>   | ,271       | ,000              | -3,348                                              | -2,185      |

Based on estimated marginal means

\*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

### Multivariate Tests

| evaDim |                    | Value | F                    | Hypothesis df | Error df | Sig. | Partial Eta Squared |
|--------|--------------------|-------|----------------------|---------------|----------|------|---------------------|
| 1      | Pillai's trace     | ,001  | ,007 <sup>a</sup>    | 1,000         | 14,000   | ,934 | ,001                |
|        | Wilks' lambda      | ,999  | ,007 <sup>a</sup>    | 1,000         | 14,000   | ,934 | ,001                |
|        | Hotelling's trace  | ,001  | ,007 <sup>a</sup>    | 1,000         | 14,000   | ,934 | ,001                |
|        | Roy's largest root | ,001  | ,007 <sup>a</sup>    | 1,000         | 14,000   | ,934 | ,001                |
| 2      | Pillai's trace     | ,882  | 104,153 <sup>a</sup> | 1,000         | 14,000   | ,000 | ,882                |
|        | Wilks' lambda      | ,118  | 104,153 <sup>a</sup> | 1,000         | 14,000   | ,000 | ,882                |
|        | Hotelling's trace  | 7,440 | 104,153 <sup>a</sup> | 1,000         | 14,000   | ,000 | ,882                |
|        | Roy's largest root | 7,440 | 104,153 <sup>a</sup> | 1,000         | 14,000   | ,000 | ,882                |

Each F tests the multivariate simple effects of tarGroup within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

### **Appendix 13: Analysis of the assertiveness sub-scale – SPSS Output**

NOTE: “H” stands for *high* group; “L” stands for *low* group; “W” stands for warmth; “Asser” stands for ability

#### **Within-Subjects Factors**

Measure: MEASURE\_1

|          |        |                    | Descriptive Statistics |                |    |
|----------|--------|--------------------|------------------------|----------------|----|
| tarGroup | evaDim | Dependent Variable | Mean                   | Std. Deviation | N  |
| 1        | 1      | HAsser             | 3,933333333            | 1,328562895    | 15 |
|          | 2      | HW                 | 4,544444444            | ,5544433311    | 15 |
| 2        | 1      | LAsser             | 3,866666667            | 1,440899190    | 15 |
|          | 2      | LW                 | 1,777777778            | ,8766518799    | 15 |

#### **Tests of Within-Subjects Contrasts**

Measure: MEASURE\_1

| Source                 | tarGroup | evaDim | Type III Sum of Squares | df | Mean Square | F      | Sig. | Partial Eta Squared |
|------------------------|----------|--------|-------------------------|----|-------------|--------|------|---------------------|
| tarGroup               | Linear   |        | 30,104                  | 1  | 30,104      | 25,914 | ,000 | ,649                |
| Error(tarGroup)        | Linear   |        | 16,264                  | 14 | 1,162       |        |      |                     |
| evaDim                 |          | Linear | 8,189                   | 1  | 8,189       | 16,096 | ,001 | ,535                |
| Error(evaDim)          |          | Linear | 7,123                   | 14 | ,509        |        |      |                     |
| tarGroup * evaDim      | Linear   | Linear | 27,338                  | 1  | 27,338      | 14,958 | ,002 | ,517                |
| Error(tarGroup*evaDim) | Linear   | Linear | 25,586                  | 14 | 1,828       |        |      |                     |

#### **Estimates**

Measure: MEASURE\_1

| tarGroup | evaDim | Mean  | Std. Error | 95% Confidence Interval |             |
|----------|--------|-------|------------|-------------------------|-------------|
|          |        |       |            | Lower Bound             | Upper Bound |
| 1        | 1      | 3,933 | ,343       | 3,198                   | 4,669       |
|          | 2      | 4,544 | ,143       | 4,237                   | 4,851       |
| 2        | 1      | 3,867 | ,372       | 3,069                   | 4,665       |
|          | 2      | 1,778 | ,226       | 1,292                   | 2,263       |

#### **Pairwise Comparisons**

Measure: MEASURE\_1

| evaDim | (I) tarGroup | (J) tarGroup | Mean Difference (I-J) | Std. Error | Sig. <sup>b</sup> | 95% Confidence Interval for Difference <sup>b</sup> |             |
|--------|--------------|--------------|-----------------------|------------|-------------------|-----------------------------------------------------|-------------|
|        |              |              |                       |            |                   | Lower Bound                                         | Upper Bound |
| 1      | 1            | 2            | ,067                  | ,570       | ,909              | -1,156                                              | 1,290       |
|        | 2            | 1            | -,067                 | ,570       | ,909              | -1,290                                              | 1,156       |
| 2      | 1            | 2            | 2,767 <sup>*</sup>    | ,271       | ,000              | 2,185                                               | 3,348       |
|        | 2            | 1            | -2,767 <sup>*</sup>   | ,271       | ,000              | -3,348                                              | -2,185      |

Based on estimated marginal means

\*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

## Appendix 14: Analysis of the sociability sub-scale – SPSS Output

NOTE: “H” stands for *high* group; “L” stands for *low* group; “Soc” stands for sociability; “C” stands for competence

### Within-Subjects Factors

Measure: MEASURE\_1

| tarGroup | evaDim | Dependent Variable | Descriptive Statistics |                |    |
|----------|--------|--------------------|------------------------|----------------|----|
|          |        |                    | Mean                   | Std. Deviation | N  |
| 1        | 1      | HC                 | 3,744444444            | ,9488227180    | 15 |
|          | 2      | HSoc               | 5,288888889            | ,7222832697    | 15 |
| 2        | 1      | LC                 | 3,688888889            | 1,295392731    | 15 |
|          | 2      | LSoc               | ,888888889             | ,8132500608    | 15 |

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

| Source                 | tarGroup | evaDim | Type III Sum of Squares | df | Mean Square | F      | Sig. | Partial Eta Squared |
|------------------------|----------|--------|-------------------------|----|-------------|--------|------|---------------------|
| tarGroup               | Linear   |        | 74,445                  | 1  | 74,445      | 69,324 | ,000 | ,832                |
| Error(tarGroup)        | Linear   |        | 15,034                  | 14 | 1,074       |        |      |                     |
| evaDim                 |          | Linear | 5,912                   | 1  | 5,912       | 31,888 | ,000 | ,695                |
| Error(evaDim)          |          | Linear | 2,595                   | 14 | ,185        |        |      |                     |
| tarGroup * evaDim      | Linear   | Linear | 70,778                  | 1  | 70,778      | 45,896 | ,000 | ,766                |
| Error(tarGroup*evaDim) | Linear   | Linear | 21,590                  | 14 | 1,542       |        |      |                     |

### Estimates

Measure: MEASURE\_1

| tarGroup | evaDim | Mean  | Std. Error | 95% Confidence Interval |             |
|----------|--------|-------|------------|-------------------------|-------------|
|          |        |       |            | Lower Bound             | Upper Bound |
| 1        | 1      | 3,744 | ,245       | 3,219                   | 4,270       |
|          | 2      | 5,289 | ,186       | 4,889                   | 5,689       |
| 2        | 1      | 3,689 | ,334       | 2,972                   | 4,406       |
|          | 2      | ,889  | ,210       | ,439                    | 1,339       |

### Pairwise Comparisons

Measure: MEASURE\_1

| evaDim | (I) tarGroup | (J) tarGroup | Mean Difference (I-J) | Std. Error | Sig. <sup>b</sup> | 95% Confidence Interval for Difference <sup>b</sup> |             |
|--------|--------------|--------------|-----------------------|------------|-------------------|-----------------------------------------------------|-------------|
|        |              |              |                       |            |                   | Lower Bound                                         | Upper Bound |
| 1      | 1            | 2            | ,056                  | ,493       | ,912              | -1,001                                              | 1,112       |
|        | 2            | 1            | -,056                 | ,493       | ,912              | -1,112                                              | 1,001       |
| 2      | 1            | 2            | 4,400 <sup>*</sup>    | ,326       | ,000              | 3,702                                               | 5,098       |
|        | 2            | 1            | -4,400 <sup>*</sup>   | ,326       | ,000              | -5,098                                              | -3,702      |

Based on estimated marginal means

\*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

## Appendix 15: Analysis of the morality sub-scale – SPSS Output

NOTE: “H” stands for *high* group; “L” stands for *low* group; “Mor” stands for morality; “C” stands for competence

### Within-Subjects Factors

Measure: MEASURE\_1

| tarGroup | evaDim | Dependent Variable |
|----------|--------|--------------------|
| 1        | 1      | HC                 |
|          | 2      | HMor               |
| 2        | 1      | LC                 |
|          | 2      | LMor               |

### Descriptive Statistics

|      | Mean        | Std. Deviation | N  |
|------|-------------|----------------|----|
| HC   | 3,744444444 | ,9488227180    | 15 |
| HMor | 3,800000000 | ,7538262189    | 15 |
| LC   | 3,688888889 | 1,295392731    | 15 |
| LMor | 2,666666667 | 1,181873681    | 15 |

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

| Source                 | tarGroup | evaDim | Type III Sum of Squares | df | Mean Square | F     | Sig. | Partial Eta Squared |
|------------------------|----------|--------|-------------------------|----|-------------|-------|------|---------------------|
| tarGroup               | Linear   |        | 5,300                   | 1  | 5,300       | 4,369 | ,055 | ,238                |
| Error(tarGroup)        | Linear   |        | 16,984                  | 14 | 1,213       |       |      |                     |
| evaDim                 |          | Linear | 3,504                   | 1  | 3,504       | 5,985 | ,028 | ,299                |
| Error(evaDim)          |          | Linear | 8,197                   | 14 | ,586        |       |      |                     |
| tarGroup * evaDim      | Linear   | Linear | 4,356                   | 1  | 4,356       | 2,739 | ,120 | ,164                |
| Error(tarGroup*evaDim) | Linear   | Linear | 22,262                  | 14 | 1,590       |       |      |                     |

### Estimates

Measure: MEASURE\_1

| tarGroup | evaDim | Mean  | Std. Error | 95% Confidence Interval |             |
|----------|--------|-------|------------|-------------------------|-------------|
|          |        |       |            | Lower Bound             | Upper Bound |
| 1        | 1      | 3,744 | ,245       | 3,219                   | 4,270       |
|          | 2      | 3,800 | ,195       | 3,383                   | 4,217       |
| 2        | 1      | 3,689 | ,334       | 2,972                   | 4,406       |
|          | 2      | 2,667 | ,305       | 2,012                   | 3,321       |

### Pairwise Comparisons

Measure: MEASURE\_1

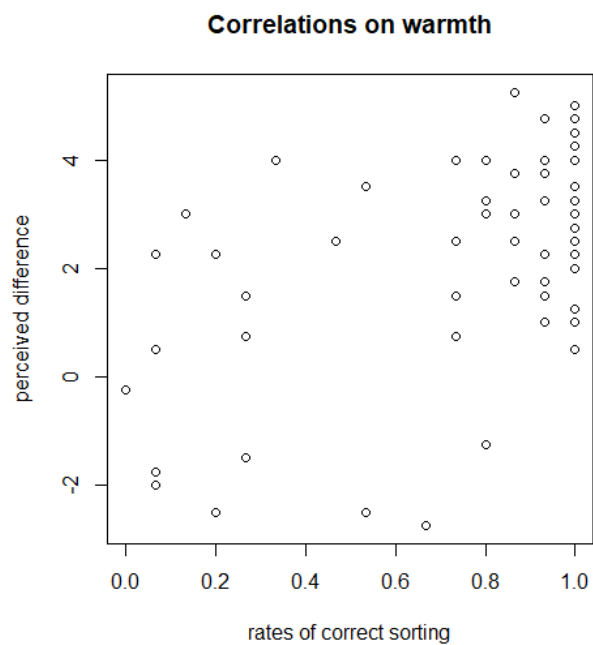
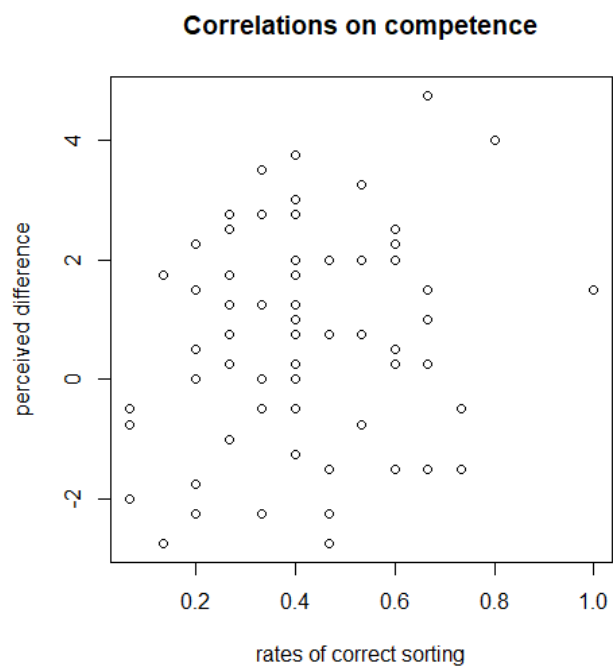
| evaDim | (I) tarGroup | (J) tarGroup | Mean Difference (I-J) | Std. Error | Sig. <sup>b</sup> | 95% Confidence Interval for Difference <sup>b</sup> |             |
|--------|--------------|--------------|-----------------------|------------|-------------------|-----------------------------------------------------|-------------|
|        |              |              |                       |            |                   | Lower Bound                                         | Upper Bound |
| 1      | 1            | 2            | ,056                  | ,493       | ,912              | -1,001                                              | 1,112       |
|        | 2            | 1            | -,056                 | ,493       | ,912              | -1,112                                              | 1,001       |
| 2      | 1            | 2            | 1,133 <sup>*</sup>    | ,362       | ,007              | ,357                                                | 1,910       |
|        | 2            | 1            | -1,133 <sup>*</sup>   | ,362       | ,007              | -1,910                                              | -,357       |

Based on estimated marginal means

\*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

**Appendix 16: Plots of the correlations between perceived difference and rates of correct sorting**





## Abstract

In the literature on social perception and intergroup relations, compensation effect is defined as the tendency of people to evaluate a target considered higher than another on one of the two fundamental dimensions of social judgment, i.e. warmth and competence, as being comparatively lower on the other dimension. This phenomenon has been largely documented, although most studies have relied on explicit measures. A key question is whether compensation is an automatic process or if it is driven by social desirability, that is, a will to appear fair. To shed light on this question, this work investigates the compensation effect at the facial representation level in two studies, by means of a reverse correlation measure (. This measure allows for an investigation of participants' facial representations at the implicit level. The results of Study 1 support the hypothesis that compensation is present at the implicit level, while the results of Study 2 do not. A series of possible reasons for these findings are discussed, and we suggest some recommendations for future works.

**Keywords:** Compensation Effect, Stereotype Content Model, Reverse Correlation, Facial Representations, Implicit Measures