Facial Stereotypes

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Abstract

People commonly believe that character is revealed in the face, although the judgement of personality from facial appearance proves to be inaccurate most of the times. Those beliefs exist as *facial stereotypes*, which seem to have a social reality. Although the consensus of scientific studies suggest that personality traits cannot be validly deduced from facial appearance, research has demonstrated high levels of consistency in judgements of personality traits based on the face, which makes it interesting to explore the processes underlying these stereotypes, despite their lack of validity.

The present research work has found evidence supporting the existence of facial stereotypes, namely for attractiveness, intelligence and trustworthiness. Specifically, the data obtained has provided evidence for preferential recall of stereotype congruent information in a learning paradigm, after automatic activation of the facial stereotype, under fairly high load processing conditions. In an interference paradigm, a significant effect of congruency was only found within the attractiveness condition. This might be explained by the fact that attractiveness is probably one of the characteristics more readily judged from facial appearance, which can be taken to give support to the biological and evolutionary perspectives on the importance of attractiveness. Furthermore, the task used in this paradigm (a gender decision task) might not require the actual processing of the characteristics that are associated with the facial stereotypes.

Finally, evidence was also found supporting the claim that many of the judgements about other people might be directly influenced by the physical attractiveness of those persons. Specifically, in an experiment where attractiveness and intelligence were manipulated simultaneously, the observed results suggest that there was an influence from the level of attractiveness (when it was the irrelevant dimension in terms of the experimental task) on the perception of intelligence (the relevant dimension), mediating the effects of the activation of the intelligence facial stereotype.

In summary, the evidence provided by these studies gives support to the social reality of facial stereotypes, as their activation has been demonstrated in a learning paradigm. Furthermore, these stereotypes seem to operate based on mechanisms which are similar to the ones that have been demonstrated to underlie other types of social stereotypes. Facial stereotype activation has been shown to automatically influence the representation in memory of information that is related to the stereotype and interferes with the recall of stereotype congruent and incongruent information. Moreover, further support to the social relevance of attractiveness and to its claimed biological and evolutionary importance was also found, and the idea that facial attractiveness can influence the perception of other characteristics based on the face was also corroborated. It is believed that the present research work contributed to bring some light on the understanding of facial stereotypes and that this has proved to be a sound research area that can be productively explored in future studies.

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Summary

The tendency to judge personality from facial appearance is very common and, for centuries, people have believed that character is revealed in the face. Some of the information that the human face conveys can be detected and interpreted usually with a great level of accuracy, such as age, gender or even some emotions. However, the inference of personality characteristics from the face proves to be less accurate, although still extremely common. Signs of the practice of physiognomy (*face reading*) can be identified over the years, and although that practice is not so popular nowadays, those beliefs are still present in the form of what can be called *facial stereotypes*.

A literature review demonstrated that the not very broad amount of research that is available on this subject shows that people are extremely consistent in their judgements of other people's honesty, intelligence, personality traits, intentions, occupation and even political opinions, based on facial appearance. However, despite the observed consistency of these judgements, it is usually found that they are barely valid. Nevertheless, the observation that people tend to hold and apply facial stereotypes in a consistent manner has conferred importance to a better understanding about the underlying mechanisms of these stereotypes. Accordingly, the present research work has been focused on the study of the nature of the processes underlying the activation and application of social stereotypes based on facial appearance.

This thesis is organised in three main sections. *Section I* comprises the introduction to the field of research and the review of the literature relevant to the area. *Section II* describes all the experimental procedures and results observed, and includes the individual discussions of each experiment. Finally, *Section III* is dedicated to the general discussion and conclusions, including as well some suggestions for further directions in future studies.

After the brief and general introduction to the field of facial stereotypes outlined in Chapter 1, the detailed literature review starts with an overlook at the more important issues related to face processing in general (Chapter 2). Here, the main differences between object and face recognition are outlined, the most prominent models of face

processing are reviewed, and neuropsychological and neurophysiological data are mentioned, highlighting the specific aspects involved in processing faces.

In Chapter 3, a general review of the main issues concerning the study of stereotypes is carried out. The notion of stereotype has been a central concept in the domain of social psychology and social cognition over the last decades, and the main findings on this field have important implications for the study, in particular, of facial stereotypes. The more significant literature regarding the aspects of representation, formation and activation of stereotypes, and the processing of stereotype congruent and incongruent information is examined.

Facial stereotypes are then the central topic of Chapter 4, which covers the relevant literature on this field. Despite the fact that both face processing and social stereotypes are issues extensively explored, the studies on facial stereotypes are not so abundant. In fact, the present research work can be considered innovative, in the sense of bringing on together the study of stereotypes and face perception, under the perspectives of cognitive and experimental psychology. Most of the literature concerned with physiognomic stereotypes has been more devoted to explore the issue of whether the inferences about personality that are made based on facial appearance are valid or not, and which are the characteristics of the face that lead to certain judgements. However, some methodological issues were sometimes raised with respect to some of those studies.

The possible mediating mechanisms linking physical features and inferential responses are reviewed, as well as the main findings regarding the accuracy of face reading. A model of appearance-trait relations is mentioned, which comprises four possible causal routes to actual appearance-trait relations, and some overgeneralization effects in perceiving faces are discussed. Then, findings related to two of the stereotypes that are most widely discussed in the available literature are presented, namely the attractiveness stereotype and the babyfacedness stereotype. Some issues regarding the perception of intelligence from facial appearance are also highlighted, and some neuropsychological data supporting the importance of the face in social judgements are reported.

Chapter 5 presents an overview of the present work, summarising the most relevant theoretical background, the aims of the present research work and a brief description of the main experimental procedures. In general, the investigation carried out was directed at the issue of whether different types of stereotypes are automatically activated whenever we look at a face, or require more deliberate evaluation. The facial stereotypes that have been addressed were related to attractiveness, intelligence and trustworthiness. The experiments were specifically designed to investigate the potential interference of the activation of social stereotypes, either in learning labels attached to male and female adult faces, or in the reaction times and response accuracy in an Irrelevant Feature Paradigm.

The collection of the initial face database and the methodology used to obtain the ratings are fully described in Chapter 6. Satisfactory interrater correlations were observed, and none of the raters deviated significantly from the mean rating value for each stimulus. This analysis validated both the sample of faces that were collected and the ratings that were obtained. So, the facial stimuli for the subsequent experiments were selected based on this set of ratings.

Experiment 1 (described in Chapter 7) was based on a learning paradigm and the results observed support the experimental predictions of preferential recall of stereotype congruent information, under fairly high load processing conditions, for all the three traits (attractiveness, intelligence and trustworthiness). Given the experimental conditions, it was suggested that the stereotypes had been automatically activated and that their activation influenced the representation in memory of information that is associated with the stereotypes. These results also provide experimental support for the social reality of facial stereotypes.

In Experiment 2 (covered by Chapter 8), a different experimental paradigm was used – an irrelevant feature paradigm, which is a kind of interference paradigm, where the main task was a gender decision task. In this experiment, a significant congruency effect was found only in the attractiveness condition. The fact that attractiveness is probably one of the most readily judged characteristics from facial appearance was taken to explain this observation. It was also suggested that this evidence gave further support to the biological and evolutionary perspectives on the importance of attractiveness. Its relevance probably contributes to a higher accessibility of the attractiveness stereotype, which would be more readily picked up and would have more automatic effects on people's reactions. Furthermore, it is also reasonable to consider that the gender decision task used in this

experiment did not actually require the processing of the characteristics that are associated with the facial stereotypes, relying instead on different cues. Consequently, only a highly accessible stereotype as attractiveness would have a significant interference on task performance.

Finally, Experiment 3 (described in Chapter 9) addressed the question of whether the perceived attractiveness of a face can influence the perception of other characteristics. The experimental paradigm was again the irrelevant feature paradigm, but this time attractiveness and intelligence were simultaneously manipulated when selecting the facial stimuli. The observed results suggested that the judgements of other characteristics, namely intelligence, can indeed be influenced by people's facial attractiveness, and that the effects of the activation of the intelligence facial stereotype might be mediated by the level of attractiveness. The observed effects of attractiveness on the perception of intelligence were in such a way that a face which looks intelligent, and which also looks unattractive will probably seem less intelligence. On the other hand, an unintelligent looking face that is at the same time attractive will probably look slightly more intelligent.

Chapter 10 includes the general discussion of the more relevant experimental observations, summarises the main conclusions and presents some suggestions for further studies.

Section I – Introduction and Literature Review

1. Introduction

In the world that we live, people are highly important entities. Therefore, our capacity to process human faces and to recognise the faces of familiar people is extremely important, because without this capacity the world would make much less sense. As Goldstein (1983) has said *"the face is the most important visual stimulus in our lives, probably from the first few hours after birth, definitely after the first few weeks"* (p.249).

The human face is an essential mediator in interpersonal relationships and in communication, as it transmits and reveals a great amount of information about the individual. The extraction and interpretation of that information requires complex perceptive and cognitive processes, which are made most often without awareness and, in the most people, with a high level of efficiency. For example, by looking at a face, it is possible to tell if it is a young or elder person, if it is a man or a woman, if the person is happy or sad, and even what the reaction of that person is to our presence. For all these reasons, the face is an extremely important vehicle of fundamental information for many different aspects of social interaction.

Accordingly, it is with relative ease that we categorise faces into different social groups, based on the physical features of those faces. These categorisations have then consequences on other attributions that are made to those persons. So, for example, a "babyfaced" adult may be judged as more immature or more dependent than a mature faced adult. In fact, researchers have found that people are highly consistent in their judgements and attributions of certain personal characteristics, based only on the observation of the face, such as personality traits, intelligence, intentions, occupation, etc. (Abdi, 1986).

Much research has been done with the aim of identifying which are the visual cues that the human brain uses for this kind of categorisation. The most evident are surely the ones that give us some details about the age, gender and race. However, much more information is extracted, most of which has considerable consequences on the individual's everyday social life.

The research work that I have undertaken has been focused on the study of Facial Stereotypes, and more specifically on the study of the nature of the processes underlying the activation and application of social stereotypes based on facial appearance.

Although the notion of stereotype is a central concept in the domain of social psychology and face processing is a theme thoroughly investigated, there are not many studies so far which cover the formation of facial stereotypes. The limited amount of previous research has demonstrated that different people are extremely consistent in their judgements of other people's honesty, intelligence, personality traits, intentions, occupation and even political opinions, based on facial appearance (*ex*: Abdi, 1986; Shepherd, 1989; Cook, 1939; Zebrowitz, 1998). Although remarkably consistent, it is usually thought that these judgements are seldom valid. The observation that stereotypes are consistently held and applied even if they are not valid leads us to consider that it is interesting and important to deepen our understanding about the underlying mechanisms of facial stereotypes.

Throughout this literature review, I will focus first on several relevant aspects of face processing, mentioning some of the most important findings regarding this ability. I will then explore the notion of stereotype, widely investigated within the domain of social psychology, and mention relevant findings regarding the processes of formation, activation and application of social stereotypes. Finally, the not too extensive literature on facial stereotypes will be reviewed, considering the findings regarding the main aspects of judging personality based on facial features.

2. *Face Processing*

Faces are a particular category of visual stimuli with which we are extremely familiar and which we usually process in a very efficient way without apparent effort. It is not difficult to understand that very complex cognitive processes must underlie the more general process of face recognition, as we deal everyday with many different people whose facial characteristics are, in fact, quite similar. The differences among a variety of faces can be considered minimal, as all the faces have the same configuration of features. Nevertheless, our ability to distinguish a familiar person in a crowded train station is impressive (as people are always changing their clothing, can wear spectacles or not, may change their hairstyle, etc., we often rely heavily on face recognition to identify a familiar person). This demonstrates that our visual memory system is extraordinarily powerful and shows high sensitivity to this kind of visual stimulus.

Ellis (1975) pointed out that so far there was no theoretical framework broad enough to account for and bring together the diverse findings in the field of face recognition. So, in the last two and a half decades, many scientists have devoted themselves to understanding and exploring this field deeply, by formulating empirical and theoretical approaches that have satisfactorily brought some understanding about the processes involved in face recognition. The theoretical approaches have embodied evidence from studies of normal face processing, everyday errors and patterns of neuropsychological impairments. This evidence shall be reviewed, in order to elucidate how human beings are able to extract, with so much expertise, the enormous amounts of information that the face conveys.

2.1 Object Recognition and Face Recognition

One of the questions that first emerged in this field was whether the processes involved in face and object perception and recognition were the same or not, and whether there was any neurological specialisation involved in face processing. Perceiving objects and faces may seem different from a starting point of view: most often, when we recognise objects, what we are actually doing is classifying them according to the category that they belong to (for example, we identify a dog, a table, a tree, a car, etc.). This categorisation is based on the visible features of the objects, which constitute a certain pattern. So, the process of visual object recognition can be conceived as that of assigning a pattern to a conceptual category, based on the salient visible features of the object (Bruce, 1995). Rosch and her colleagues (Rosch, 1978; Rosch *et al.*, 1976; *cit. in* Young & Bruce, 1991) name this property of everyday object recognition "recognition at the basic category level". However, in respect to face recognition, what we do is discriminate, within the same category, among different patterns that all share the same overall structure and basic configuration. So, the individual exemplars within this category vary at the level of the relationships between the elements that define the general basic configuration. Diamond & Carey (1986) called these spatial relations among parts or isolated features "second-order configural information".

This apparent difference between object and face recognition was initially suggested as an explanation for the difficulties observed in prosopagnosic patients (patients who show an inability to recognise familiar faces). These patients were considered to have a deficit in discriminating among exemplars within the same category, but not across categories. Consistent with this hypothesis, Damasio *et al*'s prosopagnosic patients (Damasio *et al.*, 1990; Damasio, 1990) were also impaired at distinguishing one object from another within categories.

However, some other cases were found that do not support this hypothesis. These other patients do not show any problems in discriminating among different elements within other categories of objects, although they were severely impaired at the level of face recognition. For example, WJ, a patient described by McNeil & Warrington (1993), had severe prosopagnosia, but was able to distinguish among all the sheep in his herd. Another case is that of Mr. W, described by Bruyer *et al.* (1983), who could not recognise faces of familiar people, but who could identify his own cows and dogs. Sergent & Signoret (1992; *cit. in* Ellis & Young, 1997) also describe the case of RM, who was totally unable to identify famous faces, but who had a personal interest in cars, and was still able to identify the manufacturer's name, model and approximate year of manufacture from 172 out of 210 pictures of cars. Normal control subjects' best scores were never higher than 128 correct identifications.

On the other hand, reverse impairment patterns have also been reported from patients with preserved ability to recognise faces but with difficulties in distinguishing between different glasses (Farah, 1995; *cit. in* Moscovitch, Winocur & Behrmann, 1997., 1997) or between cows (Assal, Favre & Anderes, 1984; *cit. in* McNeil & Warrington, 1993). MX, the patient described by Assal *et al.* is a farmer who was initially impaired at recognising simultaneously human faces and his livestock (cows). However, when tested 6 months later, he had recovered the ability to recognise faces, but was still unable to recognise his cows.

The mentioned dissociations seem to point in the direction of specific deficits with regard to face processing. The previously mentioned conception can be considered as a hierarchical conception, in which between-category recognition is followed by within-category recognition. However, this conception is not supported by cases such as the ones previously mentioned, in which the patients show object agnosia without prosopagnosia. These cases suggest that the two abilities can be dissociated. So, the available evidence indicates that recognition difficulties involving only faces can occur, and lends some support to the notion that there are face-specific processing areas in the brain.

Nevertheless, there is still some debate concerning this issue. Some studies have found no evidence for the uniqueness of face processing (Church & Winograd, 1986; Hay & Young, 1982; Ellis & Young, 1989). As Bruce (1995) points out, most of the perceptive, cognitive, developmental and neuropsychological evidences are most consistent with what Hay & Young (1982) have called *"the dedicated processes hypothesis"*. This hypothesis is in opposition with *"the unique processes hypothesis"*, which states that face perception and recognition might involve unique processes, quite unlike those used in the perception of any other things. In contrast, the dedicated processes hypothesis suggests that there might be processes specifically dedicated to faces, which occur in the face module or face-processing area, within cortex regions, which are not responsible for processing other objects. However, the processes themselves might be similar to those used in the perception of other object types. While there may be processing routes specific to face recognition, their organisation appears to be similar to those used for a range of other materials (Bruce, 1995).

This debate still goes on and recent functional imaging studies bring some more evidence related to this issue, again not without controversy. Kanwisher (2000) contrasts evidence for the domain-specificity of the mechanisms that are involved in processing faces with evidence that supports the domain-generality of those mechanisms. Based on evidence from neuroimaging studies, neurophysiology and neuropsychology literature, this author concludes that there is strong support for the domain-specificity hypothesis, suggesting that distinct neural substrates seem to underlie face recognition and within category discrimination of non-face stimuli.

On the other hand, Tarr & Gauthier (2000), maintain that the fusiform face area, that has been demonstrated to be involved in face processing, is domain-general and can be involved in processing subordinate-level information for all objects, including faces. So, the apparent selectivity of that area reflects in fact a more generalised form of processing that is not intrinsically specific to faces. Gauthier *et al.* (2000) argue that the fusiform face area appears to be involved in perceptual processing of visual information that is important for individual-level recognition, and seems to be recruited in either one of two situations: whenever subjects attend to the identity of objects, or when stimuli are from a category for which subjects have extensive experience processing category members at the individual level. Apparently, there is increased activity in the fusiform face area when observers become experts in discriminating objects from a visually homogeneous category, which are called "Greebles" (Gauthier *et al.*, 1999, *cit. in* Tarr & Gauthier, 2000) and the same seems to occur in bird and car experts with 20 years of experience (Gauthier *et al.*, 2000, *cit. in* Tarr & Gauthier, 2000).

2.2 Configurational or Componential Processing

Understanding how faces are processed and encoded has also been motive for a considerable amount of research in the area of face processing. The debate was mainly between the possibility of a holistic or configurational processing or, on the other hand, a componential processing, which conceived that the faces would be processed as a group of elements or independent features.

In the 70's, psychologists started to wonder if the different facial elements were in fact processed independently, or if there were some kind of interaction between the characteristics. Bradshaw & Wallace (1971) obtained evidence that the time necessary to decide that two faces were different was reduced as a function of the number of characteristics that differed between the two faces. This evidence led them to conclude that the facial elements were processed independently and in sequence.

Sergent (1984) reviewed some studies that had reached the same conclusions. However, as she points out, in most of those studies, the faces that differed in a larger number of features also differed more on their global configuration than the faces that differed in fewer characteristics. So, those results can be considered inconclusive in regard to whether the features had been processed independently or not.

In order to further investigate this issue, Sergent (1984) designed some experiments that gave evidence of an interactive processing of the facial features. So, a configuration seems to emerge from a set of features which is more than the sum of its parts and, apparently, in normal face processing, the individual facial elements are not made explicit.

Tanaka & Farah (1993) attempted to clarify the nature of the apparent configural processing. In the first experiment, subjects had to learn names that corresponded to normal faces and scrambled faces. They tested the memory for individual face features presented either in isolation or in the context that they had been previously learnt. The prediction was that, if the face is represented in a way that does not make individual parts explicit, then memory for the parts in isolation should be in disadvantage, compared with memory for the parts tested in the whole face. The experimental results supported this prediction: features learnt in the context of a normal face were better recognised in that context, while those learnt in a scrambled face were better recognised in isolation. The same results were obtained with inverted faces instead of upright faces. For houses, there was no difference in recognition accuracy whether the features were tested in a whole house or in isolation.

These results seem to lend some support to the idea that the representation of whole upright faces is based, at least in part, on a holistic description of the images. Contrarily, in the case of scrambled faces or pictures of houses, the different components of these stimuli seem to be represented separately and explicitly.

Several studies have indicated that inversion affects face recognition significantly more than the recognition of other objects, such as houses, aeroplanes or landscapes (Valentine & Bruce, 1986; Diamond & Carey, 1986; Carey & Diamond, 1977; Scapinello & Yarmey, 1970; Yin, 1969). This finding may suggest that the processes underlying both types of recognition may be different. Yin (1969) was one of the first researchers who explored the specificity of face recognition in terms of inversion effects. In his experiments, inverted faces proved to be harder to recognise then other kinds of stimuli. This author attributed faces' higher susceptibility to inversion to the interaction of two different factors: on the one hand, faces are more familiar in an upright position, and, on the other hand, faces are usually perceived configurationally, and configural perception appears to be severely impaired by inversion. These two factors together make the recognition of upside-down faces more difficult.

It could be asked why the faces seem to involve more configural processing while objects involve more componential processing. Some other studies demonstrated that it is not necessarily so. Configural processing may only be a necessity, which reflects the high expertise in a certain domain. Diamond & Carey (1986) have shown that dog experts are also disproportionately impaired in the recognition of inverted pictures of dogs, comparatively to non-experts. These results do not support the hypothesis of a perceptual strategy that is unique for faces. Instead, they seem to suggest that the importance of the relation between the different elements of a certain stimulus (a face, a dog, or an object) is a result of a more frequent exposure to that stimulus and the necessity of discriminating within that category of objects. So, faces do not seem to be special in the sense employed by Yin (Ellis & Young, 1998).

Apparently, upright faces are processed differently from other objects that people are less able to individuate. It can be conceived that the necessity to learn to individuate within a category whose members have all the same overall structure requires a different processing mode, more efficient in the encoding of the subtle differences that distinguish one person from another. These observations also give further support to the notion that the processes underlying face processing are not *unique*, even though there may be mechanisms which are *especially dedicated* to faces (Young, 1998; Bruce, 1995).

Young, Hellawell & Hay's (1987) findings also give some evidence that the processing of upright faces is probably different to when they are upside-down. They sliced pictures of famous people horizontally, to have upper and lower halves. Then they re-arranged those halves, so that the upper half of someone's face was paired with the lower half of another person's face. Participants were asked to give the names of the persons displayed in the upper halves, when these were presented in isolation, when they were aligned with someone else's lower half face or when there were two halves misaligned. Results showed that it was much more difficult to name the half pictures when they were aligned with other halves than in the other two conditions. The authors explained these results in terms of a "new configuration" from the top and bottom features that was produced when the faces' halves were aligned. This is in line with the idea of a configurational processing of faces.

Another example of how face processing is affected by inversion comes from the work of Thompson (1980). He demonstrated the effect that was called *Thatcher Illusion*.

Thompson cut out and inverted the eyes and the mouth within the face, in a picture of Margaret Thatcher. As a result, when the picture is viewed upright, a very strange expression is immediately evident, whereas when viewed upside-down the picture looks almost normal. This suggests that our perceptual system has become highly tuned to expect an input signal in the correct orientation when analysing facial expression (Young, 1998).

Several studies also demonstrated that this illusion is best explained by the hypothesis of a configurational processing mode that is available only for upright faces. In an inverted face, the components are processed independently from one another and a relationship between the features does not emerge (Bartlett & Searcy, 1993; Valentine & Bruce, 1985).

A recent study by Stürzel & Spillmann (2000) has given further support to this argument and presents results that are consistent with the idea that, during rotation of a face through 180°, the processing of the stimulus switches from a holistic to a componential mode. Attempting to determine the angular orientation at which the expression of a face with its eyes and mouth inverted changes from "pleasant" to "grotesque" and *vice-versa*, the authors found mean thresholds to lie between 94° and 100° relative to the vertical. The change between the two facial appearances seems to be sudden and to occur within a relatively narrow zone, which may be due to the eventual step-tuning properties of face neurons in the human brain, which underlie the holistic ("grotesque") versus componential ("pleasant") processing of upright versus upside-down faces.

Some studies related to the perception of emotions from inverted faces also provide evidence for the existence of two different types of processing modes: the componential and the configurational. McKelvie (1995) designed some experiments in order to investigate if facial inversion would disturb the perception of emotions. He based his predictions on the idea that the perception of facial expressions depends on the configurational properties that reflect changes in the spatial relationship among features. McKelvie predicted that different emotions would not be disturbed in the same way. For instance, the perception of happiness (open mouth with lifted corners) is based on identifiable components and therefore will be possible to identify even in an inverted face.

The results seem to support the experimental predictions, indicating that facial inversion did not affect the perception of happiness, which is supposed to be mainly identified based on one component. Contrarily, sadness and anger, the perception of which is supposed to be based on a more configurational process, were the most affected by inversion. So, this led McKelvie (1995) to the conclusion that inversion disturbs the configurational processing more than the componential processing, giving further support to previous studies.

2.3 Representational Processes in Face Recognition

Over the last years, researchers have also tried to understand how the human visual system analyses and stores the images, in order to relate the analyse of the image to the psychological aspects of face processing. It is then important to consider the mental representation of a face and the relevant aspects in that representation.

Some of the theories directly implicated and consensually accepted in object perception and recognition are also important to face processing and have influence on the theories especially elaborated in that area. The most significant ones are Marr's *Theory of Vision*, Marr and Nishihara's *Object Recognition Theory*, and Biederman's *Model of Object Recognition* (Smith *et al.*, 1994; Roth & Bruce, 1995).

According to Hancock, Burton & Bruce (1996), in order for a coding schemes to be psychologically plausible, it has to take into account the difficulties that people have in recognising faces that are presented in certain formats. For example, the difficulty of face recognition is increased extremely when pictures are presented in photographic negative form. This format of presentation seems to impair identification even more than inversion, although it preserves the global configuration of the face. In a task of identification of famous faces, Bruce & Langton (1994) have verified that there were 95%

correct responses when the faces were presented upright, which decreased to 75% correct responses when the face was presented upside-down. This percentage decreased to 55% when the face was presented in the photographic negative format and there were only 25% correct responses when the face was simultaneously inverted and in the negative form.

Difficulties can also be observed in face identification when the faces are shown as 2-D line drawings, even if those drawings also include, besides the main features (mouth, eyes, etc.), secondary aspects (such as wrinkles). On the other hand, the recognition of these drawings increases significantly if some shadow elements and/or pigmentation levels are also included, in addition to the outlines and internal elements (Bruce, Hanna, Dench, Healy & Burton, 1992; *cit. in* Hancock *et al.*, 1996).

All these observations suggest that the encoding of the human face image comprises information about image intensities, and not only about the spatial disposition of the facial elements. So, it seems that face recognition cannot rely only on the primitives based on the outlines that are sufficient to the basic level of object recognition. The descriptions on which face representation is based must, in some way, preserve details about pigmentation and shadowing.

In addition to this, there are also other problems that need to be solved. A scheme that is based on the encoding and storing of image properties must have a way of recognising the different faces independent of variations in size, background and viewpoint, as well as changes in expression, which alter the image properties. Apparently, face recognition is considerably tolerant to changes in size and background, but, on the other hand, the recognition of photographs of unfamiliar people is highly impaired when there is a change in viewpoint between study and test phases (Bruce, 1982). These observations suggest that our capacity to recognise faces independent of changes in viewpoint may result from storing multiple representations of the face of a same person, each one corresponding to that person from a certain angle. So, perhaps face recognition is achieved by viewpoint dependent representations, instead of object-centred representations (as is the case in object recognition, in Marr and Biederman's theories).

There is still some controversy around the issue of what is the most appropriate representational scheme to the way the human visual system identifies faces. Most of the recent literature on face recognition has explored the notion of *face space* – that is, the notion that there are a number of dimensions along which faces vary, and that a face can be uniquely represented as a point, or vector, in that space (Hancock *et al.*, 1996). Valentine (1995) suggests that the structure of the population of faces has an effect upon our ability to perceive and recognise faces. The central concept is that faces are not perceived in isolation. So, it is only through the knowledge of a large number of faces that it is possible to judge a particular face as being female, attractive, oriental, happy or distinctive.

This notion has been used to account for the *distinctiveness effect* (Valentine, 1991; Valentine, Chiroro & Dixon, 1995; Bruce, Burton & Hancock, 1995; Hosie & Milne, 1995). Valentine & Bruce (1986a) have verified that personally familiar faces that are judged as more distinctive tend to be recognised faster (as familiar) than familiar faces that have been rated as more typical. The same seems to happen with famous faces, where distinctiveness facilitates the speed of recognition (Valentine & Bruce, 1986b). On the other hand, Valentine & Endo (1992) found that when subjects were asked to categorise faces as Japanese or Caucasian, they were faster in categorising the faces that had been judged as more typical within each ethnic group than in categorising the faces that had been considered more distinctive in their appearance.

According to Valentine (1991), as a face is represented by its location in the multidimensional space of variation, faces that are considered as typical tend to have common values in the dimensions defined in the *facial space* (each dimension is a physical dimension along which face appearance varies). This means that typical faces (which can be considered to be more similar to each other) will cluster together in face space. On the other hand, more distinctive faces will tend to be relatively isolated in face space, as there are few faces that share the same features. Following this, the relative isolation of distinctive faces makes them easier to recognise than typical faces, because there will be a lower number of faces competing in the relevant region of space. On the other hand, if the task is to decide if a face is a member of a certain sub-category (such as race), then there will be an advantage if that exemplar is situated in a region of space that is shared by many other faces.

Supporting this theory, it has been demonstrated that making a certain face look even more distinctive facilitates its identification. It is the case of the *caricature effect* (Stevenage, 1995; Rhodes, 1995; Rhodes, Brennen & Carey, 1987). This effect can be accounted for by the notion of a *norm-based coding*, which assumes that faces are encoded as a vector in face space with reference to a central norm calculated as the average of the known population of faces (Valentine,1991). Work on computer created caricatures has shown that caricatures can be created effectively by applying a transformation that increases the difference between a given face and an "average" face. And Rhodes, Brennen & Carey (1987) have shown that faces that are distorted away from a central mean may, under certain circumstances, be recognised more accurately and even faster than the original image of that face. The same effect was found with expert birdwatchers who were faster at identifying line drawings of individual members of a familiar class of birds when these were caricatured (Rhodes & McLean, 1990).

Although not denying the importance of the "face space" framework, Burton & Vokey (1998) have raised some critics and have attempted to highlight and resolve a paradox that arises with the notion of "typicality". As it has been mentioned, this formulation assumes that the typicality or distinctiveness of a face is a function of the density of faces in the face space. The typical faces are located in areas of high density closer to the centre of the space and the distinctive faces are located in the more rarefied periphery. Following this idea, the majority of the faces would then be typical, as "typicality" is taken to reflect the proximity of a face to its local neighbours. However, when researchers take typicality measures, they rarely find that faces cluster at the "typical" end of the scale. In most of the cases, only a few number of faces in any set are judged as "extremely typical" or "extremely distinctive", with the majority of faces falling somewhere in-between. In trying to resolve this paradox, Burton & Vokey (1998) point out that the global and local densities of points in a space are not necessarily the same thing and that typicality could reasonably be a function of either one or the other. The authors consider the idea of a multidimensional face space promising, although researchers will have to more specific in the relation to some assumptions about the nature of the underlying dimensions.

The evidence related to the representational system in which face recognition is based seems to suggest that an alternative processing mode may exist. This would tend to appear as a result of the necessity to discriminate efficiently and identify individual members within the same category where all of them have similar overall shapes. This representational mode, which may be based on image properties, may co-exist with the kind of representational mode used to differentiate between objects in a more basic level of categorisation.

2.4 Models of Face Recognition

When we see a familiar person, we recognise that person almost immediately. It is a very frequent event and it is a task that is carried out automatically, without effort and without being aware of the processes that enable us to identify that person. The signs that enable us to recognise that person are varied, such as face, voice, body shape, the way of walking, etc. But probably it is the face that gives us the best and more reliable information about the identity of that person.

The human face is extremely important to interpersonal communication and may reveal much information about a person, besides their identity. So, by looking at a face we may also obtain information about the person's mood and intentions, through the analysis of facial expressions that contribute to non-verbal communication and help in the perception of verbal language through speech-reading. However, there does not seem to exist evidence to suggest that the analysis of facial expressions or speech-reading are important to face recognition. These are only other types of analysis that can be executed simultaneously with person identification.

Based on the idea that the recognition of a face should consist of the matching of a perceived stimulus and a stored representation, the first models of face recognition were based on the existence of *templates* (Ellis, 1975). However, these models had serious limitations. For instance, there would be problems in face recognition if there were a change in the stimulus originally stored (such as a change in hair style, or different accessories, like sunglasses). Smith *et al.* (1994) suggest that a satisfactory model of face recognition has to take into account the configuration of the facial features, but has to be sufficiently flexible so that we can recognise a face despite the considerable variation in the possible patterns, as a person can be seen from different angles and distances, as well as with different accessories.

2.4.1 *Bruce & Young's Model of Face Processing*

Throughout the years, various functional models have emerged, which attempt to describe the different phases involved in face processing, as well as explain the data originated by patients with cerebral lesions that present difficulties in that area. The model more consensually accepted and widespread and that received more empirical support is the one formulated by Bruce & Young (1986). This model has been the theoretical reference of much research carried out since then. It attempts to characterise the perceptual and cognitive processes involved in face recognition (Figure 2.1).

The authors propose that there are seven different types of information that can be extracted from faces (information *codes*): pictorial, structural, visually derived semantic, identity-specific semantic, name, expression and facial speech codes. These codes are not themselves the functional components of the face processing system; they are the products of the operations of those components. Furthermore, it is assumed that only the structural code, the identity-specific semantic code and the name code are involved in the recognition of familiar faces, and that the others have a secondary role in this type of recognition.

In a global sense, it can be said that, according to this model, face recognition is a sequential process that occurs independently and in parallel with other processes. These processes are the face emotional expression analysis, facial speech reading and the visually directed processing to specific facial characteristics, which are executed by independent components.

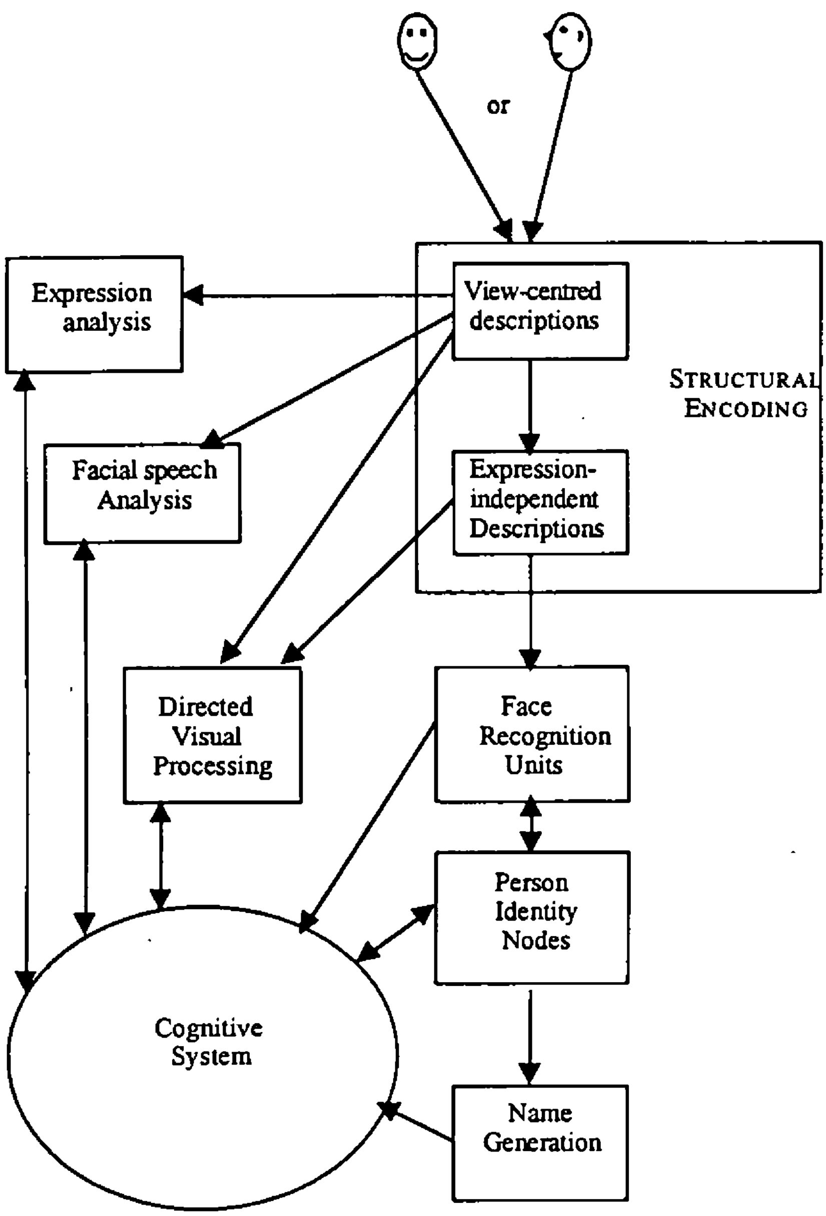


Figure 2.1: A functional model for face recognition (reproduced from Bruce & Young, 1986).

In the first stage of the model, denominated *structural encoding*, a set of descriptions of the perceived face is produced, which include both viewer-centred descriptions and more abstract descriptions, both from the global configuration and from the different features. The first type of descriptions gives information to the *facial speech analysis* and to *expression analysis*, while the more abstract descriptions, which are independent of the expression, give information to the *Face Recognition Units (FRU)*.

Each FRU has stored the structural codes that describe each of the familiar faces. When a certain face is encountered, the intensity of activation of the FRU is dependent on the level of similarity between the stored description and the input given by the structural encoding. This level of activation can also be influenced by the person identity node, through priming mechanisms. The FRUs are connected both to the *cognitive system*, where all the information about the individual is stored, being part of the semantic memory, and to the *Person Identity Nodes (PIN)*, which contain the semantic information specific of the identity that enables us to identify the person. The *Name* is only accessed through the PINs. The PINs receive input not only from the FRUs, but can also be accessed through the voice, the name, the posture, the clothing, etc.

Bruce & Young (1986) also draw our attention to the component that is labelled *Directed Visual Processing*, which allows selective attention to the visual form of a face. Its importance is clear in the processes used to compare and remember unfamiliar faces (through structural encoding and directed visual processing), in opposition to the processes used to identify familiar faces (through the FRUs).

This model seems to be able to explain the identification errors in everyday life (as have been noted by in a study by Young, Hay & Ellis, 1985), as well as most of the neuropsychological evidence, of patients with cerebral lesions and impairment of face recognition. There are also references to cases of dissociation between familiar and unfamiliar face recognition (Warrington & James, 1967), dissociation between the analysis of facial expression and face recognition (Shuttleworth *et al.*, 1982), dissociation between facial speech analysis and the recognition of faces and their expressions (Campbell *et al.*, 1986). Many laboratory experiments also seem to give support to this model, which seems to be able to account for different priming effects, and give support to the FRU and PIN components, as well as to the way through which names are accessed.

In a relatively recent study, Craigie & Hanley (1997) assessed the capacity to remember a face of an unfamiliar person when the name of that person was not presented. They have verified that, in most cases, participants have to remember the occupation of the person so that they can remember the name from the face, as well as to remember the face from the name. However, when the occupation was presented, the recall of the person's face was not contingent to the recall of their name. That is, these results indicate that, when we see the name of a person, our capacity to remember their face is critically dependent on our capacity to recall semantic information specific to their identity, such as their occupation. In this way, the results of this study clearly support Bruce & Young's (1986) model, suggesting, as it is assumed, that faces and names are directly connected to the occupation (semantic information), but not connected between each other.

On the contrary, a case described by Brennen, David, Fluchaire & Pellat (1996) seems to be more difficult to understand in the light of models of face processing, such as the one formulated by Bruce & Young (1986). Brennen *et al.* (1996) described the case of Mme. DT, 74 years old, who suffers from Alzheimer's dementia. She can sometimes remember the name of some faces and objects, without any access to any type of semantic information about those items. This case is problematic for the model, as it assumes that access to the name is dependent on a previous access to information about the person's identity. However, the authors note that the patient seemed to have some notion that the faces belonged to famous people, and suggest that maybe this limited information may allow the access to the person's name.

Moreover, a study by Hodges & Greene (1998) did not find any evidence supporting the possibility of a person being able to retrieve the name of a person without access to any semantic information about that person. If, indeed, patients with semantic impairments would show the phenomenon of "naming without semantics" (as the previously mentioned patient DT), this would have a major impact on the theories of face and object processing. So, in order to investigate this issue, Hodges & Greene (1998) have carried out a study where they tested the recognition, identification and naming of 50 famous faces by 24 patients with mild to moderate dementia of Alzheimer type and 30 age-matched controls. The results showed that, for each stimulus item, naming a famous face was possible only with semantic knowledge sufficient to identify the person. So, in a sample of Alzheimer dementia patients, naming without semantics never occurred, supporting the hypothesis that naming is not possible unless semantic information associated with the target is available.

2.4.2 *IAC Model of Face Recognition*

Despite the confirmed importance of models such as the one from Bruce & Young (1986) to the clarification of the theoretical assumptions, some other models, based on computer simulations, have more recently been formulated. For this reason, these models are helpful, as they evidence properties and weaknesses that could be less obvious. In the context of these models, the computational model of Burton, Bruce & Johnston (1990) will be mentioned. This model is based on the Bruce & Young (1986) model of face recognition, with some minor modifications.

Burton *et al.*'s model (1990) was implemented as an "interactive activation and competition" (IAC) net, and presents a connectionist architecture, in the sense that it comprises active units which are connected through modifiable links. However, the authors point out that it is not a PDP model, of the type of the ones conceived by McClelland & Rumelhart, as the representations are not distributed. In this sense, the model can be considered as having its roots in Morton's Logogenes Theory.

This IAC model comprises three central groups of units: one that contains the Face Recognition Units (FRU), another that contains the Person Identity Nodes (PIN) and the last one that contains the semantic information about each person. There are FRU and PIN units for each person that is represented in the model. However, in opposition to the model of Bruce & Young (1986), the semantic information is connected to the PIN units, but not to the FRU, as there has been some evidence that this link was inappropriate. There are excitatory links between the FRU of one person and their PIN, and from this to the semantic information related to that person. In this way, a PIN can be linked to many semantic information units, and two PINs can be linked to the same semantic information unit. Besides the excitatory links, there are also inhibitory links between the units in each central group.

The recognition of a person occurs when the activation in the relevant PIN reaches a certain threshold. This is a difference in relation to the Bruce & Young's model, which postulated that face familiarity could be directly accessed through the activation level of the FRUs. The PIN's activation will be transmitted to all the units that it is linked to, being counterbalanced by the inhibitory links. However, this model is still able to explain the sense of familiarity, as, theoretically, a certain PIN can be accessed while the links with the semantic information are blocked.

The authors carried out several simulations with this model and were able to simulate a wide range of findings about face recognition. Namely, priming effects, which are probably some of the most often studied and mentioned effects, were very successfully simulated by this model. In fact, as Burton *et al.* (1990) mention, the semantic priming mechanism is inserted in the structure of the model, as each time that a PIN is activated, it spreads that activation to a unit in the semantic information pool. This one, in its turn, will also activate other PINs to which it may be connected. If, in the meantime, the face correspondent to one of those PINs is seen, its threshold will logically be reached more quickly, as it already has some level of activation which was transmitted by the semantic unit.

On the other hand, the identity priming mechanism in this model is due to the reinforcement of the excitatory link between a FRU and a PIN. As soon as a certain PIN reaches its activation threshold (that is, when a person is recognised) that link becomes stronger. The strength of that link decreases gradually, but its initial level is still positive.

Another effect well simulated by the IAC model is the distinctiveness effect. This model assumes that the distinctive faces share fewer characteristics than the typical faces. Having introduced a further set of pools of units, which corresponded to visual characteristics, the distinctiveness level of each face was measured by counting how many overlaps of features occurred between each face and the population of faces. When running up the model, it can be observed that the PINs associated with distinctive faces reach any arbitrary threshold more quickly than PINs associated with typical features.

An explanation for the fact that names are quite difficult to recall for most people was also made explicit by this model, without the necessity to postulate the existence of a specific store for names. Burton & Bruce (1992, *cit. in* Smith *et al.*, 1994) state that, contrary to most of the semantic properties associated with a person, their name is linked only to one PIN. Due to this demand, in all the simulations of the Burton *et al.*'s (1990) model, it was found that names received less activation and were the slowest of all the semantic information to reach maximum activation. All the other semantic information units were activated before the name was retrieved. Therefore, the difficulty in remembering names is only a natural consequence of the associative network that links all the information about a person.

Recently, Young & Burton (1999) have also tested the ability of the IAC model to account for data from prosopagnosia, and its plausibility as a model of normal face recognition. In general, the model stood up well to those tests, even when accounting for data that was beyond its original scope.

Other studies (Ellis, Jones & Mosdell, 1997) also demonstrated the possibility of *repetition priming* between faces and voices, with very small intervals (0.5 s) between presentations. Burton *et al.* (1990) conclude that *"because cross-domain effects are... due to a rise in activation at the PIN, the model predicts a short-lived cross-domain self-priming effect"* (p. 372). This self-priming effect was also investigated by a study of Calder, Young, Benson & Perrett (1996). The authors found evidence that, as predicted by the IAC model, that the distinctiveness of the person's face interacted with the amount of self-priming found. Moreover, the authors demonstrated that a caricature of a face produced more self-priming than the veridical or an anti-caricatured representation of the face, which is consistent with the idea that caricaturing works by enhancing the face's distinctiveness.

2.5 Prosopagnosia: A Specific Impairment of Face Recognition

Face recognition can be affected at different levels of processing. Besides impairments of recognition, other capacities, such as the processing of expressions or matching of unfamiliar faces, can be affected. However, even at the level of face recognition, the impairment can assume different patterns, depending on the affected levels (Schweich & Bruyer, 1993).

Bodamer (1947, *cit. in* Nachson, 1995) has defined *prosopagnosia* as a neurological syndrome that is characterised by the incapacity to recognise familiar faces. However, other authors (Schweich & Bruyer, 1993) have stated that it is not a unique clinical entity and that it should not be considered a syndrome, as different types of impairment can be distinguished based on the affected cognitive capacities. De Renzi (1986, *cit. in* Ellis & Young, 1997) considers that the cases of prosopagnosia which have been described in the literature can be classified into two distinct groups. In one of the groups fall the patients with extremely affected face perception capacities, and the problem would be at the level of structural encoding, according to Bruce & Young's (1986) model. In the other group fall the patients who seem to have the perceptive ability intact, but who cannot recognise or process the faces that they seem to perceive satisfactorily.

In this last group the case of Mr W, described by Bruyer, Laterre, Seron, Feyreisen, Strypstein, Pierrard & Rectem (1983), would be classified. Mr W was unable to identify familiar people. He said that faces seemed less beautiful than before, and although he was still able to see them, he could not recognise any of them. The facial expressions were correctly perceived and interpreted, and the ability to match unfamiliar faces was also preserved. As his perceptive capacities were preserved, what Mr W did not seem to be able to do was use the differences between the faces that he encountered to make the recognition. In line with Bruce & Young's (1986) model, Mr W seemed to have the process of structural encoding intact, as well as the PINs, as he was able to recognise people by their names and voices. So, the problem seemed to be at the level of the FRUs, which did not establish an efficient link with the PINs.

On the other hand, one of the cases described by Bodamer (1947, *cit. in* Ellis & Young, 1997) illustrates well the case of an impairment of the ability to perceive faces. The patient, known as Uffz. S., 24 years old, became unable to identify previously familiar faces after an injury to his head. The patient stated that he was able to imagine the faces of the people that he knew before the accident, but when he really looked at them, they all looked the same. Uffz. S. was able to differentiate between faces and most other objects, but made some errors with animal faces. When he was looking at people's faces he was able to identify the elements correctly, but he did not have any notion of the face's individuality.

Uffz. S. was also unable to determine the age or gender of the faces, unless he could infer them from their hair cut. His capacity to interpret facial expressions was also affected.. According to Bruce & Young's (1986) model, the impairment would be at the level of structural encoding. Interpreting the nature of the perceptive impairment that was involved, Bodamer has emphasised that Uffz. S. was able to distinguish the individual elements of the face, but he was unable to perceive its unique character.

Other cases are related to the inability to recall names. McKenna & Warrington (1980, *cit. in* Ellis & Young, 1997) described the case of GBL, a patient that suffered from an anomia that selectively affected people's names. So, GBL was only able to name 3 out of 20 photographs of famous people, but she was able to describe rigorously who those people were in 18 of the cases. Contrarily, she correctly named 16 out of 20 European cities, and 12 out of 12 British cities, from their locations on a map.

An important issue concerning prosopagnosic patients is related to the fact that it has been demonstrated that these patients show a considerable recognition level of familiar faces, if they are tested with tasks that do not require an explicit awareness of that recognition. This phenomenon of *"recognition without awareness"* or *"covert recognition"* has been studied and confirmed with studies on skin conductance (Tranel & Damasio, 1985; *cit. in* Ellis & Young, 1997).

A case where covert recognition is evident is PH, described by De Haan *et al.* (1987, *cit. in* Ellis & Young, 1997). After an accident with a motorcycle when he was 19 years old, PH became completely unable to recognise familiar faces. However, he was able to match different viewpoints of unknown people, distinguishing if it were the same person or not, and was able to interpret facial expressions. His difficulties could not be attributed to memory problems, as PH could recognise people by their names. In Bruce & Young's (1986) terms, the PINs were relatively intact.

Apparently, PH's deficits were similar to the ones of Mr W. However, despite this profound incapacity in recognition tasks, PH showed familiarity effects in relation to the faces in his performance in tasks that did not require an explicit recognition. When he was asked to judge as quickly as possible if two photographs belonged to the same person or to different persons, PH was quicker with familiar faces than with unknown faces. There were also some other effects suggestive of covert recognition, such as the interference of irrelevant "distractor" faces in the classification of names into semantic categories, and a higher facility in learning pairs of "face + name", when it was a true pair compared to when it was a false pair. The same happened with pairs of "face + occupation".

However, it is unlikely that this kind of effect would happen with all the prosopagnosic patients. Campbell & De Haan (1994) point out the importance of this capacity of covert recognition to the development of possible rehabilitation programmes, as it would then be possible to stimulate and develop access to the existing representations through specific training. These authors describe a case of developmental prosopagnosia, an extremely rare disorder, that apparently does not show covert recognition, which limits the rehabilitation possibilities. The patient AB has always manifested problems in recognising people from their faces, to the exception of extremely familiar people. Although AB does not show any efficiency in face recognition, most of the visual capacities necessary for the recognition process do not seem to be very compromised. AB also shows difficulties in judging age, expression and some aspects of speech from faces. Her problems seem to be at the level of structural encoding, since she can represent some information about the faces, although the internal representations seem far from solid, which prevents the continuity of the information processing, including the construction of the FRUs.

The specificity of the disorder in face recognition seems to be confirmed by the existence of cases of objects agnosia that are dissociated from prosopagnosia (Hécaen *et al.*, 1974; Ferro & Santos, 1984; *cit in* Ellis & Young, 1997). It can also be found that different types of intra-category discrimination can be dissociated from each other. This is the case of the previously mentioned patients WJ and RM, as well as Mr W, who could correctly identify his dogs and cows, and also houses and streets.

Ellis & Young (1997) suggest that the "purest" case of prosopagnosia ever described was a patient of De Renzi (1986), who showed well maintained verbal abilities and was able to identify the all the objects, line drawings and superimposed figures that have been tested. So, he could easily make intra-category discriminations for all the visual stimuli, except for faces. This case constitutes strong evidence of the existence of specific deficits in face recognition.

As has been mentioned, Bruce & Young (1986) postulate that familiar face processing occurs in parallel with the analysis of facial expression and with *directed visual processing*, which is necessary to match unfamiliar faces. There are also cases in neuropsychological literature that show double dissociations between disorders involving the recognition of familiar faces and other types of face processing.

2.6 The Neural Structures involved in Face Processing and the Notion of Hemispheric Specialisation

The main information source about the neurological substrates of cognition in human beings has been the study of patients with cerebral lesions. This approach tries to establish correlations between the localisation of the lesion and the pattern of successes and failures in behavioural and cognitive tasks, thereby trying to identify the contribution of the damaged cerebral area to cognition. However, most of the times, the lesions are not restricted and can comprise two or more neuroanatomic areas that are adjacent. This can lead to an association of symptoms, even if they do not necessarily have the same underlying processes.

Furthermore, considerable evidence points in the direction of a close interdependence between the cerebral structures; that is, the modular functioning of the brain takes place based on highly interactive neuronal structures. For this reason, the methods of study needed to highlight the relations between brain and behaviour impose some limitations and it is necessary to be careful about the conclusions that can be drawn.

The presently available electrophysiological techniques and functional imaging techniques (such as Positron Emission Tomography – PET – and Functional Magnetic Resonance Imaging - fMRI) permit advances and also make the studies on the normal functioning in subjects without brain damage possible.

As has already been mentioned, the study of prosopagnosic patients has demonstrated that this disorder in face processing may result from lesions in different brain areas and may also manifest itself through different patterns in the various patients. Despite all the possible "variations", it has been suggested that prosopagnosia is usually associated to posterior bilateral lesions, although unilateral lesions in the right hemisphere (RH) may also cause deficits in the recognition of upright faces (but not in inverted faces) (Benton, 1990; Ettlin *et al.*, 1992; Sergent *et al.*, 1992; Yin, 1970; *cit. in* Nachson, 1995).

In a study using magnetic resonance and PET, Sergent (1994), has compared the functioning and cerebral activation of normal subjects and prosopagnosic patients, and has concluded that face and object recognition not only require different types of processing, but also their representations are not located in the same brain regions. This study indicates that face recognition involves the ventral areas of the RH, and it seems that this hemisphere is both necessary and sufficient to carry out that task. The cortical areas that perform specific operations and seem to be essential to this function are: the *lingual gyrus* (occipital-temporal junction) and the *fusiform gyrus*, the *right parahippocampal gyrus* and the *anterior temporal lobes of both hemispheres*. The first two perform the perceptive operations that lead to the encoding of the configural properties of the faces and to the extraction of the physiognomic invariants. The third seems to carry out a crucial role in the reactivation of pertinent memories, which are associated to a certain facial representation. Finally, the anterior temporal lobes of both hemispheres seem to contain the biographic information that is necessary to reactivate in order for a certain face to acquire significance so that it can be identified. The first two mentioned areas belong to the medial inferior area of the occipital-temporal cortex.

It is also important to notice that none of the cortical areas specifically active during a task of face identification was activated during a task of object recognition. This seems to have involved mainly the posterior structures of the left hemisphere. This result is consistent with the frequently observed dissociations between visual agnosia and prosopagnosia. So, it can be generally concluded that this study provides strong evidence for the structural and functional dissociation between face and object processing, and, within face processing, for the decomposition in specific operations that show a clear correspondence at the anatomic level.

Tovée & Cohen- Tovée (1993) also present some evidence that the processing of the different aspects of facial information (such as, gaze, emotion, identity, etc.) takes place in parallel in the temporal cortex, in differentiated functional and anatomic modules. For this reason, lesions in the temporal cortex can affect one or more of those processing modules, leaving the other ones intact, in such a way that the patients may show impairments in some aspects of face processing, but not in the others.

Electrophysiological studies provide strong evidence on the specificity of brain organisation concerning face processing. Jeffreys & Tukmachi (1992; *cit. in* Moscovitch *et al.*, 1997), in a study with evoked potentials, have verified a positive response with a latency of about 190 ms (P 190) to faces and sets of objects displayed in a structure that resembled faces. The evoked responses to objects only had a similar distribution but were smaller and usually later, and the responses to inverted faces only occurred later.

In a more recent study, Bentin *et al.* (1996, *cit. in* Moscovitch *et al.*, 1997) have found an early negative potential (N 170) that extends itself along the posterior temporal region and is more pronounced in the RH. The N 170 is evoked by the human face, but not by hands, animal faces, or other animate or inanimate objects.

In studies with subdural electrodes chronically implanted, responses specific to faces were also evoked. Namely, negative responses (N 200) have been registered in discrete regions of the occipital-temporal cortex when subjects saw faces. But the same did not happen when they saw faces with the internal elements disorganised, strings of letters, animals or cars (Allison *et al.*, 1994; Puce *et al.*, 1995; Puce, Allison, Asgari, Gore & McCarthy, 1996; *cit. in* Moscovitch *et al.*, 1997).

The presumed localisation of the generators of these evoked potentials coincides with the regions activated by the faces in the studies that make use of the PET and magnetic resonance techniques. In addition to this fact, all these results together reinforce the idea that there is in fact a distinct neuronal system dedicated to face recognition.

Associated to the more widely spread notion that prosopagnosia is associated with posterior lesions of the RH, the idea of a right hemisphere specialisation to face processing arises. This notion is supported by tachistoscopic studies, which usually reveal a superiority of the left visual field (which implies the superiority of the right hemisphere) for face recognition (St. John, 1981, *cit. in* Nachson, 1995). However, these results seem to be dependent on several factors that are related to the stimuli and to the tasks (Bryden, 1982; Sergent & Bindra, 1981; *cit. in* Hillis, Hiscock & Rexer, 1995).

Several authors have defended the position that upright faces are usually processed by the RH, originating the previously mentioned superiority of the left visual field, while inverted faces did not show any visual field superiority. Besides this, it has been found that right lesions affect the recognition of upright faces, but not the recognition of inverted faces (Yin, 1970; *cit. in* Tovée & Cohen-Tovée, 1993). However, the absence of superiority of the left visual field in a situation of inversion is not exclusive to faces, as it also occurs with other visual stimuli. In the face of this finding, the effects began to be related to the stimulus complexity and not to the specific attributes of faces. The data then seems to demonstrate that any special involvement of the RH in the recognition of upright faces is related to our great experience in face recognition compared to other objects, and is not due to any special quality inherent to the faces (Nachson, 1995).

Contrarily, other authors seem to have found evidence that inverted faces, in opposition to upright faces, are processed based on several isolated elements and not in a holistic way, which is a strategy where the left hemisphere (LH) seems to have a preponderant role (Carey & Diamond, 1977; Carey, Diamond & Woods, 1980; Leehey, Carey, Diamond & Cahn, 1978; Yin, 1970; Young & Bion, 1980; *cit. in* Hillis *et al.*, 1995).

Making use of this idea and using the paradigm of double-task from Kinsbourne & Cook, which consists of measuring the interference between a cognitive and a manual task performed simultaneously, Hillis *et al.* (1995) tried to study the laterality of face processing. As was expected, the recognition of upright faces was significantly affected when the face learning phase occurred simultaneously with a left manual task, as compared to a right manual task. However, inverted faces did not show any lateralised interference. The authors were then driven to think that upright faces are processed mainly by the RH, whereas inverted faces are processed more symmetrically. These results are, in this sense, consistent with certain clinical and tachistoscopic data.

Some data on perception of facial expressions also points to a cerebral asymmetry. When showing cards of faces displaying different emotions to the right or left visual fields of normal subjects, Ley & Bryden (1979; *cit. in* Tovée & Cohen-Tovée, 1993) found that the RH was more accurate in judging emotional aspects than the LH. Clinical studies have also shown that lesions in the RH affected the ability of more patients to discriminate between different facial expressions than lesions in the LH (Borod, Koff, Lorch & Nicholas, 1986; Dekosky, Heilman, Bowers & Valenstein, 1980; Mandal, Tandon & Asthana, 1991; *cit. in* Tovée & Cohen-Tovée, 1993).

Pointing in the same direction, it has been verified that when the RH is anaesthetised, subjects manifest difficulties in classifying the emotional intensity in facial expressions, in comparison to non-anaesthetised patients. However, anaesthesia to the LH does not produce this effects (Ahern *et al.*, 1991; *cit. in* Tovée & Cohen-Tovée, 1993). Bowers & Heilman (1981; *cit. in* Tovée & Cohen-Tovée, 1993) also described the case of a patient with RH lesion who was able to distinguish facial identity perfectly, but who was unable to discriminate facial expressions. However, this patient could judge the emotional contents of speech without any difficulty, which suggests that there was not any impairment of the general capacity to perceive emotions. There seemed to be only impairment in the capacity to judge facial clues that signal emotion. This case evidences a dissociation between the ability to recognise the identity of the face and the ability to analyse facial expressions (as it is suggested by the processing models), suggesting as well that, although both tasks are mainly executed by the RH, their anatomical bases are different.

2.7 The Modularity of Face Recognition

A question that has received considerable attention and discussion amongst the different authors is the attempt to define if we are in the presence of a modular process or not. Experimental data and data originated from neuropsychological and neurophysiological studies seem to point in the direction of a process that combines the characteristics of modularity, in Fodor's terms. This author argues that the main characteristics of a cognitive module are: informationally *encapsulated*, domain *specific*, *mandatory* and *unavailable to conscious awareness*, and *innately determined*.

Traditionally, the modularity of face recognition has been conceptualised mainly in respect to its domain specificity. Actually, Friederici (1990, *cit. in* Nachson, 1995) defends the idea that *"all modular attributes are epiphenomena of domain specificity, and are therefore reducible to its neurostructural properties"* (p. 256). But there have been many studies that have tried to find some back up to the different modular characteristics in Fodor's approach. Sergent & Signoret (1992; *cit. in* Nachson, 1995) seem to have found evidence that suggests that the operations underlying face recognition are informationally encapsulated. Nachson (1995) also presents some evidence in favour of the innate determination of the ability to recognise faces, defending that, although it is difficult to prove directly, indirect evidence clearly points that way.

Concerning the domain specificity, some of the previously mentioned aspects seem to support the idea of specificity of the processes underlying face recognition.

Even more relevant data to support the modularity of this process come from neuropsychology, namely from the cases of double dissociations, which provide us with strong suggestions in the direction that the underlying processes are probably different and independent. Cases such as the ones already mentioned, of dissociations between face and object recognition, intra-category dissociations, as well as dissociations affecting the recognition of familiar faces, matching of unfamiliar faces, expression analysis and speech analysis, suggest that the different necessary types of information are processed by functionally independent mechanisms.

Furthermore, neurophysiological and neuroanatomic data also provides strong evidence for the correspondence at the structural level of the brain of the same dissociations and to the existence of specific structures involved in face recognition. Kanwisher (2000) presents evidence from functional imaging studies that point in the direction of the domain-specificity of the mechanisms involved in face processing. Nevertheless, this author considers that giving an ultimate answer to the question of whether or not face processing is domain-specific requires researchers to decide which of several possible criteria of domain specificity are most important: the most common use of the module, the possible use of the module under some rare circumstances, the functions for which the module is necessary and the origins of the module in the development of the individual. Kanwisher (2000) then suggests that face processing is most likely to be a module according to the criteria of common use and origins.

In conclusion, different authors, such as Kanwisher (2000), Moscovitch *et al.* (1997), Nachson (1995), Sergent (1994), amongst others, conclude that there seem to exist bases to suggest that we are facing a process that is modular in nature. However, this issue is still under strong controversy, as some neuroimaging studies have demonstrated activation of brain areas dedicated to face processing (the "fusiform face area") in processing non-face objects with which subjects have acquired expertise. These studies give support to the hypothesis that the mechanisms involved in face recognition are also used when subjects make discriminations between structurally similar exemplars of a category for which they have gained substantial visual expertise, and, as the authors argue, point in the direction of the domain-generality of the mechanisms underlying face processing (Tarr & Gauthier, 2000; Gauthier *et al.*, 2000).

3. Stereotypes

The notion of stereotype has been a central concept in the domain of social psychology over the last decades. The term *stereotype* was introduced for the first time to the social sciences when Lippman first applied it to the analysis of intergroup perception. Lippman described stereotypes as "a picture in the head" (Lippman, 1922; *cit. in* Augoustinos & Walker, 1995). Some years later, Allport (1954; *cit. in* Augoustinos & Walker, 1995) specified that "a stereotype is an exaggerated belief associated with a category". Although this notion is compatible with the ideas currently held about stereotypes, more recent definitions do not include any reference to the level of accuracy of the stereotypes. Demonstrating the importance of this construct, research conducted over the last years has shown that the activation of a stereotype can affect almost all aspects of social information processing, such as behavioural interpretation (Macrae & Shepherd, 1989), attentional allocation, inference making and retrieval, type of information that perceivers seek about a target in the first place, and can also direct perceivers' behaviour in ways that lead to stereotype confirmation (Sherman, 1996).

So, what is then a stereotype? Although stereotypes have been defined in a variety of ways, from a standard viewpoint, it is generally accepted that *"stereotypes are beliefs about the characteristics, attributes, and behaviours of members of certain groups. (...) they are also theories about how and why certain attributes go together"* (Hilton & Von Hippel, 1996, p. 240). Despite the fact that stereotypes can be biasing to some extent, it is argued that they can also operate as functional mental devices, and it has been demonstrated that stereotypes can ease the burden of information processing (Macrae, Stangor & Milne, 1994). In situations where determined category labels are activated, the stereotypes (that is, the traits which are linked to those category labels in the semantic memory) should also be activated. Consequently, the information related to these stereotypes should be processed in a rapid and more efficient manner in posterior judgmental tasks.

In global terms, stereotypes can emerge as a way of simplifying the demands on the perceiver, as a response to environmental factors (such as different social roles, group conflicts, or differences in power), as way of justifying the status quo, or in response to a need for social identity (Hilton & Von Hippel, 1996). A variety of affective and motivational factors can also influence when and how stereotypes manifest themselves, through their impact on cognition. So, stereotypes can emerge in several contexts to serve specific functions made necessary by those contexts, and are conventionally defined as mental representations of a group and its members.

3.1 Representation of Stereotypes

Sherman (1996) suggests that stereotypes can be defined in terms of the types of mental representations that form the basis of one's knowledge about social groups. This level of definition gives information about the precise nature of the "cognitive structures" that contain stereotypical information. Several representational models of stereotypes can be identified, and it is important to address this issue, because predictions about the ways stereotypes are formed, maintained, applied and changed, depend largely on the assumptions made about how a stereotype is represented in memory.

Sherman (1996) classifies the models of representation of stereotypes into two different categories, based on the distinction between abstract and exemplar-based knowledge. So there are the *Pure Abstraction Models of Stereotypes* and the *Pure Exemplar Models of Stereotypes*. Examples of Pure Abstraction Models are the *prototype model* (Cantor & Mischel, 1978; *cit. in* Hilton & Von Hippel, 1996), models that propose that stereotypes are represented as *schemas* (Taylor & Crocker, 1981; *cit. in* Sherman, 1996), and models that argue that stereotypes can be viewed as *base rates* (Beckett & Park, 1995; *cit. in* Hilton & Von Hippel, 1996). This type of model assumes that stereotypes are based on a summary representation of the typical features of a social group that have been abstracted from experience with multiple exemplars of that group or that have been learned from outside sources (family, friends or the media). According to these models, a stereotype is an autonomous representation that is stored independently from the exemplars that originated it, and can be retrieved later. So, a target is first categorised into a specific social group, and then the group's stereotype may be activated and applied toward the perception of that target.

On the other hand, Pure Exemplar Models in general assume that knowledge consists of separate representations of the concept's specific known exemplars in memory. So, social perception is dependent on the set of exemplars that are activated by the target (those that share the most features in common with the target). After being activated, the attributes of those exemplars are summarised to form expectancies, inferences and judgements about the target.

Both these models independently show several theoretical and empirical limitations, and, at the same time, research results can be found that support both the abstraction-based models of stereotype representation (for example, Hamilton, Dugan & Trolier, 1985; Judd & Park, 1988; McConnell, Sherman & Hamilton, 1994a, 1994b) and the exemplar-based models of stereotype representation (Fiedler, Russer & Gramm, 1993; Mackie, Sherman & Worth, 1993; Manis & Paskewitz, 1987). So, many researchers started to adopt *mixed models of representation* that contain both abstract and exemplar information, assuming that both abstract and exemplar representations may form the basis of social knowledge under different conditions (Klein, Loftus, Trafton & Fuhrman, 1992; Ross, Perkins & Tenpenny, 1990; Sherman & Klein, 1994; Smith & Zarate, 1990; Nosofsky, Palmeri & McKinley, 1994).

The amount of experience that perceivers have with the target that has to be judged seems to influence the reliance on exemplars or abstractions. So, at low levels of experience with a certain target, judgements seem to be based on the activation of particular exemplars, because the perceiver only encountered few exemplars so far, and he does not have enough information to form useful abstract knowledge. However, as this number increases, an abstract representation of the target evolves, which will be on the basis of future judgements. So, at high levels of experience, abstract impressions are formed, and judgements do not need to rely anymore on exemplar activation.

Sherman (1996) presents evidence that support the mixed model of stereotyping. The results of an experiment that examined the mental representations of stereotypic knowledge and how that knowledge develops as experience with a group increases, has suggested that, at low levels of experience, group typicality knowledge is derived from information about particular group members. However, as experience with the group increases, an abstract group impression (stereotype) is formed, which is stored and retrieved independently of knowledge about the exemplars on which it was based. Another experiment further supported these conclusions, suggesting that abstract stereotypes are stored independently in memory and may be retrieved as the basis for group judgements. Knowledge about the typical features of the group was exemplar-based only when participants did not possess an applicable group stereotype. The findings of these experiments also go against the predictions of both pure abstraction and pure exemplar models of stereotyping.

3.2 Formation of Stereotypes

A fair amount of research has also been devoted to understanding how and when stereotypes are formed. The explanations that have been given to the question where do stereotypes come from in the first place can be placed into three broad categories. The first one includes the answers that consider that stereotypes are a product of the prevailing culture, where children learn from their parents, friends and the media. A second type of explanation assumes that stereotypes result from deep personal needs, such as the need to belong to one's own group, the need to feel superior to others, and the need to justify existing social order. Finally, the third category considers that stereotypes result from ordinary cognitive processes of categorisation and covariation assessment (Kunda, 1999).

The social world, as several other aspects of concrete reality, is often perceived through the process of categorisation. There are always many different categorial possibilities that may be applied in a particular situation. The choice of one over another depends on many context variables, including affective factors related to the perceiver. These cognitive processes will be explored below. The categorisation process naturally produces an accentuation of intracategory similarities and of intercategory differences. So, stereotyping can be regarded as a matter of perceiving people, including the self, in terms of categorial memberships (Augoustinos & Walker, 1995), and ascribe characteristics to people on the basis of those memberships. As Tajfel (1969, *cit. in* Oakes, Haslam & Turner, 1994) clearly stated *"Stereotypes arise from a process of categorisation. They introduce simplicity and order where there is complexity and nearly random variation"* (p. 82).

To overcome the difficulty of considering all the individuals in terms of their unique characteristics, perceivers prefer to consider them in terms of the social categories (e.g. race, gender, age, etc.) to which they belong. This makes the perception task easier, because there is already a great amount of information stored in long-term memory about those social groups. At the same time, this categorical thinking makes it easier to detect unexpected information, as the perceiver has already some expectations about the behaviour of a certain individual. So, categorical thinking can be regarded as a tool that confers the flexibility that the process of person perception demands (Macrae & Bodenhausen, 2000).

Nevertheless, there are some cognitive processes than can be considered to cause stereotypes to emerge, independent of pre-existing differences among groups. One of them is the emergence of *self-fulfilling prophecies* that lead to the creation of group differences, which is a phenomenon that has been well-documented (Hilton & von Hippel, 1996). When people have expectancies about a certain group, those expectancies can lead them to alter their behaviour, which in turn can cause the expected behaviour to be exhibited by people who are the targets of those expectancies. For example, it has been shown that men who were led to believe that their female conversational partners were beautiful behaved differently and elicited more sociable behaviour from their interaction partners, than did men who believed that they were talking to an unattractive woman.

These results were shown even though the interaction took place on the phone and there was no face to face interaction (Snyder, Tanke & Berscheid, 1977).

Another process that can lead to the formation of stereotypes is the *unconscious detection of covariation* (Hilton & von Hippel, 1996). Stereotypes can be originated through the generalisation from the behaviours of one group member to the evaluation of the other members. It has been demonstrated that the ability to detect correlations unconsciously is quite remarkable (Lewicki, 1986) and that, once a contingency between two events has been unconsciously detected, people tend to behave as if the relationship still exists even long after the contingency has been removed (Hill, Lewicki, Czyewska & Boss, 1989). In a study by Hill, Lewicki, Czyewska & Schuller (1990), the encoding rule that subjects had learnt unconsciously when presented with faces, which location of the nostrils covaried with fictitious personality profiles, even seemed to gain in strength when supporting evidence for that rule was already absent.

Because of these usually called *self-perpetuating bias* effects, stereotypes can be initiated right after an encounter with a few stereotypic individuals, and even in the absence of confirming evidence, perceivers may continue to strengthen their beliefs, which will in turn be stimulated by the emergence of self-fulfilling prophecies. It is also likely that that the unconscious detection of covariation plays a larger role in the formation of stereotypes about out-groups rather than in-groups, because contingencies have been demonstrated to be easier to learn when they are associated with individuals with whom the perceiver has little experience when compared to individuals with whom the perceiver has a lot of experience (Cacioppo, Marshall-Goodell, Tassinary & Petty, 1992).

The formation of stereotypes may also be explained by the identification of a cognitive bias denominated *illusory correlation* (Oakes, Haslam & Turner, 1994; Hamilton, 1981), which, in general terms, refers to a tendency to perceive a relationship (a degree of association) between two variables where none actually exists. The term *illusory correlation* was proposed by Chapman (1967, *cit. in* Hamilton, 1981) who found that subjects consistently overestimated the frequency of co-occurrence of items that were distinctive within the context of their respective stimulus lists. The illusory correlation bias was linked with stereotyping by Hamilton & Gifford (1976, *cit. in* Oakes, Haslam & Turner, 1994) who based their studies on the assumption that distinctive (numerically infrequent) stimuli are perceptually "salient" and, as a consequence, automatically attract enhanced attention, thus receiving enhanced encoding and becoming highly accessible and more available in memory. Hamilton & Gifford (1976, *cit. in* Oakes, Haslam & Turner, 1994) observed that subjects overestimated the incidence of distinctive behaviours performed by the distinctive group and this effect also influenced subjects' representation of that group as desirable or undesirable. Thus, the illusory correlation that was formed resulted in differential perception of the two social groups.

Hamilton & Gifford's findings have been replicated several times (e.g., Acorn, Hamilton & Sherman, 1988; Hamilton, Dugan & Trolier, 1985; Sanbonmatsu, Sherman & Hamilton, 1987; Jones, Scott, Solernou, Noble, Fiala & Miller, 1977). Nevertheless, some studies have been reported which show some results that were not expected, considering a distinctiveness-based explanation for the illusory correlation (e.g., McArthur & Friedman, 1980; Spears, van der Pligt & Eiser, 1985, 1986; Schaller & Maass, 1989). These evidences have led Fiedler (1991, *cit. in* Oakes, Haslam & Turner, 1994) to propose a different explanation of the process of formation of illusory correlations, based on hypothesised selective *information loss* that occurs when information of varying frequencies is processed. The main assumption of this explanation is that people are probabilistically more likely to forget the ratio of positive to negative behaviours when the ratio is based on a smaller (the minority) rather than a larger (the majority) sample. This differential forgetting leads people to have lesser extreme impressions of the minority groups than of the majority groups (Hilton & von Hippel, 1996). As a consequence, when people show mainly positive behaviours, the perceivers have more moderate and thereby more negative impressions of the minority group, and when people show mainly negative behaviours, the impressions of the minority group are also more moderate and thereby more positive.

Smith (1991, *cit. in* McConnel *et al.*, 1994a) has also proposed a model that does not include any role for biases in attention or encoding of information. It is a memory model that depends on the storage and retrieval of specific exemplars. Predictions of a bias in group evaluations are based on the arithmetic difference between positive and negative behaviours that are performed by a target group.

However, these accounts can not explain evidence of special attention to and accessibility of distinctive information, which was demonstrated by other research (Stroessner, Hamilton & Mackie, 1992, Johnson & Mullen, 1994, *cit. in* McConnel *et al.*, 1994a). This is why McConnell *et al.* (1994a) have proposed an *extended distinctiveness-based explanation* for illusory correlation. According to this alternative explanation, subjects process and rehearse both old and new information throughout the stimulus presentation. Distinctiveness can facilitate the occurrence of illusory correlations both at encoding and also at post-encoding stages. For example, in a condition where the distinctive items are presented early in the list, such that all the other classes of stimuli had the same frequency at the time that the distinctive items were presented, processes involving post-presentation, but prejudgement, distinctiveness can still operate and an illusory correlation will still emerge. As McConnell *et al.* (1994a) conclude, *"this theory thus maintains the importance of distinctive stimuli but extends the conditions under which stimuli will become psychologically distinctive"* (p. 420).

Hilton & von Hippel (1996) mention that there is still another effect that can originate the formation of social stereotypes. This effect is the *out-group homogeneity effect*, which, in general terms, means that out-group members are usually perceived as more homogeneous and they are also seen as possessing less desirable traits than in-group members. Consequently, people tend to believe that most out-group members share the same attributes of the specific out-group member that they have encountered and that the group stereotypes are likely to describe the individual members of the group. Although the out-group homogeneity effect has been well documented and seems to be a robust phenomenon in social perception, there is not much consensus about what are the causes of this effect (Oakes, Haslam & Turner, 1994). However, research has suggested that it may be critically associated with stereotyping, prejudice and discrimination (Hilton & von Hippel, 1996).

3.3 Stereotype Activation

Several models of stereotyping have distinguished between stereotype *activation* and stereotype *application*, as sequential steps that occur in stereotyping (Gilbert & Hixon, 1991; Blair & Banaji, 1996). A stereotype can only be applied to perceptual or judgmental operations if it has been previously activated by contextual cues. The question of whether a stereotype will always be automatically activated whenever a perceiver is exposed to a member of a stereotyped group has worried many researchers over the last decade.

Much research in this area has been influenced by the notion that many of our thoughts and feelings can be activated automatically, without any awareness or intention from our part, and can influence our subsequent judgements (Kunda, 1999). This idea has been in the base of some highly influential studies by Devine (1989), who concluded that the activation of the social stereotypes about a group is automatic and inevitable, regardless of personal beliefs, and it influences judgements without the perceiver's awareness of that influence. However, people who are not prejudiced towards that group may be able to suppress or replace their automatically activated stereotypic thoughts, if the circumstances permit controlled processing. Thus, the inhibition of the activated stereotype is proposed to be an effortful process that requires conscious cognitive resources from the perceiver, which may or may not be available at the moment.

Although Devine's central study has been conducted under conditions that do not allow controlled processing (subliminal priming), there are other studies demonstrating that stereotypes can also be activated and used under conditions that permit controlled processing (e.g.: Dovidio, Evans & Tyler, 1986; Gilbert & Hixon, 1991; Macrae, Stangor & Milne, 1994).

Opposing Devine's conclusions, Fazio, Jackson, Dunton & Williams (1995) have used a measure of automatic affective reactions to assess people's attitudes towards social groups and have demonstrated that there are individual differences in the automatic reactions of individuals high and low in prejudice. Fazio *et al.*'s (1995) results indicate that, when people are primed with information that is directly related to the negative stereotype about a social group, everybody will automatically activate that stereotype, independently of their level of prejudice. However, only prejudiced people will activate the negative stereotype about the group if they were primed with neutral reminders of that group.

Thus, in the last decade there has been a strong debate about the conditions under which the categorical representations that we construct and use to make sense of other people may or may not be activated when we interact with them. A considerable amount of earlier research, primarily based on priming techniques, seemed to demonstrate that category activation was an unconditionally automatic mental process (Macrae & Bodenhausen, 2000). However, this notion of the unconditional automaticity of category activation started to be questioned, as most mental operations do not appear to satisfy entirely the strict definition of automaticity and the multiple criteria needed to qualify a process as exclusively automatic (Bargh, 1994). Bargh (1994, 1997) argues that, at the level of complexity that mental processes are studied by social psychologists, they are not exclusively automatic or exclusively controlled. Instead, they are combinations of the features of each. These ideas gave rise to the conception of *conditional automaticity*, which has then influenced most of the research in this field.

A study by Gilbert & Hixon (1991) definitely challenged the assumption that stereotypes are automatically activated in the presence of a triggering stimulus. Emphasising the distinction between stereotype activation (the activation of stereotypic ideas in long-term memory) and stereotype application (the actual application of stereotypes that have already been activated), these authors found evidence that cognitive busyness will increase the likelihood that perceivers will apply previously activated stereotypes.

However, the results also indicate that cognitive busyness may decrease the likelihood that a particular stereotype will be activated in the first place.

In a word-fragment completion task, non-busy subjects generated more stereotypic completions when exposed to an Asian than a Caucasian assistant, but busy subjects (that were asked to rehearse an eight digit number while performing the verbal task) did not. Therefore it seems that cognitively busy subjects were too busy to activate the stereotype's contents, although they were still able to identify the category membership of the target. In a second task, subjects that were non-busy in the first place (and consequently had their stereotypes activated) and that were made busy in the second task (by performing a visual search task while simultaneously attempting to form an impression of the assistant) made more stereotypic ratings of the Asian assistant than of the Caucasian assistant. Stereotype activation thus seems to be conditional upon the availability of cognitive resources for perceivers to locate and retrieve stereotypical information from their memory store.

Other researchers have also carried out a number of studies, which have attempted to identify other factors that may play a role in the activation of categorical knowledge structures. Such is the case of Blair & Banaji (1986), who have found support for the roles of perceiver intentions and cognitive constraints in moderating stereotype priming. The results of their studies suggested that stereotype priming can be eliminated under specific conditions, specifically when perceivers have an intention to process counterstereotypic information and sufficient cognitive resources are available. In a conventional priming task, participants with a counterstereotypic strategy, who expected that the prime and the target would be opposite in their gender association (for example, if the prime was stereotypically masculine – ex: ambitious -, they should expect the target to be a female name most of the times – ex: Betty – so that they could improve their performance in the task of judging if the target was a male or a female name), were able to reverse the stereotype priming and implement their intentions, when they were under relatively low cognitive constraints. However, under high cognitive constraints, participants with a counterstereotypic strategy failed to reverse the priming. Thus, perceivers' expectations seem to be able to impede stereotype activation, when there are enough cognitive resources available.

Macrae, Bodenhausen, Milne, Thorn & Castelli (1997) have demonstrated the importance of processing objectives for the activation of social stereotypes when perceivers are confronted with photographs of female faces. Participants were randomly assigned to view photographs, including female faces, under one of three processing objectives (a feature-detection condition, a semantic-judgement condition, and an exposure condition). After each trial, participants were asked to complete a lexical decision task, which involved female-stereotypic and –counterstereotypic words. Only when participants processed the targets (photographs) in a semantic manner did stereotype activation occur, as demonstrated by lexical facilitation only apparent on stereotypic traits (participants responded faster to stereotypic than counterstereotypic traits).

Another demonstration that goal states, more specifically self-image maintenance, can influence category activation comes from a study by Spencer, Fein, Wolfe, Fong & Dunn (1998). Evidence from this study has shown that even perceivers with no cognitive resources available (conditions that have been shown to make stereotype activation unlikely) are capable of stereotype activation, as long as that activation can enhance their feelings of self-worth. Spencer *et al.* (1998) had participants completing two ostensibly different experiments. The first one involved an intelligence test, after which the participants received feedback (either positive or negative) about their test performance. In the second experiment, a task similar to the one used by Gilbert & Hixon (1991) was used (a word completion task). The results of their study have replicated the ones from Gilbert & Hixon (1991), demonstrating that, while cognitively busy, participants who have received positive feedback showed no stereotype activation on exposure to an Asian American target person. However, participants who had received negative feedback on the intelligence test, showed evidence for stereotype activation, by making more stereotypic completions when they saw the Asian American assistant. Thus, after negative feedback, there was an automatic activation of the stereotype after exposure to a member of a stereotyped minority group, which demonstrates that, when people experience self-threat, the goal to restore their self-image can lead perceivers to activate stereotypes when they encounter members of a stereotyped group, even when under cognitive constraints that would otherwise inhibit such activation. In other experiments, the authors demonstrated the occurrence of this effect with a different stereotype (the African American stereotype) and even when the exposure to the members of the stereotyped group occurred without perceiver's awareness.

Other research has also demonstrated that a perceiver's chronic beliefs about others may also seem to moderate the activation of categorical thinking, or stereotype activation (Lepore & Brown, 1997, Locke, MacLeod & Walker, 1994, Wittenbrink, Judd & Park, 1997, *cit. in* Macrae & Bodenhausen, 2000; Hilton & von Hippel, 1996). Thus, evidence seems to suggest that category activation can sometimes be under the perceiver's control, as it seems to be at least responsive to the perceiver's cognitive limitations, temporary processing objectives and chronic beliefs about social groups. Macrae, Bodenhausen, Milne & Calvini (1999) have further shown that category activation is also moderated by the resolution of visual attention. In their study, only when triggering stimuli (forenames) fell within the spotlight of attention did category activation occur, Thus, all this evidence supports the view that category activation is conditionally automatic.

3.3.1 *Category selection and category inhibition*

Every time we encounter a person (say, for example, a young asian female dentist), there a number of different categories into which that person can be classified (her age, race, gender, occupation). Which category will we chose to classify that person? Some research has been done, in order to try to understand how is this problem solved by our cognitive system.

Some researches have suggested that category selection may be facilitated through the operation of low-level inhibitory processes (Macrae, Bodenhausen & Milne, 1995; Bodenhausen & Macrae, 1998, Stroessner, 1996, *cit. in* Macrae & Bodenhausen, 2000). It is a widespread notion that stereotypes provide order to experience and that social perceivers are capacity-limited processors. Therefore, in order to increase the intelligibility of mental life in a world of extreme complexity, we must make use of simplifying cognitive strategies. Social categorisation has been suggested to be one of those strategies, being a process that involves the classification of a target into his or her applicable social categories by the perceiver (Macrae *et al.*, 1995). All applicable categories are supposed to be activated in parallel, originating a competition for mental dominance. Category salience, chronic accessibility and goal relevance are belive to be factors that confer some activational advantage to determined categories in that competition (Bodenhausen & Macrae, 1998, *cit. in* Macrae & Bodenhausen, 2000).

The question is then what happens to the remaining activated categories once one particular category achieves the necessary activation level to win the competition for mental dominance. Macrae *et al.* (1995) have found evidence for the existence of both facilitatory and inhibitory processes in category activation. These authors claim that inhibitory mechanisms serve a central regulatory function in the category activation process. Macrae and his colleagues suggest that people suppress the less dominant of two applicable stereotypes in order to avoid distraction and interference.

Sinclair & Kunda (1999) have found evidence for the importance of the perceiver's motivation state in the active inhibition of social categories. Motivation may determine which stereotype will be chosen amongst the ones applicable to an individual, increasing the activation of the one that support the desired impression of that individual, and inhibiting the ones that conflict with it. Participants who had received positive feedback from a black doctor, and were therefore motivated to view him as competent, inhibited the category "blacks" and activated the category "doctors". On the other hand, participants who had received negative feedback from the black doctors wanted to discredit him and view him as incompetent, and thus inhibited the category "doctors" and activated the category "blacks". It can be concluded that motivational factors are also important, both in the activation and inhibition of stereotypes or social categories.

Everybody can be faced with situations where we feel that we have to be careful with what we say about a certain topic or group of people (that is, we feel that we have to try to control our thoughts and suppress the respective stereotypes from our expressions). The public concerns and discussions about prejudice, egalitarianism and fairness towards minority groups also makes people be cautious about the ways they express their feelings and ideas. Due to either personal or social reasons, there may be many situations in which perceivers desire to avoid the influence of activated stereotypes on their evaluations of others. These reasons have conducted researchers to explore the mechanisms involved in thought control, its consequences and the conditions which influence them.

Wegner (1994, *cit. in* Macrae & Bodenhausen, 2000) has developed a general theoretical model of thought suppression. This author proposes that the process of thought suppression evolves in two different phases, which demand different cognitive resources from the perceiver. So, when a perceiver wants to avoid a particular type of thought (i.e., categorical thinking), in the first instance there is a monitoring process that scans the mental environment, looking for sign of the unwanted thought. If any sign of this thought is found, there will be a second operating process, which tries to direct consciousness away from the unwanted thought by focusing attention on a suitable distracter. The first process is believed be quite automatic, whereas the second one is postulated to be effortful and to require adequate cognitive resources from the perceiver.

Ironically, some researchers have demonstrated that the effort to avoid a particular thought may result in its hyperaccessibility (Wegner & Erber, 1992) and that stereotype suppression can produce a rebound effect, in which the magnitude of stereotyping increases significantly after a period of suppression (Macrae, Bodenhausen & Milne, 1998). Due to the effortful nature of the second mechanism, if perceivers have available resources and adequate motivation, they will probably be able to avoid the stereotypic thoughts. But, if the perceiver is cognitively busy, low in motivation, distracted or under time pressure, the stereotypic material may escape the operating process, due to the hyperaccessibility created by suppression efforts (Macrae & Bodenhausen, 2000).

Moreover, Macrae, Bodenhausen, Milne & Ford (1997) have shown that the task of inhibiting stereotype congruent memories make notable demands on the perceiver's attentional resources. In the conditions where inhibitory processing was compromised through a reduction in resource availability, participants demonstrated enhanced recall performance on the stereotype-congruent material that they had previously been instructed to dismiss. These authors suggest that memory processes seem to operate in a manner that discourages stereotype change, because where established stereotypes are involved, it seems to be the stereotype congruent information that dominates the recollections about those individuals.

3.4 Stereotype congruent and stereotype incongruent information processing

A wide body of research has been devoted to investigate the factors that influence the process of person memory and impression formation. A particular focus of this research has concerned the processing of information that is either congruent or incongruent with an initial impression and how stereotype based beliefs affect people's memory for information. The first findings seemed to be inconsistent and contradictory, because some studies demonstrated that perceivers preferentially recalled stereotype congruent information, whereas other studies claimed that stereotype incongruent information was more readily retrieved from long-term memory (Macrae, Hewstone & Griffiths, 1993). Several explanatory mechanisms have been evoked to account for those contradictory findings and researchers have shifted their attention to attempt to identify the factors or conditions which reliably produce preferential recall for either stereotype consistent or inconsistent information.

It is generally accepted that stereotypical beliefs about social groups are useful in both making judgements and interpreting new information about individual group members. Accordingly, one of the factors that is commonly evoked as an explanation for the maintenance of social stereotypes is that perceivers are more likely to attend to and remember information that is congruent with their expectations about social groups than information that is incongruent with those expectations (Stangor & Duan, 1991). However, some studies have started to question this general assumption. Most of the work done in this area has been influenced and stimulated by an important paper by Hastie & Kumar (1979). In their studies, participants were first given a description about a target person which contributed to the formation of an initial impression about that person. After that, they asked to read a few sentences describing some of the target person's behaviour, which could be congruent, incongruent or irrelevant to the initial impression. In the latest phase, participants were asked to recall as many behaviours as they could remember. The results showed that behaviours that were incongruent with the initial impression were more probable to be recalled than impression-congruent behaviours, which, in turn, were recalled with higher probability than irrelevant behaviours. These results have been replicated in a number of other studies with similar experimental paradigms (e.g.: Sherman & Hamilton, 1994; Hamilton, Driscoll & Worth, 1989; Srull, 1981; Srull, Lichtenstein & Rothbart, 1985; Wyer & Gordon, 1982).

Srull (1981) has proposed an associative network model of impression formation to account for these results. According to this model, the target person is represented in memory by a central node, to which items of information become attached as they are encoded. An associative pathway between two items will be established if those two items are compared during the encoding process. However, the model assumes that this associative activity occurs only during the encoding of expectancy-incongruent behaviours, and not during the encoding of expectancy-congruent or irrelevant behaviours. This is justified by the difficulty of integrating incongruent information with the previously existing impression, which requires additional thought, whilst other types of information (congruent and irrelevant) are processed rather effortlessly. This kind of representation of the target person can then explain the recall advantage of incongruent items. Incongruent items are associatively linked to both congruent and incongruent items, so there are more retrieval routes leading to them. Therefore, they are more likely to be assessed during recall than are congruent items.

The attempt to reconcile incongruent information to the prevailing expectation about the target person or target group makes people think about these behaviours in relation to other relevant behaviours. This process has been called by Srull & Wyer (1989) in their model of person memory as an "inconsistency-resolution process", that results in cognitive associations which are formed between the incongruent behaviours and other incongruent and congruent behaviours and the person or group concepts. These associations aid in recall and may contribute to the better recall of incongruent information.

As pointed out by Stangor & Duan (1991), the results of these studies are problematic for the general argument that stereotypes about social groups might be maintained because of preferential memory for expectancy-congruent behaviours. However, some other studies have demonstrated that, under certain conditions, the inconsistency-resolution process will be less likely to occur, and consequently the recall of congruent information will prevail.

The limiting conditions for the incongruency effect have progressively become better defined. Accordingly, some studies have suggested that preferential memory for incongruent information is less likely to occur for memory of behaviours that were performed by a group of individuals than when it is performed by a single target (Stern, Marrs, Millar & Cole, 1984; Srull *et al.*, 1985; Wyer, Srull & Gordon, 1984). This can be explained because behavioural incongruency is regarded as less incongruent when it occurs among different people than when it occurs within the same person. Greater behavioural variability is expected among a group of individuals than within a single individual, so when incongruent behaviours were performed by a group of people they demand less inconsistency-resolution.

Another variable that might influence the process of inconsistency-resolution is the availability of cognitive resources. Some studies have shown that the tendency to recall incongruent information may be reduced, or even reversed, when the processing demands of the environment are increased. Stangor & Duan (1991) have shown that recall for information about social groups is more likely to be congruent with expectations about those groups when impressions are formed under conditions that require the perceiver to form multiple concurrent tasks. Subjects tended to recall a greater proportion of congruent (versus incongruent) behaviours about social groups as the number of target groups they were required to learn about increased. This is actually a situation much more similar to the real world environment than conditions in which the perceiver is able to allocate all his or her attention to a single impression formation task.

In another study, Macrae, Hewstone & Griffiths (1993) also investigated the effects of processing load on the relative memorability of stereotype-based information. In the high processing load condition a concurrent task was introduced simultaneously with the task of learning information related to a stimulus. Replicating previous findings, these authors have also found evidence that subjects showed preferential recall for stereotype consistent information under high processing loads, but that they recalled significantly more inconsistent information under low processing loads. This suggests that, in demanding social interactions, cognitive processes seem indeed to facilitate the maintenance and perpetuation of social stereotypes.

Bodenhausen & Lichtenstein (1987) have presented evidence that favour the hypothesis that when perceivers face a complex judgmental situation, they use stereotypes (when these are available and relevant) as a way of simplifying the task. They organise the presented information that is consistent with the stereotype around it, and tend to neglect the inconsistent information.

Moreover, in a study that used a paradigm where participants were allowed to control the amount and nature of the information they received about individual group members, Johnston & Macrae (1994) have demonstrated that participants tended to use a biased information-seeking strategy and showed a preference for stereotype-consistent, rather than stereotype-inconsistent information. However, when subjects were forced to use all the information available, their stereotypic evaluations of the group diminished. The authors conclude that these results also demonstrate the general resistance of stereotypes to change in everyday natural information-seeking settings.

Stangor & McMillan (1992) have made a meta-analytic review of 54 experiments which tested several competing models of how social expectations influence memory for information that is either congruent or incongruent with those expectations. This review examined three major theoretical models of person memory and their predictions in this regard. Those models were the *Schematic Information-Processing Model*, the *Schema-Pointer Plus Tag Model* and the *Associative Network Model*. The results from this review suggest that all the models are able to account for some aspect of the data that the other models can not account for. Therefore, it is also evident that none of the models is sufficient, alone, to account for all the observed results. This study made use of three different types of memory measures, which were recognition-sensitivity measures, response biases measures and recall measures, and included several different moderating variables that might influence social memory. Overall, stronger expectations, more difficult or complex processing conditions (particularly number of groups and processing time), descriptive inconsistency, trait (versus behavioural) stimuli, and memory (versus impression formation) processing goals all led to greater recall and response bias toward congruent information, whilst simultaneously led to a bias toward accurately recognising incongruent information on sensitivity measures.

These authors have also highlighted the importance of inconsistency-resolution goals. In interpreting the data from all these experiments, it is useful to consider the perceiver's motivations as he or she processes the stimulus information. Thus, perceivers who are first forming impressions of social targets may be especially motivated to form integrated impressions of the targets, and will be more likely to engage in inconsistency-resolution processes. On the contrary, individuals who have already a well-developed impression may be more motivated to maintain a simple, straightforward and coherent impression and then be less likely to process the incongruent information and try to resolve the inconsistencies. Stangor & Ford (1990, *cit. in* Stangor & McMillan, 1992) found results that seem to support this pattern.

Taken altogether, the data suggest that congruency effects are more likely to occur when processing takes place under cognitively demanding conditions, when the stimulus information is substantially ambiguous, when people are attempting to form an impression of the target person or group and when there is a significant interval between the processing of the stimulus information and the recall or judgement. As it is likely that these are exactly the most common situations when processing of social targets occurs in everyday life, it is reasonable to believe that stereotypical expectancies may be maintained as a result of expectancy-congruent information being well-remembered in real world situations. At the same time, congruency biases may be more important in maintaining stereotypical expectancies about groups than about individuals, as congruency effects were greater for groups than for individuals. Moreover, preferential memory for congruent information is more likely to play a role in stereotype maintenance than in stereotype formation, as congruency effects were only found for already established expectations (Stangor & McMillan, 1992).

4. Facial Stereotypes

The human face conveys a great variety of important social signals that can be detected and interpreted usually in a correct way by other human beings. For instance, when we look at a face, it is with relative ease that we can say if we are facing a young or an old person, if it is a man or a woman, or if that person is sad or happy. These inferences are usually made with a great level of accuracy. Not less often, but maybe less accurately, people also tend to infer some personality characteristics from other's facial appearance, and it is common to listen to people say that this person "looks" intelligent, honest, kind, introvert, dependent, etc. All this information that can be extracted from the face has substantial consequences for everyday social life.

For centuries people have believed that character is revealed in the human face. Despite the scepticism of the actual trends in the psychological approach, these beliefs are still present in the form of what can be called *facial stereotypes*. Ligget (1974) has reported that over 90 per cent of university students who participated in a survey believed that there are important facial guides to character. In fact, the not very broad amount of research that is available on this subject has demonstrated that people are extremely consistent in their judgements of other people's honesty, intelligence, personality traits, intentions, occupation and even political opinions, based on facial appearance (*ex:* Abdi, 1986; Shepherd, 1989; Cook, 1939; Zebrowitz, 1998). Although remarkably consistent, it is usually thought that these judgements are seldom valid. Many studies have suggested an almost total absence of any clear associations between certain physiognomic features and objective personality traits (Alley, 1988; Shepherd, 1989). Despite that, we still do not know how to answer the question about how and why do people make such consensual and consistent inferences about a person's personality based in a stimulus so limited in information as a photograph or even a schematic drawing of a face. And the observation that these stereotypes are consistently held and applied even if they are not valid leads us to consider that it is interesting and important to deepen our understanding about the underlying mechanisms of facial stereotypes.

A considerable amount of literature on the social psychology of attraction demonstrates that many of our judgements about other people seem to be directly influenced by the physical attractiveness of those persons (Bull & Rumsey, 1988). This influence can vary from the confessed satisfaction after a date with a previously unknown person, through evidence that the simple fact of being an attractive person values their social status, until findings that suggest that people who are considered to be more beautiful are also believed to possess other desirable psychological attributes, and are even considered guilty a fewer number of times in criminal judgements. These aspects seem to be related to the fact that most of the people are susceptible to the stereotype "what is beautiful is good" (Dion, Berscheid & Walster, 1972), of which there are many examples in the literature. Thus, the way we are judged by other people seems to depend, at least some of the times, on the attractiveness of our face.

In this section the available literature on facial stereotypes will be reviewed and the main findings regarding the principal aspects of judging personality based on the face will be mentioned. A better understanding about the processes underlying facial stereotypes can be considered important in general terms, as awareness about the influence of other's appearance in the way we perceive them, how does it manifest itself and how can it be controlled can be beneficial in many different contexts, where the first impressions we make about other people are remarkably important and decisive to the possible outcomes of that situation. For instance, it has been demonstrated that a facial disfigurement had a marked negative effect both on the perception of personal qualities and job skills in a recruitment context. The results also indicated that, although the possession of a physical disability significantly reduced the chances of being selected, the possession of a facial disfigurement had a far greater negative impact (Stevenage & McKay, 1999).

4.1 Judging people's personality by their face

It is undeniable that most of our views of other people are strongly influenced by superficial qualities, and in particular their facial features. Signs of the practice of physiognomy (*face reading*) persist and can be found from ancient times to the present days. For example, in the words of either Cicero, Confucius or Aristotle, we can find some kind of reference to the possibility of reading character from the face. Even some caricaturists and cartoonists drew on the traditions of physiognomists to communicate the distinguishing personality traits of various social groups and different occupations. Artists, such as Rembrandt, Gauguin or Leonardo da Vinci, have also exploited the ability of the face to convey psychological traits. Even some writers, who are famous for their ability to make realistic verbal descriptions of people, are also masters at physical portrayals, with vivid descriptions that provide immediate grasps of the person's character (Zebrowitz, 1998).

When people are asked to give a description of person, either a stranger or a familiar person, almost everybody tends to start by describing their physical features. Moreover, this tendency is present since early ages, with children tending to rely almost only on physical features. It can also be noted that people who physically resemble each other are perceived to have the same psychological traits. Moreover, when people possess facial features which deviate considerably from average, they are usually judged as possessing also more extreme personality traits, when compared with people with a more average appearance. It can also be noted that people who have a more stable appearance across times are also perceived to be more constant in character, and perceivers more readily ascribe personality changes to someone whose appearance also changes (Zebrowitz, 1990).

There is also evidence of consistent physiognomic impressions across different cultures. Secord & Bevan (1956, *cit. in* Alley, 1988) found general agreement between Norwegians and Americans on personality judgements of facial photographs. Keating, Mazur & Segall (1981, *cit. in* Alley, 1988) also reported that Americans had similar results to a wide variety of cultures across the globe in a task of sorting facial photographs along a dominance-submissiveness dimension. Moreover, there also seems to be a significant cross-cultural consensus regarding judgements of attractiveness, as faces viewed as attractive in Western cultures are also seen as attractive by non-Westerners (McArthur & Berry, 1987, *cit. in* Zebrowitz, 1990; Thakerar & Iwawaki, 1979). All these observations confirm the importance of appearance, implying that the study of attributions based on specific facial characteristics is worth pursuing, and, from a certain point of view, it can be inferred that appearance probably conveys some kind of information about the person.

It is interesting to note, however, that people who tend to infer personality characteristics based on facial appearance, usual find it very difficult to explicit the features in which they rely to make those assumptions. Nevertheless, people tend to strongly agree in their impressions about other people's personality traits based on facial photographs, and seem to find it much easier to make trait judgements than objective physical judgements (such as wideness of eyes or fullness of lips). This implies that there must be some observable facial characteristics that convey the trait impressions, be they correct or incorrect (Zebrowitz, 1998). To consider what a person's face does in fact reveal may help to understand the question of why do people still tend to rely on the facial appearance to infer psychological traits. In fact, there are a considerable number of facial qualities that give us plenty of information about a person.

4.1.1 *Mediating mechanisms linking physical features and inferential responses*

Shepherd (1989) suggests that there can be three main mediating mechanisms by which physical features might be linked to inferential responses. The first of these mechanisms corresponds to the assignment of a person to a social category, such as age, sex or race. The face conveys a number of valid cues for this categorisation, and all these categories have widely held stereotypes associated with them. A second possible mechanism corresponds to the extension of the expression of a temporary emotional state to a stable disposition. There are also a number of valid cues in the face that signal the person's emotional state and that can be used to attribute a stable disposition to the target person. Finally, the third mechanism mentioned by Shepherd (1989) is based on the extension of ethological concepts to the human sphere. This perspective claims that specific facial attributes have evolved for signalling states of dependence, submissiveness or dominance. Thus, the face also provides useful information for these purposes, through specific cues.

Regarding the first mechanism that was mentioned, which is related to the perception of social categories based on facial information, there are several fairly objective cues provided by the face that enable us to categorise people according to their age, gender and race. The cues to age can be either static cues, which are provided by facial structure and skin quality, or dynamic cues that are provided by facial movements. Changes in the facial structure involve a relatively smaller, more backward-sloping forehead, relatively smaller, higher placed eyes, and a relatively bigger, more protrusive chin in the adult face. The head of the adult is also proportionally smaller than the head of the child and the adult's skin is generally darker than that of the child. After maturity, other changes in the skin and structure will signal the ageing process, and some of those changes may even cause the elderly face to revert to a more infantile appearance. The role of the dynamic cues to age that are provided by facial movements has been highlighted by the point-light technique. This technique has been used to reveal the information provided by facial movement that is independent of structure. When people's faces are videotaped and subsequently played in such a way that what one sees is the movement of small luminous dots, the guesses of the age of a particular face are much more accurate than when viewers are shown only a freeze-frame of it. This observation demonstrates that the facial movements are adding information about age over and above whatever structural information the dots provide (Berry, 1990, *cit. in* Zebrowitz, 1998).

There seems to be a good deal of consensus and accuracy in guessing people's age from their facial appearance. A study by Henss (1991, *cit. in* Zebrowitz, 1998) has shown that people highly agree with one another when estimating the age of men and women, ranging from their mid 20s to their late 60s. Most of the times, the estimates were quite accurate, being only 3 to 7 years away from the real age. It has also been shown that the ability use facial cues to judge the person's age is present since very young ages. Children with only three years old were able to sort photographs of adults into "parents" and "grandparents", and photographs of children into "babies", "little girls and boys" and "big girls and boys" (Edwards, 1984, *cit. in* Shepherd, 1989). Although it has not been yet confirmed if the ability to distinguish between younger and older faces has a specific neural locus, there is some evidence that patients with certain types of brain lesions have difficulty in estimate people's ages from their faces (Tiberghien & Clerc, 1986).

The most obvious cues to identify gender are facial hair and smoothness of skin, although these cues are mainly used amongst Caucasians. Other less obvious cues, which can have wider variability between the different cultures, are scalp hair, skin tone and structural differences. These subtle cues have been proved to be used, although people may not be aware of responding to them. As well as with age cues, there is also evidence that the ability to identify face genders is already present early in life (Zebrowitz, 1998). Despite the fact that adult faces provide more obvious cues, it is also possible to distinguish between genders in faces of very young children. Undergraduates were able to distinguish with above chance accuracy between infant boys and infant girls under one year of age (Shepherd, 1989).

Finally, there is also a relationship between race (and ethnicity) and facial appearance, although this relation may lead to more identification errors than the two previous ones. In what concerns race, the primary basis for identification is skin colour, although specific facial features are also commonly used, such as the shape of nose, lips and eyes, eye colour, hair colour, length and texture, etc.

Going back to the previously mentioned mediating mechanisms that might link physical features and inferential responses, let us consider now the second one. That mechanism suggests that facial signs linked to temporary emotional states (like a smile or a frown) may be used to make a more stable dispositional attribution. In fact, it has been demonstrated that at least seven basic emotions can be accurately communicated by facial expressions: happiness, fear, surprise, anger, sadness, disgust and contempt (Ekman, Friesen & Ellsworth, 1982). Attribution theory (Heider, 1958; Jones & Nisbett, 1972, *cit. in* Shepherd, 1989) states that there is a tendency in an observer to attribute behaviour to internal, "dispositional" causes at the expense of situational causes, especially if the behaviour is salient and the situational information is minimal. On the basis of this theory, if the perceiver does not have any other information available, it would be expected that a valid facial signal to an emotional state would be attributed to a stable disposition. For example, a smile denotes a state of happiness and, therefore, the trait of a "happy person".

The third mentioned mechanism, which is based on the ideas of some ethologists, suggests that specific facial attributes may have evolved in humans in order to signal states such as dependence, submissiveness, or dominance. The signals to these states are associated to a large extent with signs of age and sex, but they are assumed to influence judgements directly, without being necessary to have a mediating categorisation based on age or sex (Shepherd, 1989). For example, Lorenz (1943, *cit. in* Berry & McArthur, 1986) has suggested that a range of appearance variables commonly found in both humans and animal infants combine to elicit responses from adults that increase the infant's chance of survival. Specifically, adults tend to respond to infants with positive affect, protection and a decreased likelihood of aggression, which indicates that the infant's appearance signals cuddliness, helplessness, and non-threateningness. Muscarella & Cunningham (1996) tested the effects of male pattern baldness and beardness on social perception, in terms of the multidimensional meaning of physical maturational stages. The results supported the initial predictions, indicating that a decrease in the amount of cranial hair was associated with increased perceptions of social maturity (which is a unique and internally consistent factor that includes the key traits of intelligence, positive social status, and helpfulness), appeasement and age, and decreased perceptions of attractiveness and aggressiveness. On the other hand, the presence of facial hair resulted in increased perceptions of age and aggressiveness, and decreased perceptions of appeasement. These results are consistent with the evolutionary hypothesis that facial hair signals male sexual maturity and dominance.

Regarding the issue of trying to understand how people may become to infer personality characteristics on the basis of facial appearance, a study by Lewicki (1986) might give a hint on how facial stereotypes might be created. Lewicki (1986) has demonstrated that simple co-occurrences of certain types of social information and certain physical features can be easily and non-consciously extracted. Subjects were presented photographs of female faces (either with long or short hair) accompanied by brief descriptions referring to the person's personality traits (either kindness/helpfulness or capability/effectiveness). In each experimental condition, each hair length was always paired with the same personality trait (e.g.: long hair and kindness, and short hair with capability). After a distractor task, subjects were asked about the kindness and capability of a different set of stimulus persons, half of them with long hair and the other half with short hair.

Results showed that three initial training trials were enough for subjects to link hair length to the personality characteristics, as subjects' retrieval processes were systematically affected by the manipulated covariation between physical characteristics and personality traits. Subjects in each condition took longer to respond in the trials that were relevant to the covariation that they had been exposed to (e.g.: when judging the kindness of the new faces, they spent longer evaluating those with long hair, and when judging the capability, they spent longer evaluating those with the short hair, according to the example previously given for an experimental condition). However, nobody reported having been aware of any influence on their judgements or having used any rule. So, a relationship between hair length and personality had been extracted without awareness, and subjects were also not aware of that influence on their judgements. These findings point to the possible origin of the formation of stereotypes, and suggest that they can be formed without awareness.

4.1.2 *The accuracy of face reading*

Most of the research that has been conducted on physiognomy has mainly addressed two separate issues: the accuracy of physiognomic judgements and the existence of consistent and consensual impressions of psychological characteristics based on facial appearance, that is, the existence of facial stereotypes. The scientific literature on this topic reveals that, with few exceptions, researchers have not found direct relationships between the normal variations in facial features and psychological characteristics. Despite that, there is good evidence that people continue to hold strong and consensual beliefs about what the face tells about personality (Alley, 1988).

Alley (1988) mentions a few studies using facial photographs where small correlations between impressions based on facial appearance and more objective measures of the related traits have been found (e.g.: Anderson, 1921; Hull, 1928; Terry, 1975; Terry & Sneider, 1972). However, this author claims that being such small correlations makes it unlikely that those traits can be usefully assessed by examination of the facial features. Furthermore, Cohen (1973, *cit. in* Alley, 1988) has found no meaningful relations between physiognomic and psychological characteristics, which could maintain their statistical significance in cross-validation on other data.

However, Zebrowitz (1998) discusses some studies based on a different experimental paradigm, which provide some evidence of accuracy in judging other people's traits from their appearance. For example, college students were asked to rate each other as well as themselves after being together for a short time, in small groups, without being able to talk. Results have shown that strangers tend to agree with one another in some of their trait judgements. This effect has been named *"consensus at zero acquaintance"*, and additional evidence for the accuracy of these consensual judgements has been so far provided by their agreement with people's self-ratings, ratings by acquaintances, personality test scores and behavioural observations.

Researchers have also tried to establish which traits are more likely to show the higher levels of consensus in judgements. Some researchers have based their approach on the examination of the personality traits known as the Big Five: extraversion, conscientiousness, agreeableness, emotional stability and culture. These traits are of interest because they include dimensions of people's perceptions of others and also of self-perceptions. However, other researchers preferred a functional approach, which claims that people should be more able to judge traits whose correct or incorrect identification had implications for survival and reproduction in the human evolutionary past, such as social dominance, sexual availability, intelligence and honesty.

From the first group of traits, judgements of extraversion (how talkative, open, adventurous and sociable a person is) are the ones that seem to show more accuracy and consensus, in a zero acquaintance paradigm. Judgements of conscientiousness (how tidy, responsible, scrupulous and persevering a person is) seem to elicit significant agreement between self-ratings and strangers' ratings, but the consensus in strangers' ratings is small. The other traits seem to elicit no significant consensus or consistent agreement (Zebrowitz, 1998).

With respect to the second set of traits, judgements of dominance at zero acquaintance show considerable accuracy, and people show moderate consensus when rating the dominance of unknown individuals depicted in photographs. Besides recognising leaders, we also seem to be able to recognise available sexual partners, as some studies have showed a moderate correspondence between strangers' ratings and self-ratings on traits such as "sexually permissive" and "sexually active". Both intelligence and honesty are traits for which accurate detection would seem to be functional and useful. However, the limited research on intelligence does not seem to show very clear results in terms of whether appearance can accurately communicate intelligence. With respect to honesty, Mealey, Daood & Krage (1996) have presented some evidence that we may have evolved non-conscious biases in our perceptual and cognitive processes that enable us to be especially attuned to those individuals who are perceived as potentially threatening, and these adaptive features are built into the individual face recognition mechanism. In their study, subjects showed a bias for remembering faces that had originally been presented with a description indicating potential threat (as having a history of cheating), as compared to both neutral and trustworthy characters. Mueller, Thompson & Vogel (1988) also reported that subjects showed better recognition and greater confidence on that recognition associated with dishonest faces, after faces had been rated for honesty by independent raters. However, the results of the studies on honesty seem to be discrepant, suggesting that the accuracy of honesty perceptions may be dependent on the particular experiences of the target individuals, as well as on the specific way of assessing honesty (Zebrowitz, 1998).

There is one point that is important to notice: when the accuracy of trait impressions has been established in zero acquaintance paradigms, the perceivers are provided access to more cues than those available only from the face, as judges often viewed the whole body of the person, either in personal contact or on videotape. Although results from studies with static photographs have also shown strong consensual judgements, there is not so much evidence that those judgements are in fact accurate. So, it can be questioned if the accurate judgements at zero acquaintance derive from reading the facial cues or from the bodily cues, and regarding the facial cues, if it is the facial physiognomy or the expressive facial movements that are important.

4.1.3 *A model of appearance-trait relations*

Zebrowitz (1998) addresses the question of why traits may be manifested in the face, suggesting a model of appearance-trait relations. This model is illustrated in Figure 4.1 and, as can be observed, it comprises four possible causal routes to actual appearance-trait relations.

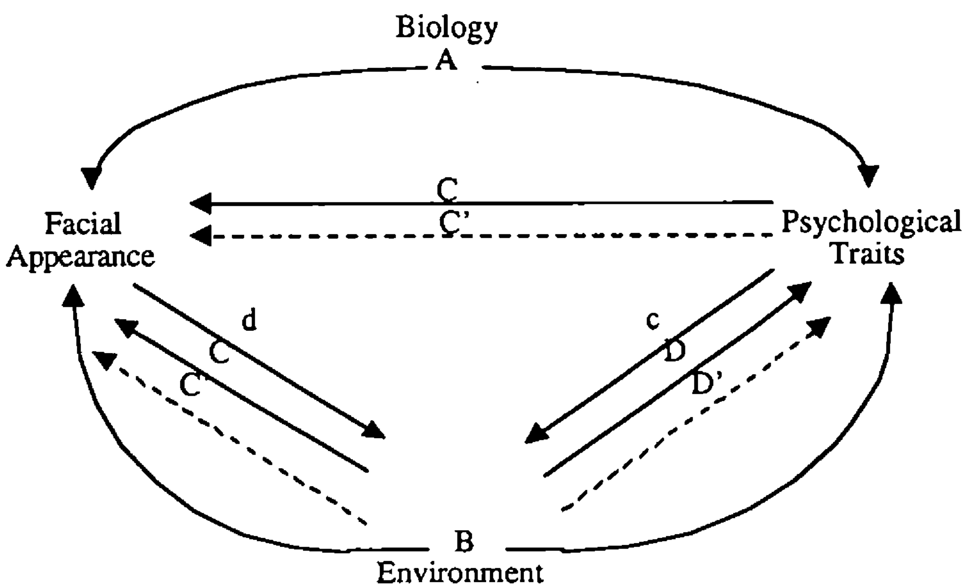


Figure 4.1: A model of appearance-trait relations (reproduced from Zebrowitz, 1998).

The first route is illustrated by path A, and represents the possibility of appearance and psychological traits being related because both are influenced by the same biological factors. For example, genes may cause a relationship between a certain facial feature and a psychological trait, as happens with the biological anomalies that produce the intellectual impairments associated with Down syndrome, which also produce distinctive facial markers. A second possibility is represented in Path B, conceiving that both appearance and psychological traits may be influenced by the same environmental factors, either physical or social ones, which would contribute to the development of a link between them. For example, food deprivation may lead to a particular facial appearance and may also lead to the development of personality traits that derive from that same food deprivation.

The third possible link between appearance and psychological traits that is illustrated in the model is that differences in personality may cause differences in facial appearance. This tendency is represented by the solid Paths C in the model, and Zebrowitz (1998) named it as the *Dorian Gray Effect*, which can be a direct effect of personality on appearance or can be mediated through the environment. For instance, people with a more irritable character may tense certain facial muscles in a way that will influence the development of the jaw in a different way from that of people that are more easygoing. There in another possible effect of personality on appearance, which is an *artifice effect*, by which personality produces an incongruent facial appearance (illustrated by the broken Paths C' on the model). It can also be direct (for example, when someone that is lying tries to smile and look people in the eyes), or mediated by the environment.

The fourth possible link between facial appearance and personality traits is represented by Path D. In this pathway, different facial qualities are supposed to cause people to experience different environments, which in turn will cause differences in the traits of those who have a particular appearance versus another. If a person that is extremely fair-skinned is viewed and treated by the others as if she was sick and fragile, this may produce a *self-fulfilling prophecy effect* (solid Paths D), in which that person becomes less active than someone who spends a lot of time outdoors, or someone who is treated as healthy and robust by the others. Alternatively, it can originate a *self-defeating prophecy effect* (broken Paths D'), in which the fair-skinned person compensates for the deprivation of outdoor activities, by becoming even more robust than someone who does not suffer the same environmental consequences on appearance.

Some support for the effects present in this model has been found in a study by Zebrowitz, Collins & Dutta (1998), where the relationship between appearance and personality has been investigated from childhood to age 60, using archival data. For men, lagged effects of attractiveness on personality were consistent with a self-fulfilling prophecy; for adolescent boys, lagged effects of babyfaceness on personality were consistent with a self-defeating prophecy; for women, lagged effects of personality on attractiveness were consistent with a Dorian Gray effect, whereby early personality produces a congruent later appearance.

4.1.4 *Overgeneralization effects in perceiving faces*

Zebrowitz (1998) argues that overgeneralization effects can be in the origin of certain expectancies that contribute to the development of actual appearance-trait relations via self-fulfilling or self-defeating prophecies. These overgeneralization effects may also simply produce stereotypes that will influence people's perception based on facial appearance. The author maintains that these overgeneralization effects all derive from the adaptive value of responding to the information that appearance qualities provide. It might have been so important in evolutionary terms to detect and respond to some facial attributes that enable us to detect identity, species, fitness, emotion or age, that a strong preparedness to respond to those facial features might have been developed and our responses were overgeneralized to individuals whose appearance merely resembles them. Although overgeneralization may lead to identification errors regarding those qualities, a failure to respond to certain facial qualities, such as the ones that signal age, would be even more maladaptive than overresponding to those same facial features.

One type of overgeneralization effect occurs when we perceive a stranger as having the same psychological traits as another familiar person, just because their facial features resemble those of the other person. It can be inferred that this effect had its origin in the adaptive value of the appearance markers of identity that helped to avoid potentially dangerous strangers and approach safe and familiar people. Other overgeneralization effects may be identified when people are perceived as having the traits that are associated with the animals that their features resemble. For example, we may perceive people to have foxy or leonine behaviours when their faces resemble the features of those animals. In a study by Szymanski & Zebrowitz (1987, *cit. in* Zebrowitz, 1998), foxes and fox-faced men were judged as shrewd, whereas lions and lion-faced men were seen as dominant and proud.

Another overgeneralization effect can be identified, which is related to perceiving people to have traits that are associated with the emotional expressions that their features resemble. For example, a person who has naturally turned-up mouth corners may be perceived as a happy person, whilst a person whose eyebrows are low-placed might be perceived as angry. This effect might be rooted in the adaptive value of avoiding an angry person and approaching a happy one. It is also common to perceive people whose facial features resemble those observed in certain physical or mental disorders to have the same psychological traits that are associated with those disorders. For example, someone with thick, dry skin or large or flabby ears may be perceived as low in intelligence like the cretin, whose features these resemble. In evolutionary terms, this effect probably reflects the adaptive value of responding to appearance indicators of fitness, making it possible to avoid those individuals with communicable diseases and mating those who are genetically fit.

There is another effect, named by Zebrowitz (1998) as the Attractiveness Halo Effect, which is related to the "what is beautiful is good" stereotype (Dion, Berscheid & Walster, 1972). This effect is present in situations where people whose faces are judged to be attractive are also perceived as having more desirable traits, and are usually treated accordingly. Some theories support the view that facial attractiveness is enhanced by qualities that signify fitness, such as symmetry and average facial proportions (Thornhill & Gangestad, 1999). So, there is a possibility that the attractiveness halo effect is in fact related to an evolutionary preparedness to detect fitness from faces, and reflects as well the sickness similarities overgeneralization effect. The positive feelings that beauty evokes in the perceiver are also a possible contributing factor for this effect.

The last effect suggested by Zebrowitz (1998) is the Babyface Overgeneralization Effect, which reflects the observation that people whose facial features resemble those of infants may be perceived as having childlike traits and be treated accordingly. This effect may be related to the adaptive value of responding to facial cues to maturity, which contribute to nurturing the young and mating with the fertile. This quality of the faces is also related to sex stereotypes, as babyface characteristics are more similar to the female typical features. Both the attractiveness halo effect and the babyface overgeneralization effect will be further discussed in the following sections.

4.2 The Attractiveness Stereotype

Attractiveness is one of the aspects from the face which is more readily judged, and is probably the one which has more consequences for the personal life of the individual (Bull & Rumsey, 1988). Berscheid & Walster (1974) have provided a major review of the research previously done on this topic and most of the interest had been centred on the social value and implications of attractiveness. Only after the 1980s there seems to be some research on what the components of physical attractiveness are.

The classical theory about beauty is the Greek hypothesis that beauty is a matter of good proportions, even though there was not much agreement on what those proportions might be. However, this view became substantially less popular after the philosopher David Hume had argued that beauty *"is no quality in things themselves: it exists merely in the mind which contemplates them; and each mind perceives a different beauty"* (Hume, 1757, pp. 208-209, *cit. in* Bruce & Young, 1998). This idea that beauty is in the eye of the beholder has become very popular ever since, especially amongst the general public, artists, art critics and philosophers.

However, it is not possible to deny the considerable evidence suggesting that facial attractiveness influences the way people are perceived in may respects, including their personality characteristics. As it has already been mentioned, there seems to be a well-developed stereotype about physical attractiveness, which shows both cross-cultural consensus and exist since very early in life. People seem to agree in their judgements both when raters of different ages are compared and when they are rating faces of people with different ages from their own. Dion (1973) asked eight adults to rate facial photographs of 6 year old children on attractiveness and found a mean correlation of .81. Pre-schoolers who were asked to select the most attractive one from pairs of these faces were also able to pick up the more attractive one significantly often. Styczynski & Langlois (1977) also shown that children as young as three to five years can choose the more attractive of two stimuli pre-scaled by adult judges. Moreover, when babies who are less then one year old are shown faces that are considered by adults as attractive or unattractive, they spend longer looking at the attractive faces (Langlois, Roggman, Casey, Ritter, Rieser-Danner & Jenkins, 1987).

Kissler & Bäuml (2000) investigated to what extent does the agreement in preference for attractive faces between adults and children holds both for the general direction of preferences and also for the preference strengths. In a choice experiment, where subjects were presented with pairs of women's and girls' faces, and were asked to pick up the prettiest one, the authors found no difference in preferences between nine-year-olds, twelve-year-olds and adults, neither in direction nor in strength, for the women's faces. However, for the girls' faces, although there were no significant differences in preference direction, there were reliable differences in preference strength. Children showed less pronounced preferences between face stimuli than adults, which suggests that there may be some developmental factors playing a role in the perception of facial attractiveness after all.

Regarding the judgement of attractiveness across different cultures, there are a considerable number of studies that show a fair cross-cultural consensus (Cunningham, Roberts, Wu, Barbee & Druen, 1995; McArthur & Berry, 1987, *cit. in* Zebrowitz, 1990;

Thakerar & Iwawaki, 1979; Shepherd, 1983, *cit. in* Shepherd, 1989; Cross & Cross, 1971). Zebrowitz, Montepare & Lee (1993) found strong interracial agreement in ratings of attractiveness in a study with U.S. white, U.S. black and Korean students. Langlois & Roggman (1990, *cit. in* Bruce & Young, 1998) have also shown that, if average responses are used, there is a reasonable degree of agreement between people from different cultures regarding which faces are considered attractive.

4.2.1 *"What is beautiful is good"*

Dion, Berscheid & Walster (1972) have found evidence suggesting that the physical attractiveness variable may have a number of implications for a variety of aspects of social interaction and influence. Their results suggest that a physical attractiveness stereotype exists and that its content is perfectly compatible with the "What is beautiful is good" thesis. Perceivers tended to judge more attractive people as being more socially desirable, and as being expected to attain more prestigious occupations, be more competent spouses, have happier marriages, be better parents, and have better prospects for happy social and professional lives than less attractive people. According to this evidence and to a considerable amount of literature on the topic, people's physical attractiveness seem to influence to a great extent the way they are perceived in many other aspects of their lives (Bull & Rumsey, 1988).

The same effect seems to be present even in the perception of children, as it can be observed in a study by Dion (1972), where a description of an aggressive act was accompanied by a picture of an unattractive or an attractive child. The results show that adults tended to attribute the reasons for the aggressive behaviour more to character dispositions when the child was unattractive and more to contextual circumstances when it was an attractive child (that is, they were more likely to think that the unattractive child was nasty, but that the attractive child was just in a bad day).

There is considerable evidence that this "attractiveness halo effect" is present for faces of all ages, since 3 to 9 months babies, until people aged from 60 to 95 years old, and, moreover, the more favourable reactions to attractive people develop within the first year of life. With respect to gender differences, although good looks are usually believed to be more valued in women than in men, evidence suggests that a significant difference only exists for the impression of sexual warmth. The tendency for attractive people to be perceived as sexually warmer than less attractive people is large for impressions of women but only moderate for impressions of men. So, it can be considered that the halo effect is present both for men and women.

Concerning cross-cultural effects, the main findings suggest that although the attractiveness halo effect is racially universal, the specific traits on which the halo effect manifests itself may depend on cultural values or expectations (Zebrowitz, 1998). For instance, in a study including Korean students (which come from a collectivistic culture), photos of other Korean students were rated at three levels of attractiveness on dimensions included in meta-analysis of the physical attractiveness stereotype as shown in North America (which is known as an individualistic culture). It was observed that, in one hand, participants did not perceive attractive targets as higher in potency, as North American participants do, but, on the other hand, the Korean students perceived attractive targets as higher in integrity and in concern for others, as North Americans do not. These results support the idea that all cultures show an attractiveness halo effect, but that the content of the stereotype depends on cultural values (Wheeler & Kim, 1997).

However, there is some evidence suggesting that an opposite effect to this attractiveness halo effect may also occur, which is related to the argument of many people that "beauty is in the eye of the beholder". How many times did we start to think that someone was more attractive as we started to know him or her better? When an instructor behaved in a warm and friendly manner, 70 percent of college students judged his physical appearance as appealing, whereas when his behaviour was more cold and distant, only 30 percent of the students judged him as physically appealing (Nisbett & Wilson, 1977). Moreover, a woman was rated as more physically attractive when the perceivers had received a favourable description of her personality (Gross & Crofton, 1977, *cit. in* Zebrowitz, 1998).

So, there seems to exist evidence favouring both the idea that physical attractiveness influences the perception of other characteristics of the person, enhancing judgements of other personality traits, and the idea that a person's behaviour and other personality characteristics do influence the perceived degree of attractiveness.

4.2.2 *An evolutionary perspective on the perception of attractiveness*

The more traditional view about what makes some faces more attractive than others is that standards of beauty are set arbitrarily by culture and the media, and have little functional significance. However, a few more recent lines of evidence have emerged and suggested that perceptions of attractiveness may be, at least partly, biologically based. From an evolutionary perspective on the perception of attractiveness, it can be argued that the psychological mechanisms underlying attractiveness judgements are adaptations that have evolved in the service of choosing a mate so as to increase gene propagation throughout evolutionary history (Thornhill & Gangestad, 1999). This view suggests that selection is the only cause of adaptations and it should have favoured psychological features that evaluated observable bodily traits that varied with mate value, and should find attractive those traits connoting high mate value. The working hypothesis from this perspective is that, when members of a species discriminate between potential mates with regard to their physical appearance, as humans do, than the discrimination should reflect special-purpose adaptations responsive to cues that had mate value in evolutionary history (Symons, 1987, *cit. in* Thornhill & Gangestad, 1999). Moreover, the fact that humans share views about what features are attractive suggests that there are species-typical psychological adaptations.

Some evidence has been presented suggesting that human attractiveness evolved because of mate preference for healthy and fertile mates (Symons, 1979, *cit. in* Thornhill & Gangestad, 1999). Furthermore, physical attractiveness shows consistency across the life cycle from childhood through adulthood (Zebrowitz, Olson & Hoffman, 1992) and, therefore, attractiveness at any stage potentially predicts health at later stages. Consistent with this view, it has been shown that attractive people of all ages receive favourable treatment from others (Eagly, Ashmore, Makhijani & Longo, 1991).

Evolutionary psychologists have tried to address the adaptationists' question of whether the facial attractiveness judgements evolved as assessments of the overall phenotypic condition. For that, they have considered whether facial attractiveness reflects less-obvious indicators of that condition in three main aspects: the impact on ratings of attractiveness of symmetry, averageness and non-average sexually dimorphic features.

Concerning symmetry, it is important to note the concept of *fluctuating asymmetry*, which is a departure from symmetry in traits that are symmetrical at the population level. These small random deviations from perfect bilateral symmetry result from environmental and genetic stresses during development, so that symmetry signals genetic quality and health (Palmer & Strobeck, 1986, Parsons, 1990, *cit. in* Rhodes, Hickford & Jeffery, 2000). Several experimental studies suggest that humans do tend to prefer symmetric faces to less-symmetrical ones (Perret *et al.*, in press, *cit. in* Thornhill & Gangestad, 1999). In a study that compared the symmetry and perceived attractiveness between monozygotic co-twins, who are genetically, but not developmentally identical, Mealey, Brigstock & Townsend (1999) found that the more symmetric twin of a pair was consistently rated as more attractive. Moreover, the magnitude of the difference between twins in perceived attractiveness was directly related to the magnitude of the difference in symmetry. Rhodes, Profitt, Grady & Sumich (1998, *cit. in* Thornhill & Gangestad, 1999) created symmetrical faces by combining mirror images and original face textures and asked raters to judge faces for attractiveness and for appeal as long-term date. The results indicated that that the degree of symmetry affected both judgements for both genders. And again, attractiveness covaried with the degree of symmetry. No sex differences in the attractiveness-rating of symmetry were found, but symmetry affected more men's preferences for long-term mates than women's.

Facial averageness was hypothesised to be attractive because averageness is associated with above average performance in tasks such as chewing and breathing (Symons, 1979, *cit. in* Thornhill & Gangestad, 1999). Evolutionary pressures should yield a preference for individuals who have characteristics close to the population average, since such individuals would be less likely to carry harmful genetic mutations (Zebrowitz, 1998). As on continuously distributed heritable traits the average denotes genetic heterozygosity, Thornhill & Gangestad (1993, *cit. in* Thornhill & Gangestad, 1999) also suggested that a preference for average trait values in certain facial features could have evolved, because heterozygosity could provide genetic diversity, which is valuable in selection contexts. There is some empirical evidence supporting this preference for average faces. For example, Langlois & Roggman (1990) have created composite faces, by "averaging" computer images of many individual faces and have found out that those "averaged" faces tended to be judged as more attractive than any one of the individual faces. The bigger the number of faces that were included in that composite image, the more attractive the resulting face was judged to be. Some authors suggested that the greater attractiveness of average faces might be due to their greater symmetry, and, as it has been noted, symmetry is attractive. However, in a study by Rhodes, Sumich & Byatt (1999, *cit. in* Thornhill & Gangestad, 1999), averageness and symmetry were independently manipulated, and attractiveness effects were found for both; averageness seems to affect attractiveness even in perfectly symmetrical faces.

Prototypical male and female faces differ in several features, so that the adult female face retains more infantile characteristics (such as smaller jaw, smaller nose, larger eyes and cheekbones, lighter skin), while the typical adult male face has more mature features (more square-shaped jaw, more protrusive nose and forehead, darker skin). People show a large preference for babyfaced women and mature-faced men when asked to rate the facial features that they find most attractive (Wagatsuma & Kleinke, 1979). These differences may result from the differential effects of male (testosterone) and female hormones (estrogens) at puberty, which contribute to the development of those characteristics. In men, testosterone levels increase after competitive success and its metabolism might be less costly for males who are better able to win intrasexual competitions. The levels of the masculine hormone testosterone and its phenotypic effects could be honest signals of condition. Likewise, estrogen signals the readiness of a woman for reproduction and so it is a signal of fertility. This could account for the preference for prototypical male and female adult faces.

However, some contradictory findings have been reported. Some studies show preference for masculine facial features (Cunningham, Barbee & Pike, 1990), whereas others evidence preference for near average or even feminised facial features in male faces (Perrett *et al.*, 1998; Penton-Voak *et al.*, 1999; Rhodes, Hickford & Jeffery, 2000). To explain these results, Thornhill & Gangestad (1999) have suggested that women might not prefer men who possess honest signals of good condition (that is, typical masculine faces) under all mating conditions, but only under those conditions in which it will be beneficial to make that choice. Men who show honest signals of good condition are more successful at attracting mates, but are less likely to invest time and other resources in offspring, as well as in exhibiting fidelity. On the other hand, it has been observed that women's preferences shift during the menstrual cycle. In the low-conception phases of the menstrual cycle, they tend to prefer feminised male faces, whereas in the fertile phase show preference for more masculine faces. Furthermore, this shift towards greater masculinization in the high-fertility phase is only apparent when considering a short-time mate, and not for a long-term mate (Penton-Voak *et al.*, 1999). These results are in line with the potential explanation that selection might have designed preferences based on the costs and benefits of a certain mating choice.

With respect to women, several experiments have consistently demonstrated that the most attractive female faces are associated with smallness in the bony features of the lower face, large lips, and width and height in the cheeks. The development of these features seems to be related to the high levels of estrogen during puberty (Thornhill & Gangestad, 1999). There is another aspect that plays an important role in the perception of women's facial attractiveness, which is age. Males (and not so much females) show a stronger preference for younger females, because the effects of age on female fertility and reproductive value are more marked, and so female mate value is more tightly linked to age. It is known that the ratio of female estrogen to androgen production changes with age, and female faces tend to masculinize with age. Thus, physical attractiveness is also valuable as an age cue, and this might explain why men are usually thought to give more importance to physical attractiveness cues in mating and romance than do women (Buss, 1989; Feingold, 1990).

The evolutionary hypothesis also suggests that youthfulness is attractive because it signals health. Men who looked young for their age to physicians, who did not know anything about them, also proved to be physiologically younger on subsequent examination. Young-looking men also lived longer, in particular those who were between the ages of 45 and 75 (Borkan, Bachman & Norris, 1982). So, these findings support the suggestion that some signs of youthfulness might be attractive because they do indeed signal fitness.

4.3 The Babyface Stereotype

Relying once more on an ecological approach to social perception, the age-related facial features are another variable, which may reveal psychological attributes whose detection is important to the survival of the species or for the adaptive functioning of the individual, and therefore may influence impressions. So, detecting the attributes of infants is also regarded as being adaptive, and several studies have demonstrated that the facial features that characterise infants, such as relatively large eyes and cranium, do reveal their dependency and approachability. Moreover, this adaptive reaction to the facial information that identifies infants and their attributes seems to be overgeneralised to those adults who resemble the young. For example, adults with various childlike facial qualities, such as large, round eyes, a short nose, a large forehead or a small chin, are perceived to afford more warmth, more submission, more honesty, less physical strength and more naivete than those with more mature faces (Berry & McArthur, 1986). These effects of a babyface are also present in impressions formed of pre-schoolers, elementary school children, adolescents and elderly adults (Zebrowitz & Montepare, 1990, *cit. in* Zebrowitz, 1990).

A baby has a different head shape from an adult, as maturation of the facial structure and the force of gravity have altered the cranium of the adult person, and the differences in the head shape can be accurately identified. The shape of the head when seen in profile has been proved to provide an accurate indication of who is older than whom, as people are able to identify the older of two profiles when the difference in shape is only slightly greater than the smallest difference that can be detected (Shaw & Pittenger, 1977, *cit. in* Zebrowitz, 1998). Moreover, infantile head shape seems to stimulate caretaking impulses and to inhibit aggression. A babyish head shape is viewed as less alert, less strong and less intelligent, which are perceptions of dependency that should favour more caretaking attitudes. Furthermore, they are also seen as cuter, less threatening and more lovable, perceptions of a disarming approachability that should both stimulate caretaking and inhibit aggression. However, there is one aspect of approachability which is lower in a babyish profile: it is perceived as less sexy than the mature one (McArthur, 1982, *cit. in* Berry & McArthur, 1986). This impression is also adaptive, as the babyface is meant to elicit behaviour oriented to protect and nurture, but not to sexually molest. And, in fact, people report that they feel more compelled to protect the more babyish profiles (Alley, 1983, *cit. in* Zebrowitz, 1998).

Although it is usually thought that all babies are supposed to be cute, it does not seem to be exactly the case, and the effects of a babyface stereotype seem to hold up even for small babies. Babies with "non-babyish" features, such as small forehead, long chin, small eyes and large nose, are perceived as less cute than the ones with a more prototypical babyface (Alley, 1981, *cit. in* Zebrowitz, 1998). Moreover, observations of face-to-face interactions between parents and their 3-month-old infants showed that the cuter infants received more smiles and vocalisations (Hildebrandt & Fitzgerald, 1983, *cit. in* Zebrowitz, 1998).

As the attractiveness halo effect, the impact of a babyface on person's impressions about other people is present not only for targets of different ages, but also for perceivers of various ages and from different cultures. Perceivers can identify babyfaced individuals at every age that has been studied, ranging from 6 months to 60 years old. Furthermore, the strong babyface stereotype that is found for impressions of children, young adults and older adults, can not be explained by differences in the attractiveness of babyish versus more mature-looking faces (Zebrowitz & Montepare, 1992). In the perception of older adults, it is observed that, despite the more youthful appearance, more babyfaced older adults are perceived to be more dependent, more submissive, more likely to give in to friend's wishes, more naïve and less able to follow complicated instructions than their equally attractive, mature faced peers (Zebrowitz, 1998).

Even at a very early age, differential responses to babyfaced people seem to be present. Infants as young as four months of age show a preference for babyish facial stimuli (McCall & Kennedy, 1980). Children between the ages of 4 and 7 show a strong tendency to identify the person with more low mature-faced eyebrows as the dominant one in a social interaction story, when it was paired with another photograph of a person of the same sex and race, but with high babyfaced eyebrows (Keating & Bai, 1986). In another study, children viewed pairs of faces that differed in overall babyfaceness, as determined by ratings of adults. After listening to a story, children again showed strong effects of the babyface stereotype that is shown by adults, by choosing more often the mature-faced person as the dominant one and the babyfaced person as the warm one (Montepare & Zebrowitz-McArthur, 1989).

There is also evidence that the babyface stereotype is racially universal. Perceivers of all races judge babyfaced men representing the three major racial groups as being more submissive, naïve, physically weak, honest and warm than their more mature-looking peers. These effects are usually very large and they hold true when age and attractiveness are controlled for (Zebrowitz, Montepare & Lee, 1993).

It can be observed that the facial characteristics that differentiate babies from adults also tend to differentiate women from men, and some researchers suggest that these sex differences in appearance might have some influence on sex stereotypes. In fact, like a babyfaced person, the stereotypical female is perceived as warm, weak, submissive and naïve, and, like a mature-faced person, the stereotypical male is perceived as cold, strong, dominant and shrewd. However, although the effect of facial mature-like features on sex stereotypes seems to be undeniable, it would certainly be too simplistic to propose that stereotypes of women can be totally explained by a babyish appearance (Zebrowitz, 1998).

Recently, Paunonen, Ewan, Earthy, Lefave & Goldberg (1999) have shown that individuals rated higher on the dimensions babyfacedness and femininity were also considered as more empathic, honest, pleasant, popular and extrovert. These authors demonstrated that small details in facial appearance, which were experimentally manipulated (such as eye size), could profoundly affect the perceived personality based on the face.

Similarly to the effects and social outcomes of attractiveness, the effect of facial babyishness on impressions goes beyond simple trait ratings. For example, the results of a study by Berry & Zebrowitz-McArthur (1988) supported the predictions that a babyfaced defendant would be more often found guilty of an offence resulting from negligent actions, whereas mature-faced defendants would be more often perceived as guilty of charges involving intentional criminal behaviour. Moreover, subjects did recommend less severe punishment for babyfaced defendants than for mature-faced ones. Zebrowitz, Voinescu & Collins (1996) also found evidence of the attribution of greater honesty to more attractive and more babyfaced individuals, which reflects both the attractiveness halo and the babyface overgeneralization effects.

4.4 The perception of intelligence from facial appearance

Although the assessment of intelligence from the face has preoccupied many psychologists over the time, the validity of these judgements has not been successfully proved. The general conclusions drawn from early studies on the subject was that judgements from photographs were not a reliable method for assessing intelligence, and irrelevant cues, such as spectacles, could mislead the judgement, leading to estimates of high intelligence (Thornton, 1943, *cit. in* Shepherd, 1989).

Cook (1939) carried out a study where he gave an intelligence test to 150 students and asked people to estimate their intelligence from their photographs, all taken under standard lightening conditions. The results showed no correlation between the estimations of intelligence and the actual scores on the test or the students' performance. However, interestingly, peoples' estimates tended to agree with each other, despite the fact that the judgements did not seem to be valid. It can be concluded that there seemed to be something about the faces that was consistently and reliably picked out, although it was something that was not apparently valid to estimate the intelligence from the faces.

Regarding the issue of which cues do people pick up for their judgements, there is not agreement about the cues associated with apparent intelligence. Cook (1939) concludes that symmetry of facial features, seriousness of expression and tidiness of hair and appearance were the factors that seemed to lead to judgements of high intelligence. Secord, Dukes & Bevan (1954, *cit. in* Shepherd, 1989) found that no single physiognomic trait was associated with intelligence. Laser & Mathie (1981, *cit. in* Shepherd, 1989) reported that a long face, and thick or thin eyebrows were related. McArthur & Apatow (1983-84, *cit. in* Shepherd, 1989) found eye size positively correlated with intelligence ratings.

Although it does not seem possible to identify the cues that are in the base of judgements of intelligence and these judgements do not seem to have any external validity, it is well documented that people show high consensus in the judgement of this characteristic. For this reason, it can also be considered as one of the apparently well established and used facial stereotypes.

4.5 Some neuropsychological support for the importance of the face in social judgements

Some studies with neuropsychological patients also bring up some important evidence, suggesting that there are characteristics from the faces which are specifically processed in social judgements. Adolphs *et al.* (1998) have found evidence that gives support to the hypothesis that the human amygdala is involved and is necessary for the social judgements of other individuals on the basis of their facial appearance. This observation comes to join previously existing evidence that the amygdala has a fundamental role in processing emotions through the face (Adolphs *et al.*, 1994; Broks *et al.*, 1998; Morris *et al.*, 1996; Morris *et al.*, 1998; *cit. in* Adolphs *et al.*, 1998).

The data obtained by Adolphs *et al.* (1998) seems to suggest that patients with complete bilateral amygdala damage have strong difficulty in extracting from faces the social information that is relevant to make a social judgement that is in line with the social stereotypes consistently attributed by the majority of the subjects. Specifically, these patients judged unfamiliar faces as being more trustworthy and more approachable than did control-subjects, and this difference was more significant for the faces which were perceived more negatively in those characteristics by normal subjects. Moreover, it was demonstrated that this impairment did not extend to judging verbal descriptions of people. These findings suggest that the human amygdala appears to trigger the retrieval of socially and emotionally relevant information on the basis of prior social experience or innate bias in response to visual stimuli, being of special importance for the social judgement of faces that are normally classified as unapproachable or untrustworthy. This aspect is consistent with the amygdala role in processing threatening and aversive stimuli (Adolphs *et al.*, 1998). A study by Adolphs & Tranel (1999) has demonstrated that the human amygdala appears to play a role in guiding preferences for visual stimuli that are normally judged to be aversive or to predict aversive consequences. And it is probable that this function may be most important in regard to judgement of social stimuli such as faces. The mechanism that is hypothesised to act here is that stimuli that have been associated with negative (aversive) consequences in the past (either through individual experiences or through phylogeny) activate the amygdala to trigger responses such that the organism can avoid the aversive consequence that is predicted by the stimulus (Adolphs & Tranel, 1999).

Bellugi, Adolphs, Cassady & Chiles (1999) have investigated the social judgements of subjects with the Williams Syndrome (WMS). The WMS is a rare disorder with distinct profile of medical, psychological, neurophysiological and neuroanatomical characteristics that results from hemizygous deletion of about 20 genes. Amongst others, it is of special interest an unusual social phenotype of an overfriendly, engaging personality and excessive sociability with strangers. In this study, Bellugi *et al.* (1999) used a similar experimental paradigm to the one used in the previously reported study by Adolphs *et al.* (1998). The main finding of this study was that subjects with WMS judged the faces of unfamiliar individuals to be abnormally approachable, which is consistent with their excessively social behaviour in everyday life. Furthermore, these subjects exhibit perfectly intact face-processing abilities. This evidence suggests once more that there is something in particular about the face which is used specifically in social judgements, and its processing seems to have a neural basis. This study indeed suggests that there may be a contribution of genes to the neural systems underlying social behaviour.

A review study carried by Adolphs (1999) suggests that there are three major structures that seem to play a key role in guiding social behaviour: the amygdala, ventromedial frontal cortices and right somatosensory-related cortex. Once more, a number of studies are mentioned highlighting the role of the amygdala in social cognition, and in particular in the social judgement of faces, specifically in processing facial cues that are related to potential threat or danger.

A recent paper by Phelps *et al.* (2000) also demonstrates another important role for the amygdala in social cognition. This paper presents some results that suggest that the amygdala may also be specifically involved in indirect or nonconscious responses to racial groups. In this study, White subjects observed faces of Black and White males, while the strength of amygdala activation was assessed. This study has shown for the first time that members of Black and White social groups can evoke differential amygdala activity and that this activity is related to unconscious social evaluation.

When subjects saw faces of unfamiliar Black and White faces, the strength of amygdala activation to Black-versus-White faces was correlated with two indirect measures of race evaluation but not with the conscious expression of race attitudes. However, when the faces belonged to familiar and positively regarded Black and White individuals, these patterns were not obtained. This suggests that the amygdala response to Black-versus-White faces in White subjects is a function of culturally acquired information about social groups, modified by individual knowledge and experience. The authors propose that one possible mechanism by which the amygdala may affect racial responses is suggested by studies that show its involvement in nonconsciously signalling the presence of stimuli that have acquired an emotional significance on the basis of previous experience (Whalen, 1998; Whalen *et al.*, 1998, *cit. in* Phelps *et al.*, 2000).

SECTION II – EXPERIMENTAL WORK

5. Overview of the Present Work

It can be noticed from the literature that has been reviewed that the study of the nature of the cognitive processes that underlie the activation and application of social stereotypes based on facial appearance has been so far left out from most of the research that has been conducted on this field. The literature seems to provide strong evidence favouring the existence of facial stereotypes, in terms of considerable agreement on the judgement of personality characteristics based on facial features. Despite that, it does not seem to be very clear how the processes underlying the activation of those facial stereotypes work. It seems reasonable to believe that the main conclusions drawn from the studies on general stereotypes from the social cognition field might be extended to the processes of the formation, activation and application of facial stereotypes.

Therefore, the aim of the present research work was mainly to investigate the processes of activation of facial stereotypes. The pertinence of this research work is related to the fact that it brings on together cognitive psychology and experimental psychology perspectives to the study of stereotypes, which have broadly been explored only under the scope of social psychology. This research also contributes to develop the knowledge about face perception, since facial stereotypes have so far been left out the research work undertaken in this area. The body of knowledge and the models of mental functioning provided by cognitive psychology, combined with experimental techniques, were applied to the study of the processes underlying facial stereotypes, constituting a different and innovative approach to this theme.

In the literature on social cognition, it has been argued that, under certain processing conditions, stereotypes might be automatically activated in the presence of the triggering stimulus (Macrae, Bodenhausen, Milne, Thorn & Castelli, 1997; Gilbert & Hixon, 1991; Blair & Banagi, 1986). If that is the case, and if the same processes apply to facial stereotypes, than the presence of a facial stimulus under certain processing conditions should elicit the activation of the corresponding facial stereotype, if the faces that are presented are consistently rated as high or low in the relevant characteristic.

The traits that were initially selected for the purpose of rating the facial stimuli were attractiveness, intelligence, kindness, trustworthiness, distinctiveness and age. These traits were supposed to cover some of the more important characteristics that are commonly extracted and inferred on the basis of facial appearance, and that can influence the perception of other characteristics. That seems to be the case of attractiveness, which has been demonstrated to influence the perception of many other personality traits (Zebrowitz, 1998).

Supporting the idea that facial appearance has a significant effect on the way people are perceived, Hassin & Trope (2000) have provided evidence that demonstrates that personality information conveyed in faces changes the interpretation of verbal information. When participants were shown ambiguous verbal information about a target, physiognomic information about that same target proved to significantly affect the interpretation of verbal information. Moreover, they found that high levels of confidence consistently accompanied judgements that relied on physiognomy. In another experiment, the authors demonstrated that, when making a decision about candidates' careers in a context of personnel selection, participants were unable to ignore physiognomic information, even when asked to do so, and that information influenced their decisions. In view of this evidence, the authors claim that the use of physiognomic information has one important characteristic of an automatic process (as defined by Bargh, 1994). Specifically, it seems that perceivers can not ignore physiognomic information, even when they are explicitly asked to do so and actually think that they have done so.

The present experiments were generally designed in order to investigate the potential interference of the activation of social stereotypes, either in learning labels attached to male and female adult faces or in the reaction times and response accuracy in an Irrelevant Feature Paradigm, based on Simon Paradigm (De Houwer, Hermans & Eelen, 1998; De Houwer & Eelen, 1998).

The first experiment was based on a learning paradigm, and participants had to learn verbal labels that were either congruent or incongruent with the appearance of the faces that they were attached to. The traits that were included in this study were attractiveness, intelligence and trustworthiness (the reasons for this choice will be discussed further on). After the learning phase, participants were tested on their reaction times to recall the labels that had been previously learnt and on their response accuracy. In the learning-phase, participants had to learn the labels attached to 10 different facial stimuli, which were presented only once, for a short time each and following each other fairly quickly. These processing conditions were believed to be quite demanding and to impose some constraints on the available cognitive resources. Based on previous findings (Macrae *et al.*, 1993), preferential recall for stereotype congruent information was expected to occur under high processing load conditions. Moreover, as there was no explicit mention to the manipulated characteristics of the faces (the facial stereotypes), it could be argued that its detection occurred without the participant's intention. Therefore, superior recall of congruent information and faster reaction times on the congruent trials would mean that there had been an automatic activation of the facial stereotypes until some extent.

The learning experiment was meant to maximise the chances that the characteristics of the faces that are related to the manipulated dimension (attractiveness, intelligence or trustworthiness) would be picked up and could not be ignored when learning the labels associated with the faces. The processing conditions were supposed to activate the facial stereotypes that then could not be switched off in order to learn arbitrary information. Therefore, they would interfere with the representation of information in memory, in such a way that the representation of stereotype-consistent information would be more effortless and efficient than the representation of stereotype-inconsistent information. Consequently, the recalling times for both types of information would also be affected, resulting in slower reaction times in the incongruent trials in comparison with the congruent trials.

The second and third experiments were designed on the basis of an Irrelevant Feature Paradigm (De Houwer, Hermans & Eelen, 1998; De Houwer & Eelen, 1998). In this kind of paradigm, it is expected that a feature of the stimulus that is irrelevant to the task that has to be performed will affect the reaction times and accuracy on that task. The irrelevant feature is not explicitly mentioned across the experiment, and if the results prove that it had a significant effect, it can be assumed that it must have been processed in some way, without the participant's intention. In these experiments, participants had to make a gender decision after the presentation of either a male or female adult facial photograph, by saying a certain word if it was a female face or the opposite meaning word if it was a male face. These words were related to one of the traits that were included in the studies (attractiveness, intelligence or trustworthiness), but were presented as being absolutely arbitrary verbal labels. A gender decision task does not require that the facial characteristics associated with the stereotype would be processed in order to effectively give an answer. Thus, the main objective was to investigate whether the activation of the facial stereotypes would interfere with the performance on a task of this nature. It might happen that the gender of a facial stimulus could be determined before information about the facial stereotype is processed automatically.

In experiment 2, all the three traits were manipulated independently, and in experiment 3 only attractiveness and intelligence were included, and were manipulated orthogonally (high attractiveness and high intelligence faces, high attractiveness and low intelligence faces, etc.). The specific objective of the third experiment was therefore to investigate whether the level of attractiveness of the faces would influence the perception of other traits (in this case, intelligence), as it has been suggested by a number of studies (Dion, Berscheid & Walster, 1972; Bull & Rumsey, 1988; Zebrowitz, 1998).

These experiments will be thoroughly discussed in the next sections, where the methodology and experimental results will be presented. In conclusion, a final discussion will integrate the relevant reviewed literature on the subject and the present results.

6. *Collection of the Face Database*

6.1 Introduction

The objective of this initial phase of the work was to gather a database of photographs of adult faces, which covered a range of ages, poses and expressions. It was not intended to investigate racial stereotypes, so only caucasian faces were used.

All the faces were of non-famous people, so that no influence of previous knowledge about the person would occur. Only with unknown faces it was possible to study the processes associated with the possible activation of social stereotypes based only on facial appearance.

A database of 600 photographs was collected (300 male faces and 300 female faces). These faces were rated on the characteristics of interest by 6 independent raters. For the next experiments, it would then be possible to choose sets of male and female faces which had been consistently rated as high or low on each of the considered features.

As the participants in the following experiments would be university students, people from the same population were asked to be the raters. If the ratings were consistent across these 6 raters, it could then be assumed that the ratings were reliable and that they could probably be generalised to other members of the same population.

6.2 Method

6.2.1 *Participants*

Six postgraduate psychology students at the University of York (3 men and 3 women) participated in this initial phase of a study on "Facial Stereotypes" for monetary compensation.

6.2.2 *Materials*

Six hundred coloured photographs of caucasian male and female adults were selected from Internet sources and databases. Only photographs of non-famous people were selected. All the pictures were cropped around the face and hair, so that as little as possible of the clothing and background would be visible. The photographs were all adjusted to be approximately the same height (150 pixels; approximately 5cm on screen display). Photos were chosen which involved as wide a range of adult ages, poses and expressions as possible.

6.2.3 *Procedure*

Six people were asked to rate the six hundred photographs on six 1 to 7 scales, with 1 meaning a very low rating on the referred characteristic and 7 meaning a very high degree of that characteristic. The six scales were: attractiveness, intelligence, kindness, trustworthiness, distinctiveness and age. A qualification was made for the Age scale, where 1 meant "Young Adult" and 7 meant "Old Adult". The participants were also asked if the person was a male or a female, and if they could recognise the person displayed in the photograph. If they could, they were asked to give the name of the person. This information was used to screen out minor celebrities and lookalikes.

The photographs were displayed on an Apple Macintosh computer screen, on a white background, using the Experimenter Generator Package SuperLab Pro 1.74. Before each part of the rating task started, the participant saw the written instructions for the respective scale, which were displayed on the screen (Appendix I). In each trial, one photograph and the respective scale appeared in the centre of the screen and were displayed until the person had given an answer to the relevant characteristic (i.e., rated the face displayed in the photograph according to the mentioned scale). The scale always appeared underneath each photograph and the extreme poles of the scale were always mentioned (e.g.: 1 – very unattractive; 7 – very attractive). The participants were asked to type on the keyboard the number related to their rating of the face, being informed that they could have as much time as they needed to make a decision about each face. When one of the 1 to 7 keys was pressed both the picture and scale were erased from the screen and there followed an interval of 750 ms before the next picture and scale appeared.

For each different scale there was a practice block of 20 photographs, so that the participants could become familiar with the task, scale and answering keys. After this block they would see 3 blocks of 200 photographs each, and could take a short break between each block.

To avoid any possible contamination of the ratings from one characteristic to another, each person rated the six hundred photographs on a single scale each day, and returned on the next day to rate the same photographs on another scale, and so on. The supplementary questions about the sex and identity of the person, however, were assessed during a single session because it was supposed that they would not have any influence on each other. The faces were presented in a random order that varied across participants and different presentations.

6.3 Results

In order to be sure that the ratings obtained were consistent and reliable, interrater reliabilities were determined for the independent ratings of the 600 photographs on the 6 characteristics included in the study. Table 6.1 displays the correlation between each individual rater and the mean rating for each stimulus in each of the 6 traits, and below there are the correlation matrixes for each of the scales (Tables 6.2, 6.3, 6.4, 6.5, 6.6 and 6.7). The correlation tables for male and female faces separately can be consulted in Appendix II.

	Mean Attract.	*Mean Intellig.*	*Mean Trust.*	*Mean Kind.*	*Mean Age*	*Mean Distinct.*
Rater 1	0.80 *	0.72 *	0.73 *	0.81 *	0.94 *	0.79 *
Rater 2	0.88 *	0.77 *	0.78 *	0.79 *	0.96 *	0.63 *
Rater 3	0.81 *	0.66 *	0.76 *	0.85 *	0.96 *	0.76 *
Rater 4	0.85 *	0.76 *	0.63 *	0.65 *	0.94 *	0.79 *
Rater 5	0.82 *	0.64 *	0.63 *	0.79 *	0.95 *	0.68 *
Rater 6	0.73 *	0.49 *	0.55 *	0.59 *	0.91 *	0.53 *

* $p<0.001$

Table 6.1: Correlation between each individual rater and the mean rating for each stimulus, in each of the 6 scales (Attract. = attractiveness; Intellig. = intelligence; Trust. = trustworthiness; Kind. = kindness; Distinct. = distinctiveness).

All the correlations between the ratings of each individual rater and the mean rating for each stimulus are significant at a significance level of 0.001. This indicates that there is significant agreement on the ratings of each face and that no rater deviates significantly from the final mean rating for the stimuli.

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.66	1				
Rater 3	0.53	0.64	1			
Rater 4	0.66	0.68	0.61	1		
Rater 5	0.56	0.68	0.57	0.65	1	
Rater 6	0.59	0.59	0.45	0.58	0.55	1

Table 6.2: Interrater correlations for Attractiveness

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.43	1				
Rater 3	0.47	0.37	1			
Rater 4	0.50	0.43	0.39	1		
Rater 5	0.27*	0.37	0.35	0.40	1	
Rater 6	0.25*	0.28*	0.19*	0.37	0.18*	1

Table 6.3: Interrater correlations for Intelligence

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.54	1				
Rater 3	0.42	0.52	1			
Rater 4	0.40	0.36	0.31	1		
Rater 5	0.27*	0.36	0.42	0.25*	1	
Rater 6	0.32	0.35	0.36	0.24*	0.25*	1

Table 6.4: Interrater correlations for Trustworthiness

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.57	1				
Rater 3	0.62	0.58	1			
Rater 4	0.44	0.39	0.49	1		
Rater 5	0.53	0.58	0.61	0.48	1	
Rater 6	0.39	0.37	0.41	0.25*	0.39	1

Table 6.5: Interrater correlations for Kindness

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.87	1				
Rater 3	0.88	0.91	1			
Rater 4	0.86	0.88	0.88	1		
Rater 5	0.86	0.90	0.88	0.86	1	
Rater 6	0.83	0.85	0.86	0.85	0.84	1

Table 6.6: Interrater correlations for Age

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.35	1				
Rater 3	0.59	0.29	1			
Rater 4	0.59	0.38	0.55	1		
Rater 5	0.51	0.22	0.47	0.50	1	
Rater 6	0.28*	0.28*	0.22*	0.32	0.19*	1

Table 6.7: Interrater correlations for Distinctiveness

All the correlations reported in the previous tables are significant at a significance level of 0.001, which indicates significant interrater reliabilities. There are, however, some smaller correlations, with correlation coefficients below 0.30, which are still significant at a high level alpha, probably due to the large number of stimuli. These smaller correlations are marked on the tables with a *, and, as can be observed, there are not many cells with small coefficients. Most of these cells refer to Rater 6, mainly in the Intelligence and Distinctiveness condition. However, the correlation of this rater and the overall mean for each picture was still considerable (Table 6.1), and it did not seem necessary to exclude the data from this rater. So, the stimuli for the next studies were selected based on this set of ratings.

The mean rating and standard deviation were calculated for each individual stimulus, on each of the 6 characteristics (Appendix III). No statistical analysis was carried out for the question about gender and identity. Instead, faces which were identified as belonging to famous people, and faces which were not consistently classified as being male or female, were not used in the following experiments.

The mean ratings of all the faces show that a wide range of stimuli were collected, which were classified across a useful range of the 1 to 7 scale. This was actually very important, as it would be necessary to choose the stimuli for the following studies according to their high and low ratings on the different characteristics.

7. *Experiment 1*

7.1 Introduction

Because of the interest in investigating how social stereotypes are activated when we look at people's faces, the general aim of this experiment was to look at the potential interference of the activation of social stereotypes in learning labels attached to male and female adult faces.

The traits that were included in this study were Attractiveness, Intelligence and Trustworthiness. Attractiveness seems to be one of the most readily extracted and judged characteristics from the faces and some researchers claim that this feature underlies most of the judgements about other characteristics. That is, many of the judgements that are made about other people seem to be directly influenced by the perceived attractiveness of those persons (Bull & Rumsey, 1988). So, it would be very important to include this variable in this kind of study. Moreover, there is a consistent background literature suggesting the great importance of facial attractiveness from a biological and evolutionary perspective, which makes it interesting to investigate its actual importance in social matters.

Intelligence is one of the most commonly mentioned characteristics in social studies and there have been a number of non-conclusive studies attempting to relate perceived intelligence from facial appearance with the actual intelligence of that person. Nevertheless, despite this apparent inaccuracy in judging intelligence from faces, people seem to be very consistent in their judgements, significantly agreeing amongst themselves about which faces "look" intelligent (Cook, 1939; *cit. in* Shepherd, 1989). There are also some studies which tried to investigate which specific features of the face are the basis for the stereotypical judgements about intelligence based on facial appearance. So, it was decided to investigate how automatically would a face based intelligence stereotype be activated.

The third characteristic that was included in this study was Trustworthiness, which was considered to be an important trait in the context of real-life social relationships. It might be considered important even from an evolutionary and survival perspective. In these terms it would be important to develop a trustworthiness stereotype, in order to easily identify which persons would be safe to approach and establish a relation with and which ones would not. Additionally, a recent study by Adolphs *et al.* (1998) has reported that subjects with complete bilateral amygdala damage seem to be substantially impaired in judging trustworthiness from faces. It seemed then interesting and justifiable to include this trait in the study.

The experiment involved a learning paradigm where the participants would have to learn some labels attached to adult faces. It would then be tested how fast and easily they could remember the previously learnt labels. The labels were attached to the faces in such a way that faces which had been rated as stereotypically high and low on the three characteristics included in the study were paired on different trials with information that is consistent or inconsistent with their stereotypical appearance. According to each one of the characteristics, the labels used were Attractive, Unattractive, Intelligent, Unintelligent, Trustworthy and Untrustworthy.

If the activation of the facial stereotype occurs in the presence of the facial stimulus, then, on the basis of previous research, preferential recall for stereotype congruent information would be expected to be found. Deliberately, the participants were told in the instructions that the labels had been randomly attributed to the faces. As there was no explicit mention of the manipulated characteristics of the faces, it can be considered that evidence of an eventual activation of the stereotype (in the form of superior recall of congruent information) would be consistent with the idea that the stereotype had been automatically activated.

This learning paradigm was designed in such way that was expected to raise the probability that, after stereotype activation, stereotypical information could not be ignored. Subjects were required to learn labels associated with facial stimulus, and it was expected that stereotype activation would influence the way information was represented in memory, having an influence on later retrieval. It was expected that the stereotypical traits would be picked up quite automatically, interfering with the representation of stereotype-inconsistent information, and leading to longer reaction times during retrieval.

7.2 Method

7.2.1 *Participants and Overview*

Twenty-four students at the University of York (12 men and 12 women) participated in this experiment on "Facial Stereotypes", for either monetary compensation or fulfilment of course requirements. The purpose of this study was to look at the potential interference of the activation of social stereotypes in learning labels attached to male and female adult faces. The traits included in this experiment were Attractiveness, Intelligence and Trustworthiness. The faces were selected so that, for each of the mentioned characteristics, there was an equal number of male and female faces with high and low levels of the manipulated trait.

The participants were asked to learn the labels attached to male and female adult faces. The faces were presented in blocks of ten, one at each time, and each face appeared only once. The labels attached to the faces were bipolar, and only two different labels would appear in each block. So, the labels related to Attractiveness were "attractive" and "unattractive", the labels related to Intelligence were "intelligent" and "unintelligent" and the labels related to Trustworthiness were "trustworthy" and "untrustworthy".

After having seen each block of 10 faces, the participants were presented the same faces again, but this time without any label, and were asked to press, as fast and as accurately as possible, one of two buttons on a button-box, according to the labels which they had previously learnt.

Attention was then directed to the differences in the reaction times across the different conditions. It was expected to observe slower reaction times when the participants had to learn a label that was not congruent with the face that was shown in comparison with the reaction times in the trials where the label was congruent with the presented face. For example, it was expected to be slower to respond in a trial where the label "unattractive" had been attached to an attractive face than in a trial where the label attractive had been attached to an attractive face. Below are some examples of faces included in the experiment together with the labels that the participants should learn, to illustrate some possible congruent and incongruent trials (Figure 7.1).

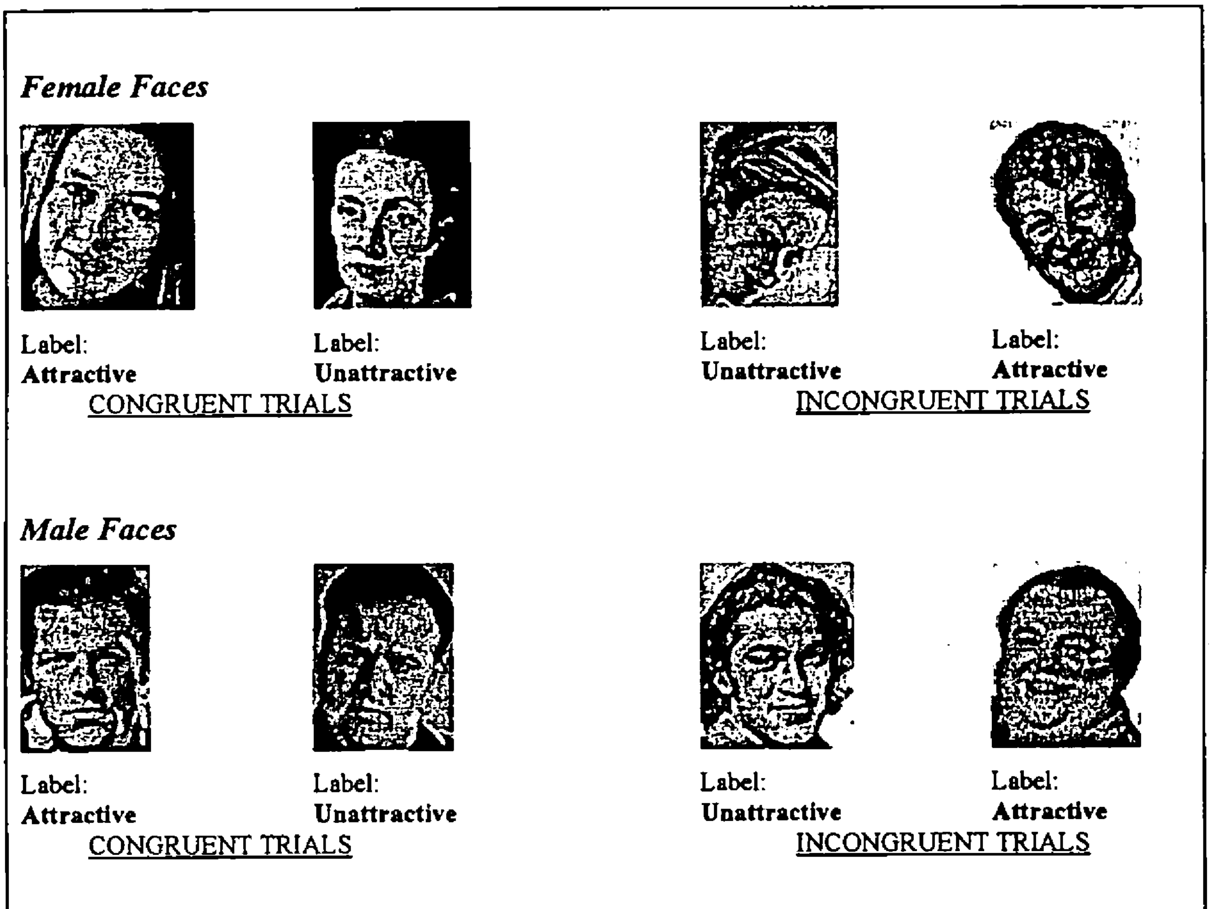


Figure 7.1: Examples of congruent and incongruent trials, based on the labels that should be learnt and on the facial appearance of the facial stimuli. The labels in this example are related to Attractiveness.

7.2.2 *Materials*

Sixty coloured photographs of caucasian male and female adult faces were used in this experiment, which had been selected on the basis of the ratings obtained previously. The stimuli were grouped in 3 sets of 20 faces (each one corresponding respectively to the selections based on attractiveness, intelligence and trustworthiness), and each set contained 10 male and 10 female faces, of which 5 had been rated high and 5 had been rated low on the respective characteristic. The selected faces for each set can be seen in Appendix IV.

As already mentioned, in each experimental condition, the faces were chosen according to their high and low ratings on each of the three characteristics included in this study and matched for the other two. Other characteristics, such as perceived age and distinctiveness, were also matched as far as possible. In this way, each of the high and low level sets for each of the three features would have the same characteristics for all the traits, except for the one that was being manipulated. Tables 7.1, 7.2 and 7.3 present the means and standard deviations for each of the selected sets of faces on the various traits. The raw scores for each individual stimulus can be consulted in Appendix V.

Low Attractiveness							
		Attract.	Distinct.	Kind.	Intel.	Trust.	Age
Female	**Mean**	**2.4**	**4.5**	**4.1**	**3.7**	**4.4**	**4.5**
Faces	SD	0.3	0.8	1.2	1.0	0.8	1.7
Male	**Mean**	**1.9**	**5.1**	**3.4**	**3.9**	**3.7**	**5.0**
Faces	SD	0.3	0.7	1.2	0.7	1.1	0.9
Overall Mean		2.2	4.8	3.7	3.8	4.1	4.7
Overall SD		0.4	0.8	1.2	0.8	0.9	1.3
High Attractiveness							
		Attract.	Distinct.	Kind.	Intel.	Trust.	Age
Female	**Mean**	**6.5**	**4.6**	**4.5**	**4.0**	**4.3**	**2.3**
Faces	SD	0.3	0.3	1.0	0.4	0.8	0.3
Male	**Mean**	**6.1**	**4.6**	**4.3**	**4.1**	**4.1**	**3.2**
Faces	SD	0.3	0.6	0.7	0.3	0.6	0.7
Overall Mean		6.3	4.6	4.4	4.0	4.2	2.7
Overall SD		0.3	0.4	0.8	0.3	0.7	0.7

Table 7.1: Means and SD for the sets of faces selected for Attractiveness (Attract. = Attractiveness; Distinct. = Distinctiveness; Kind. = Kindness; Intel. = Intelligence; Trust. = Trustworthiness; SD = standard deviation).

Low Intelligence							
		Intel.	Trust.	Age	Attract.	Distinct.	Kind.
Female	**Mean**	**2.7**	**3.9**	**2.9**	**4.6**	**3.8**	**3.8**
Faces	SD	0.2	0.5	1.0	1.6	0.9	0.6
Male	**Mean**	**2.7**	**3.9**	**2.9**	**4.1**	**4.0**	**4.0**
Faces	SD	0.3	0.6	1.0	1.5	1.2	0.4
Overall Mean		2.7	3.9	2.9	4.4	3.9	3.9
Overall SD		0.2	0.5	0.9	1.5	1.0	0.5
High Intelligence							
		Intel.	Trust.	Age	Attract.	Distinct.	Kind.
Female	**Mean**	**5.1**	**4.0**	**4.0**	**4.9**	**3.7**	**3.4**
Faces	SD	0.2	1.0	0.5	0.6	0.9	1.0
Male	**Mean**	**5.7**	**4.0**	**3.9**	**3.8**	**3.9**	**3.7**
Faces	SD	0.3	0.7	0.8	0.9	1.1	1.0
Overall Mean		5.4	4.0	4.0	4.3	3.8	3.5
Overall SD		0.4	0.8	0.6	1.0	1.0	0.9

Table 7.2: Means and SD for the sets of faces selected for Intelligence (Intel. = Intelligence; Trust. = Trustworthiness; Attract. = Attractiveness; Distinct. = Distinctiveness; Kind. = Kindness; SD = standard deviation).

Low Trustworthiness		Trust.	Age	Attract.	Distinct.	Kind.	Intel.
Female	**Mean**	2.4	3.0	4.3	4.3	2.4	3.8
Faces	SD	0.4	0.7	0.7	0.9	0.7	0.6
Male	**Mean**	2.5	3.4	4.1	4.5	2.7	4.6
Faces	SD	0.2	0.6	0.8	0.6	0.8	0.6
Overall Mean		2.5	3.2	4.2	4.4	2.6	4.2
Overall SD		0.3	0.6	0.7	0.7	0.7	0.7
High Trustworthiness		**Trust.**	**Age**	**Attract.**	**Distinct.**	**Kind.**	**Intel.**
Female	**Mean**	6.2	6.4	4.1	4.6	6.2	4.6
Faces	SD	0.3	0.6	0.5	0.6	0.3	0.6
Male	**Mean**	5.8	5.6	4.2	3.3	5.8	4.0
Faces	SD	0.3	1.0	0.7	0.5	0.4	0.4
Overall Mean		6.0	6.0	4.2	4.0	6.0	4.3
Overall SD		0.3	0.9	0.6	0.9	0.4	0.6

Table 7.3: Means and SD for the sets of faces selected for Trustworthiness (Trust. = Trustworthiness; Attract. = Attractiveness; Distinct. = Distinctiveness; Kind. = Kindness; Intel. = Intelligence; SD = standard deviation).

All the pictures had been previously cropped around the face and hair, so that as little as possible clothing and background would be visible. The photographs were all the same height (150 pixels; approximately 5cm on screen display).

7.2.3 *Procedure*

The experimental design was based on a Learning Paradigm. The participants were told that they were going to be required to learn some labels that had been randomly attributed to faces of male and female adults. The instructions were first given in written format (Appendix VI - a) and afterwards the experimenter explained again the procedures.

As already mentioned, the characteristics included in this study were Attractiveness, Intelligence and Trustworthiness. The respective bipolar labels were attractive and unattractive, intelligent and unintelligent, trustworthy and untrustworthy.

The faces were presented in blocks of 10 faces of the same gender, half of which had been rated high on one of the characteristics and the other half had been rated low on the same characteristic. Three of the faces rated high on the characteristic were presented paired with the label correspondent to the stereotypical appearance of the faces (congruent trials) and the other two were presented with a label that was contradictory with the stereotypical appearance of the face (incongruent trials). The same procedure was used for the faces rated low on that characteristic. So in each block of 10 faces there were 6 congruent trials and 4 incongruent trials. This attribution of labels was counterbalanced across the two genders and across the six blocks of 10 faces, so that in the end every participant responded to the same number of congruent and incongruent trials.

Resulting from this distribution of labels, there were six different main trial types:

- Congruent trials for Attractiveness
- Incongruent trials for Attractiveness
- Congruent trials for Intelligence
- Incongruent trials for Intelligence
- Congruent trials for Trustworthiness
- Incongruent trials for Trustworthiness

For half of the participants the face and label pairings were reversed, such that the faces initially paired with one label were in the second version paired with the opposite label. The objective of this procedure was to counterbalance the effect that individual characteristics of the faces could possibly have on the ability of participants to remember the label associated with them.

Participants were seated in front of an Apple Macintosh computer screen and the photographs of the faces were displayed using the Experimenter Generator Package SuperLab Pro 1.74. Each part of the experiment was divided into a learning phase and a test phase. In each learning phase, the participants would see 10 different faces of the same gender with one of two bipolar labels attached; these faces were presented one at a time. There was a total of six different blocks of 10 faces, and consequently six different learning and test phases.

In the test phase the participants were asked to press one of two labelled keys on a button-box, as quickly and as accurately as possible, according to the labels that they had previously learnt. In each test phase, the participant responded to a total of 40 trials, as each face was presented four times (that is, each block of 10 faces was repeated four times. The faces were presented in random order, both in the learning and test phases.

The order of presentation of the blocks referent to each characteristic was counterbalanced across participants (some participants were first shown the 2 blocks referent to attractiveness, then intelligence and finally trustworthiness, while for other participants this order was reversed, so that all the possible combinations were distributed across all participants). The faces were presented in blocks of 10 faces of the same gender to increase the difficulty of recalling the labels. However, for each characteristic, the block of male faces and the block of female faces were always presented in sequence, although the order in which they appeared was counterbalanced across participants.

After the instructions had been explained, the experiment started with a black screen displaying the word "READY" in white letters, in the centre of the screen, for 3000 ms. This was followed by an interval of 750 ms and then the presentation of the faces begun. The faces were shown in the centre of the screen, and the labels (in the learning phase) appeared right below the faces. During the learning phase each face and the attached label remained on the screen for 5000 ms and no input was accepted from the computer keyboard. Between the appearance of each face there was a 750 ms interval.

After the presentation of each set of 10 faces and labels pairings, a cross would appear in the centre of the screen for 3000 ms and a block of instructions (Appendix VI – b) would come up explaining once more the procedure for the test phase. The test phase started straight away, beginning with the word "Ready" again, followed by an interval of 750 ms and then a face. The face would remain on the screen until the participant had given a response by pressing one key or until a time limit of 5000 ms.

Written feedback was given on the screen after each trial, informing the participants if they were correct or incorrect in their responses. The feedback word remained for 1000 ms, followed again by an interval of 750 ms before the next face appeared. Both the answers and the reaction times were registered by the computer software.

Given this procedure, all the participants performed a total of 240 trials, being 80 trials for each one of the characteristics. When analysing the data, the errors made by the participants were excluded from the data set, and were analysed apart from the correct responses data. The main interest of this experiment was in the differences in reaction times across the congruent and incongruent conditions.

7.2.4 *Pilot-studies*

It is worth mentioning that this experiment resulted from two prior pilot-studies that enabled some adjustments of procedure, mainly related to the way that the stimuli were grouped and presented. In the first pilot-study, the facial stimuli were presented in the learning phase in groups of 4 faces, being two males and two females, and each face was presented twice. The rest of the procedure was basically the same.

In the second pilot-study, the stimuli was again presented in blocks of 4 faces, shown twice, but this time all the faces in each block belonged to the same gender. The procedures were again very similar.

The results of these pilot-studies did not show consistent effects for any of the characteristics. It was considered that both these pilot-studies might involve too easy tasks, that enabled the participants to extract rules to help them learn the labels, which did not demand any processing of the facial characteristics themselves. For example, they could memorise only two of the faces, or they could rely on other characteristics, such as photograph background colour, hair colour or hair style, etc. The more difficult procedure used for the main experiment was therefore adopted.

7.3 Results

The major interest of this experiment was to look at the differences in reaction times between the congruent and incongruent trials (that is, the time the participants take to respond in a trial where, for example, an attractive face was paired with the label "attractive" in comparison with a trial where an attractive face was paired with the label "unattractive") across the three traits included in the study.

Each participant completed a total of 80 test trials for each one of the three characteristics (which sums up 240 test trials in total). Trials on which the participants incorrectly recalled the labels associated with the faces were eliminated from the data set and analysed separately. The means, standard deviations and percentage of errors made by the participants in the main experimental conditions are shown in Table 7.4. The absolute number of errors made by each participant in each condition can be consulted in Appendix VII.

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS	
	CONG	INCONG	CONG	INCONG	CONG	INCONG
Mean	4.29	5.50	4.38	5.46	5.17	5.67
SD	(3.47)	(4.62)	(2.86)	(3.74)	(3.41)	(3.97)
%	[10.73%]	[13.75%]	[10.95%]	[13.65%]	[12.93%]	[14.18%]

Table 7.4: Means, standard deviations and percentage of errors in congruent and incongruent trials for attractiveness, intelligence and trustworthiness (CONG = congruent; INCONG = incongruent; SD = standard deviation).

A 3x2 (Trait X Congruency) analysis of variance (ANOVA) of the error rates, with repeated measures on both factors, revealed no significant main effects or interactions, indicating that the differences between error rates in the congruent and incongruent conditions were not significant.

It was predicted that the accuracy of participants' responses might be greater in the congruent trials than in the incongruent trials. If the incongruent labels were more difficult to recall than the congruent labels, than it was also expected that this would influence the accuracy of response. In fact, the data show a tendency towards higher error rates in the incongruent trials, but this tendency did not prove to be statistically significant in the data analysis. The main function of the error analysis is therefore to confirm that subjects did not trade accuracy for speed, and we now turn to consider the reaction times.

As already stated, the main purpose of this experiment was to examine the difference in reaction times between congruent and incongruent trials. So, a 3x2 (Trait X Congruency) analysis of variance (ANOVA) of the reaction times, with repeated measures on both factors, was carried out. This analysis revealed a significant main effect for congruency [$F(1,23)=7.72, p<0.02$], indicating that the overall reaction times for the incongruent trials ($M=920$ms, $SD=235$) were significantly slower than for the congruent trials ($M=883$ms, $SD=202$). Both the main effect for trait and the interaction between factors were not significant [$F(2,46)=0.15$, $p=0.86$ and $F(2,46)=0.25$, $p=0.78$, respectively for the main effect and the interaction].

As can be observed from Figure 7.2, participants took significantly longer to respond in the incongruent trials, in comparison to the congruent trials, across all the three different characteristics included in the study.

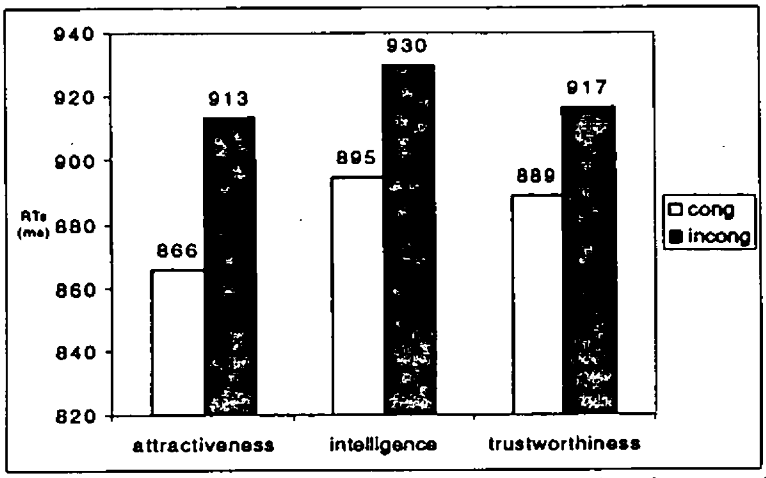


Figure 7.2: Mean reaction times in congruent and incongruent trials for attractiveness, intelligence and trustworthiness (cong = congruent trials; incong = incongruent trials; RTs = reaction times).

This observation supports previous findings in the stereotypes literature, which indicate that information incongruent with a stereotype is more difficult to recall. Considering the observed slower reaction times in the incongruent trials, the results suggest that there was an activation of the facial stereotype, in each one of the three traits, which interfered with the recall of the corresponding label, when this was incongruent with the facial appearance. So, it can be assumed that the process of recalling of the incongruent labels suffered some interference, and therefore it took more time to the participants to produce a response to those stimulus faces that had been paired with labels incongruent with their facial stereotype.

7.3.1 *Subsidiary Analysis*

Although the main effect of congruency was demonstrated in the previous analysis, revealing overall slower reaction times in the incongruent trials when compared to the congruent trials, there were still some other factors that could have had an influence on the results. So, a subsidiary analysis was carried out, considering three more factors: level of each characteristic, face gender and subject gender.

Table 7.5 displays the mean reaction times and standard deviations for all the experimental conditions, considering all the five factors included in the next analysis, as well as the overall means and SD with data collapsed across male and female subjects. The main table with the individual means for each participant can be examined in Appendix VIII.

		HIGH				LOW			
		Male Faces		Female Faces		Male Faces		Female Faces	
		Cong	Inc	Cong	Inc	Cong	Inc	Cong	Inc
	M sub	762	939	773	841	875	831	785	767
	(SD)	198	446	228	167	271	250	235	167
ATTRACTIVENESS	F sub	911	1076	888	922	939	960	994	973
	(SD)	202	448	218	236	287	323	341	404
	Overall	836	1008	830	881	907	895	889	870
	(SD)	210	442	226	204	275	290	306	320
	M sub	838	959	769	854	1022	872	797	833
	(SD)	301	416	211	245	436	320	224	311
INTELLIGENCE	F sub	879	920	895	1046	990	985	967	969
	(SD)	252	251	207	402	390	285	265	375
	Overall	858	939	832	950	1006	929	882	901
	(SD)	272	336	214	340	405	302	255	344
	M sub	796	829	842	831	831	852	713	806
	(SD)	220	217	289	281	285	281	140	296
TRUSTWORTHINESS	F sub	957	953	1031	1046	988	933	955	1083
	(SD)	296	253	359	361	204	145	304	415
	Overall	877	891	936	938	909	892	834	944
	(SD)	268	239	333	335	255	222	262	380

Table 7.5: Mean reaction times and standard deviations for the congruent and incongruent trials, across all the different experimental conditions (M sub = male subjects; F sub = female subjects; HIGH = high level faces; LOW = low level faces; Cong = congruent trials; Inc = incongruent trials; SD = standard deviation).

A 5-way ANOVA of the reaction times was carried out with four within-subjects factors, trait (attractiveness, intelligence and trustworthiness), level of the characteristic (high level faces and low level faces), face gender and congruency (congruent trials and incongruent trials), and one between-subjects factor, which was subject gender. The ANOVA summary table can be observed in Appendix IX.

The analysis revealed a significant main effect of Congruency [$F(1,22)=7.43$, $p<0.02$], supporting the previous finding. No other main effects were found.

A significant 2-way interaction between level and congruency also emerged [$F(1,22)=8.13$, $p<0.01$]. Simple main effects analysis revealed a significant main effect of congruency in the high level faces of the characteristics [$F(1,23)=13.31$, $p<0.001$], with slower reaction times in the incongruent trials, but not in the low level faces [$F(1,23)=0.00$, $p=0.966$].

Three other 3-way interactions were also found. There was an interaction between trait, level and congruency [$F(2,44)=4.06$, $p<0.05$]; there was another interaction between trait, face gender and congruency [$F(2,44)=2.70$, $p<0.08$]; and the last interaction was between level, face gender and congruency [$F(1,22)=4.92$, $p<0.05$].

Figures 7.3, 7.4 and 7.5 illustrate the interaction between trait, level of the characteristic and congruency in a clear way. As can be observed, separated simple main effects analysis for attractiveness, intelligence and trustworthiness show that, both in the attractiveness and in the intelligence conditions, participants were significantly slower in responding to the incongruent trials than to the congruent trials only within the high level faces. However, in the trustworthiness condition, this effect is only significant for the low level faces.

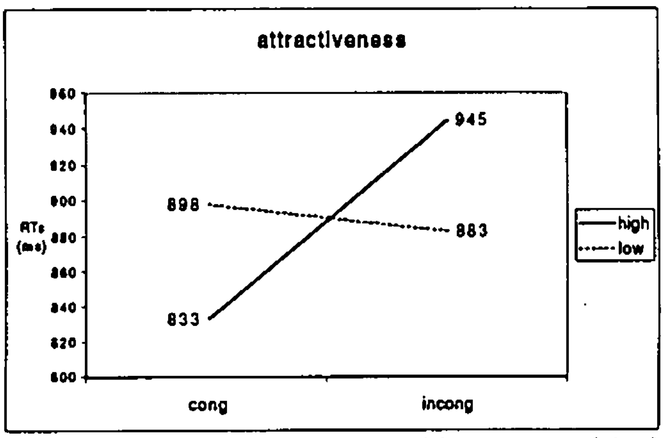


Figure 7.3: Mean reaction times in the congruent and incongruent trials, for the high and low level faces in the attractiveness condition (high = high level faces; low = low level faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

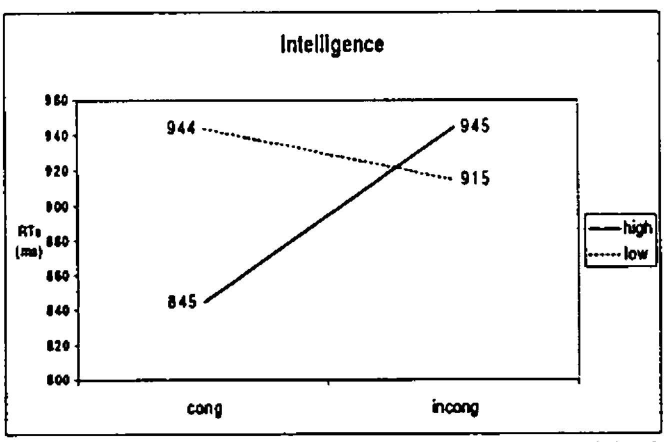


Figure 7.4: Mean reaction times in the congruent and incongruent trials, for the high and low level faces in the intelligence condition (high = high level faces; low = low level faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

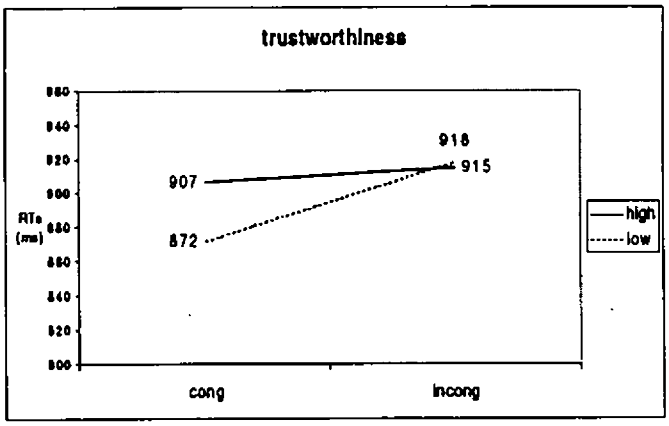


Figure 7.5: Mean reaction times in the congruent and incongruent trials, for the high and low level faces in the trustworthiness condition (high = high level faces; low = low level faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

To investigate the 3-way interaction between trait, face gender and congruency, a simple main effects analysis was carried out. This showed a significant difference between the reaction times in the congruent trials and the incongruent trials only for the male faces in the attractiveness condition, with slower reaction times in the incongruent trials. This same effect of congruency was significant only for the female faces both in the intelligence condition and in the trustworthiness condition. This interaction can be better visualised observing the graphs in Figures 7.6, 7.7 and 7.8.

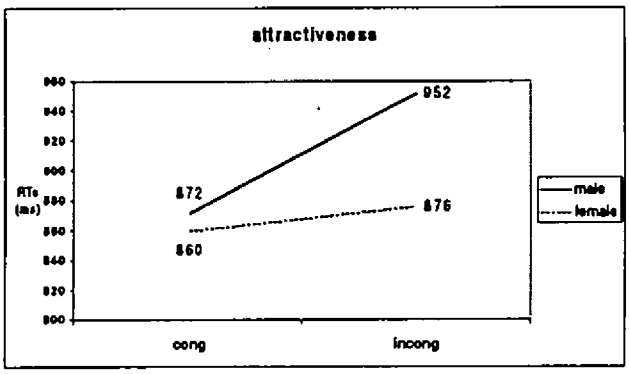


Figure 7.6: Mean reaction times in the congruent and incongruent trials, for the male and female faces in the attractiveness condition (cong = congruent trials; incong = incongruent trials).

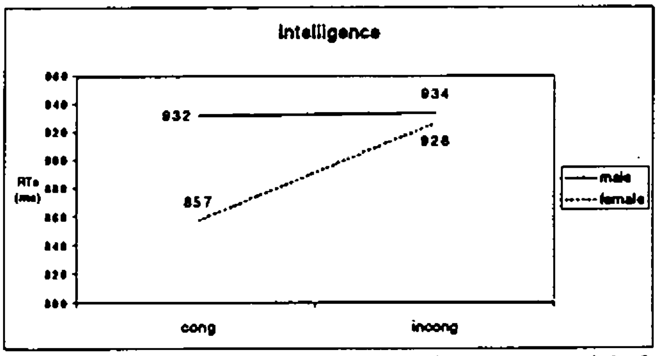


Figure 7.7: Mean reaction times in the congruent and incongruent trials for the male and female faces in the intelligence condition (cong = congruent trials; incong = incongruent trials).

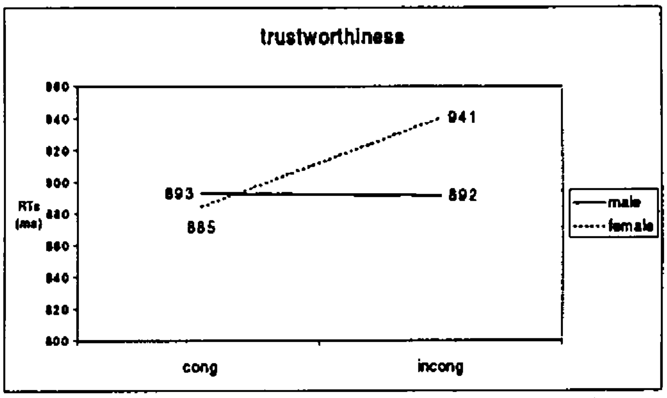


Figure 7.8: Mean reaction times in the congruent and incongruent trials for the male and female faces in the trustworthiness condition (cong = congruent trials; incong = incongruent trials).

Finally, the three-way interaction between level, face gender and congruency was also analysed by simple main effects analysis independently for male and female faces. As can be observed from Figure 7.9, what can be concluded is that the congruency effects for the female faces occurred both for the high and low level faces, with slower reaction times in the incongruent trials. However, for the male faces, there were significantly slower reaction times in the incongruent trials within the high level faces, but for the low level faces participants have been faster in responding to the incongruent trials then to the congruent trials. This suggest that the effect of level of the characteristic, with results evidencing slower reaction times in the incongruent trials only for the high level faces, is carried out mainly by the male faces.

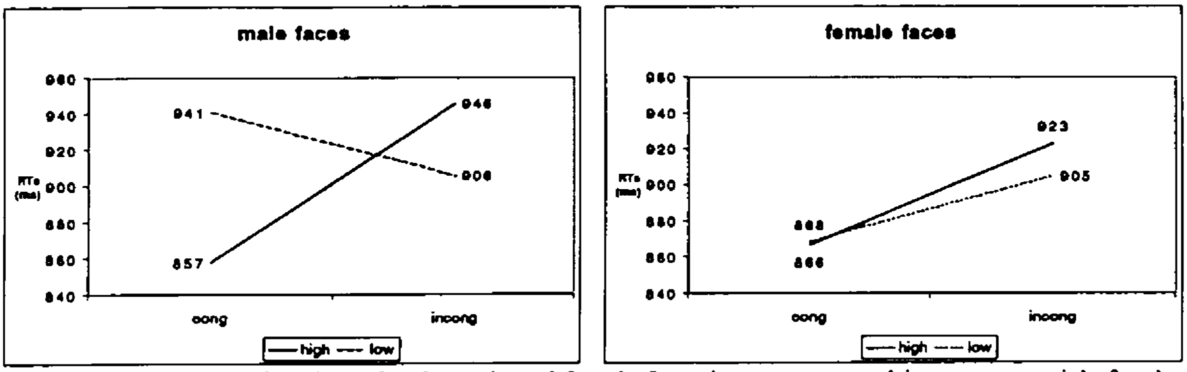


Figure 7.9: Mean reaction times for the male and female faces in congruent and incongruent trials for the high and low level faces, with data collapsed across trait (high = high level faces; low = low level faces; cong = congruent trials; incong = incongruent trials, RTs = reaction times).

7.4 Discussion

The main aim of this experiment was to investigate the potential interference of the activation of social stereotypes in learning labels attached to male and female adult faces. On the basis of previous research on stereotypes (Macrae *et al.*, 1993), preferential recall for stereotype congruent information was expected to occur under high processing load conditions. So, faster reaction times on the congruent in comparison to the incongruent trials were predicted, as well as higher response accuracy in the congruent trials.

The results partially confirmed the experimental hypothesis. For response accuracy, the differences between error rates in the congruent and incongruent conditions were not significant. This result indicates that there was no influence of stereotype congruency in the actual ability to recall congruent or incongruent labels and subjects did not show any evidence of trading accuracy for speed.

For reaction times, the results seem to support the experimental predictions. There was a main effect of congruency across experimental conditions, indicating that the overall reaction times were significantly slower in the incongruent trials (when the verbal label to be learned was incongruent with the facial stereotype evoked by the person displayed in the photograph) than in the congruent trials (when both the verbal label and the facial stereotype were congruent). This effect was present for all the three traits included in the experiment (attractiveness, intelligence and trustworthiness). Apparently, it was easier to recall information that is congruent with previously held facial stereotypes than information that is incongruent with those stereotypes. This may be taken to suggest that there was an activation of the stereotype, which affected the process of recalling the previously learned verbal label.

During the experiment there was no explicit mention of the facial appearance of the people displayed in the photographs and participants were deliberately told that the verbal labels had been randomly attributed to the faces. Therefore, it can be argued that the superior recall of stereotype congruent information suggests that the stereotypes were automatically activated in the presence of the facial triggering stimuli.

Moreover, stereotype activation probably interfered with the extraction of facial features in order to associate the faces with the verbal information, in such a way that stereotype-congruent features were picked up more easily, and the representation in memory of this kind of information was facilitated (Macrae, Stangor & Milne, 1994). Consequently, the retrieval of stereotype-consistent information was also facilitated, leading to faster reaction times in the congruent trials, in comparison to the incongruent trials.

The interaction between level of the characteristic and congruency suggests that participants were generally slower in the incongruent trials than in the congruent trials for the high level faces of the characteristics, but the same effect was not present for the low level faces. However, the three-way interaction between trait, level and congruency shows that this effect was in this direction only for attractiveness and intelligence. For trustworthiness, the effect was in the opposite direction, with slower reaction times in the incongruent trials only for the low trustworthiness faces, and not for the very trustworthy faces.

So, the results seem to indicate that there was an activation of facial stereotypes for the high attractiveness and high intelligence faces, but for trustworthiness, only the very untrustworthy faces activated the facial stereotype. Although these results were not expected *a priori*, the different social importance of the three traits may help to understand the observed effects. Attractiveness can be considered a very important characteristic in social terms, and highly attractive people seem to be positively regarded in a number of other aspects, as it is manifested by the *attractiveness halo effect* (Zebrowitz, 1998). Consequently, it makes sense that people are mostly tuned to be influenced by high attractive faces. This would contribute to the observed activation of the attractiveness facial stereotype only for the high attractive faces, but not for unattractive faces. It is a stereotype that could be considered to be socially more important and valued in its positive pole (attractive faces) than in its negative pole (unattractive faces).

The same reasoning can be made in relation to intelligence, as in the professionally and socially demanding world that we live in nowadays, intelligence might also be one of the most valued personal characteristics. So, high intelligence faces could be stronger triggering stimuli than low intelligence faces, in terms of the social value of their detection, contributing to an easier activation of the intelligence facial stereotype.

For trustworthiness, this is probably not the case. From an evolutionary perspective, it can be considered highly adaptive to readily detect an untrustworthy individual, in order to avoid threatening and dangerous situations. So, it would be more advantageous to detect more readily untrustworthy faces, which could cause an easier activation of the trustworthiness facial stereotype when triggered by the untrustworthy faces. In line with this idea of a special tuning for the detection of potentially threatening stimuli, it has been demonstrated that the detection of threatening (angry) schematic faces is faster than the detection of nonthreatening (happy) faces, independently of the background (Öhman, A., Flykt, A. & Lundqvist, D., 1999). Furthermore, Adolphs *et al.* (1998) have reported a study with patients with bilateral amygdala damage who showed significantly impaired ability to extract from faces the information that is relevant to make social judgements about trustworthiness and approachability. These patients judged unfamiliar faces as being significantly more trustworthy and more approachable than did control-subjects, especially for the faces that were judged more negatively by controls. There is some evidence suggesting that the human amygdala might be implicated in the retrieval of socially and emotionally relevant information from facial stimuli, and this is consistent with the hypothesis of a natural advantage to the detection of threatening faces.

The three-way interaction between trait, face gender and congruency suggests that the difference between the reaction times in congruent and incongruent trials was only significant for the male faces in the attractiveness condition, whereas in the intelligence and trustworthiness conditions, it was significant only for the female faces. Participants were slower in the incongruent trials in comparison to the congruent trials for the male faces when attractiveness was manipulated. However, when either intelligence or trustworthiness was manipulated, significantly slower reaction times in the incongruent trials were apparent only for the female faces. These results indicate that there was an activation of the facial stereotypes only for the male faces in the attractiveness condition and only for the female faces in the intelligence and trustworthiness conditions.

These results seem somehow counterintuitive, as it is usually thought that attractiveness is a characteristic mostly valued in women. In what concerns trustworthiness, it would be thought that it would a characteristic more salient in men, as potentially related traits such as dominance and aggressiveness, are usually thought to be more characteristic of men. These were no specific predictions regarding these results and there does not seem to be any immediately obvious plausible theoretical explanation capable of accounting for these observations. Consequently, it is obviously not possible to discard the eventuality that these results are due to inherent characteristics of the specific set of stimuli that were used in this experiment.

Finally, another three-way interaction between level, face gender and congruency was also identified. This interaction shows that the previously reported two-way interaction between level of the characteristic and congruency was mainly carried out by the male faces. For the female faces, slower reaction times in the incongruent trials than in the congruent trials occurred both for the high level faces and low level faces, whereas for the male faces this effect was only present for the high level faces. For the low level male faces, participants have been, in fact, significantly faster in the incongruent trials than in the congruent trials. These results were also not predicted and again there does not seem to be any immediately obvious plausible explanation for those findings. The results that correspond to the female facial stimuli support the experimental predictions of slower reaction times in the incongruent trials. So, the possibility that the observed effects might be due to this specific set of male faces must be considered.

8. *Experiment 2*

8.1 Introduction

The previous experiment has provided evidence for an effect of the activation of facial stereotypes on the participants' reaction times in a learning paradigm. Specifically, participants took longer to recall a previously learnt label when it had been paired with a face whose appearance was incongruent with the meaning of the label than when both the label and facial appearance were congruent.

According to the literature on stereotypes, this suggests that there was an activation of the social stereotypes based on the appearance of the faces. It has been demonstrated that, under certain demanding processing conditions, information that is incongruent with previously held social stereotypes is more difficult to recall (Macrae *et al.*, 1993; Stangor & McMillan, 1992; Stangor & Duan, 1991).

The demonstration of this same effect with social stereotypes based on facial appearance confirms the existence of facial stereotypes, which seem to produce the same effects as other types of stereotypes. Having demonstrated a congruency effect on a learning paradigm, we wanted to further investigate how automatically could these stereotypes be activated.

So, experiment 2 was designed, using an *Irrelevant Feature Paradigm*, based on Simon Paradigm (De Houwer, Hermans & Eelen, 1998; De Houwer & Eelen, 1998). This is a type of interference paradigm, with some similarities with Stroop's paradigm, which involves a *relevant feature* that determines what the correct response should be, an *irrelevant feature* that has to be ignored, and a *response* that is meaningfully related to the irrelevant feature but not to the relevant feature.

Previous studies have demonstrated that, under certain conditions, the irrelevant feature can influence the response times and accuracy. So, it is assumed that, if the irrelevant feature has an effect, it must have been processed in some way. In the second experiment, there is no explicit reference to this irrelevant feature. So, if it proves to have an influence on the task results, it can be argued that this feature was processed automatically to some extent.

Making use of this kind of paradigm, the interest of this study was to investigate to what extent would there be an influence of the activation of facial stereotypes on the participants' reaction times and response accuracy. This would permit to draw some possible conclusions about the automaticity of the process of activation of social stereotypes based on facial appearance.

8.2 Method

8.2.1 *Participants and Overview*

Sixteen students at the University of York (8 men and 8 women) participated in this second study, for monetary compensation or fulfilment of course requirements.

The purpose of this study was to look at the potential effect of the activation of facial stereotypes on the participants' reaction times and accuracy in a task of labelling male and female faces. Once more, the traits included in this study were Attractiveness, Intelligence and Trustworthiness, and the faces were selected according to their high and low level on each of those characteristics.

In the first block of stimuli, participants were asked to label the female faces with one trait and the male faces with the opposite trait, in the second block participants were asked to do the opposite, and in the subsequent blocks the instructions were repeated alternatively. Participants were asked to say verbally the labels correspondent to the male and female faces, as soon as possible after the faces appeared on a computer screen, and their reaction times were recorded by the computer software via a voice key device.

So, for example, in the Attractiveness Condition, participants were instructed to say "Attractive" to all the female faces and "Unattractive" to all the male faces in the first block, then in the second block were instructed to say "Unattractive" to the female faces and "Attractive" to the male faces, and so on in the subsequent blocks, swapping instructions across blocks. The procedure was essentially the same for the other two conditions, saying "Intelligent" to female faces and "Unintelligent" to male faces, or *vice-versa*, and "Trustworthy" to female faces and "Untrustworthy" to male faces, or *vice-versa*.

With respect to what was said before about the "Irrelevant Feature Paradigms", face gender can be defined here as the Relevant Feature, as it is the characteristic of the faces that has to be processed in order to give the right answer. The facial stereotype is the Irrelevant Feature, as it is a characteristic of the face that is not mentioned in the task and its processing is useless in terms of the task demands. Finally, the Response is the word/label that has to be said, which is meaningfully related to the traits/stereotypes that have been manipulated in the study, that is, the irrelevant feature of the faces, which should be ignored.

The differences in the reaction times in the different conditions were closely examined. Although the facial stereotypes were never explicitly mentioned, it was expected that it would take longer to say, for instance, "Attractive" to an unattractive face and "Unattractive" to a highly attractive face (incongruent conditions) than it would take to respond in the trials where the label and the facial appearance were congruent.

8.2.2 *Materials*

The same set of sixty coloured photographs of caucasian male and female adult faces from the previous study was again used in this experiment. As already said, all the photographs had been selected on the basis of the ratings previously obtained. In each condition, the faces had been selected according to their high or low ratings on the considered characteristic (Attractiveness, Intelligence or Trustworthiness), and matched on the other two.

There were 20 faces selected for each one of the characteristics, 10 male and 10 female faces, being 5 of them rated high and the other 5 rated low on the respective trait.

For the practice trials, 6 other faces (3 male and 3 female faces) were randomly selected from the initial database. The same 6 faces were used in the practice trials of the 3 characteristics, so that all the conditions in the experiment would be equivalent in terms of the faces the participants had previously seen as practice trials.

The photographs had been cropped around the face and hair, to show the minimum of the clothing and background as possible. The pictures were all the same height (about 5cm on screen display).

8.2.3 *Procedure*

The experimental design was based on an Irrelevant Feature Paradigm. The participants were told that we were interested in studying the process of labelling stimulus in an arbitrary way. It was made clear that it would have nothing to do neither with classifying the stimuli nor with personal opinions about them.

The general instructions for the experiment were first given at the beginning in written format (Appendix X), and after the participant had read them all, the experimenter explained again the procedures and made sure that the participant did not have any doubts. The instructions regarding which labels the participants should say to the male and female faces were given before each part of the experiment, as the labels changed between each block.

The photos were displayed on an Apple Macintosh computer screen using the Experimenter Generator Package SuperLab Pro 1.74. The stimuli were presented in random order in blocks of 6 faces plus 20 faces (that is, each block had 26 faces, from which the first 6 were always the same faces, and were considered practice trials). For each characteristic, the same block of 26 faces was repeated 4 times, with different instructions regarding the labels to attribute each time.

So, for example, for the Attractiveness condition, in the first presentation of the block, half of the participants were instructed to say "attractive" to all the female faces and "unattractive" to all the male faces. In the second presentation of the block, the instructions were reversed and they would have to say "unattractive" to the female faces and "attractive" to the male faces. The third presentation of the block had again the same instructions as the first presentation, and the fourth had the same instructions of the second. The order in which the labels were given to the faces was counterbalanced across participants, so the other half of participants would start by saying "unattractive" to the female faces and "attractive" to the male faces, and so on. The order of testing of the different characteristics was also varied across participants.

Each participant performed a total of 80 test trials for each characteristic (attractiveness, intelligence and trustworthiness), summing up a total of 20 observations per cell in each of the four main conditions for each trait (that is, male and female faces, with high and low levels of each trait). So, each participant performed a total of 240 test trials.

After the instructions had been explained and the participant had been told which words he/she would have to say to the male and female faces before each block, the experiment started with a black screen and after an interval of 1500 ms a white cross was displayed in the centre of the screen during 500 ms, so that the participants could direct their attention to the stimulus that was coming afterwards. The cross was followed by another interval of 500 ms and then a photograph of a face appeared in the middle of the screen. The face was displayed until the participant had given a response or until a time limit of 5000 ms. After either one of these conditions was met, another interval of 1500 ms would follow and then another white cross, and the same sequence was again repeated.

Participants were asked to give their verbal oral response (according to the instructions previously given) as quickly and accurately as possible. The vocal sound triggered the microphone and the computer software registered the reaction times. The experimenter took notes on the participants' responses. When analysing the data, the errors made by the participants were excluded from the data set, as well as trials where there was a voice key failure.

The congruent and incongruent trials were classified according to the specific instructions given to each participant in each different block. So, for example, if a participant had to say "Attractive" to all the female faces and "Unattractive" to all the male faces in a particular block, the classification would be like this:

- Attractive female face ⇒ Congruent trial

- Unattractive female face ⇒ Incongruent trial
- Attractive male face ⇒ Incongruent trial
- Unattractive male face ⇒ Congruent trial

The classification would follow the same logic in the other characteristics (intelligence and trustworthiness) and in all the possible variations of the instructions (ex: say "Unattractive" to all the female faces and "Attractive" to all the male faces). According to the previous experiment and to the already mentioned literature on stereotypes, slower reaction times in the incongruent trials (trials where the correct response and the facial stereotype did not correspond, that is, were opposite) when compared to the congruent trials (when the correct response and the facial stereotype corresponded) were expected. It was expected that the facial stereotype would be activated in the presence of the stimulus face. Its involuntary processing would interfere with the production of the necessary response in the incongruent trials, and therefore slower reaction times in the incongruent trials were expected.

8.2.4 *Pilot-studies*

This experiment followed two previous pilot-studies that necessitated some adjustments in the experimental design. The main modifications were related to the number of test trials in each condition and to the instructions given about the labels that should be attributed to the faces.

In the first pilot-study there were only 40 test trials for each characteristic, which seemed an insufficient number. The initial 10 observations per cell could be reduced if the participants had made a considerable number of errors in a particular cell. So, it was considered necessary to increase the number of test trials to a total of 80 test trials for each characteristic.

In both pilot-studies, the instructions were not reversed after each block, as in the previous described final version of the experiment. So, the participants would attribute the same label to the male and female faces across the 80 trials for each block. The results did not show consistent differences between the reaction times in the congruent and incongruent trials. So, it was considered that there could have been some sort of previous activation or facilitation of the association between each face and the label that had to be attributed. It was possible that this could occur because each face was presented four times. Some kind of activation could lead the participants to give the required response with just a superficial processing of the facial characteristics, which could possibly hinder the activation of any facial stereotypes. Therefore, in the final version of the experiment, a procedure where the instructions before each block were reversed was adopted.

8.3 Results

The primary interest of this study was on the mean reaction times to respond to the congruent trials (e.g., a highly attractive face labelled as "attractive") as compared with the incongruent trials (e.g., a highly unattractive face labelled as "attractive"), in all the three dimensions (attractiveness, intelligence and trustworthiness).

In total, each participant completed 240 test trials (80 trials for each trait). Trials on which a voice key failure occurred were discarded, as well as trials on which participants incorrectly labelled the target stimulus. A separate analysis was carried out with the error data. The mean error rates made by the participants in each of the experimental conditions, as well as the standard deviations and percentage of errors are shown in Table 8.1. As can be observed, participants made very few errors in general. A Table with the absolute number of errors in each condition for each participant can be consulted in Appendix XI.

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS	
	CONG	INCONG	CONG	INCONG	CONG	INCONG
Mean	0.69	0.94	0.81	0.69	0.88	0.88
SD	(1.30)	(0.85)	(0.83)	(1.08)	(0.72)	(1.02)
%	[1.73%]	[2.35%]	[2.03%]	[1.73%]	[2.20%]	[2.20%]

Table 8.1: Means, standard deviations and percentage of errors in congruent and incongruent trials for attractiveness, intelligence and trustworthiness (cong = congruent trials; incong = incongruent trials; SD = standard deviation).

A t-test analysis with paired samples was carried out to compare the error rates between the congruent and incongruent trials across the three traits. The analysis did not show any significant effect of congruency in either of the traits, indicating that the accuracy of participants' responses was not influenced by the possible activation of the stereotypes, as their error rates were similar both in the congruent and incongruent trials.

Mean reaction times were calculated separately for each subject in each of the experimental conditions. As the difference in reaction times between the congruent and incongruent trials was again the main focus of interest of this experiment, a 2-way repeated measures analysis of variance (ANOVA) with Trait (3 levels) and Congruency (2 levels) as with-in subjects factors was carried out. This analysis revealed no significant effects. Contrary to the previous experiment, a significant main effect of congruency across the three characteristics was not observed [$F(1,15)=3.06$, $p=0.101$]. The main effect of trait was also not significant [$F(2,30)=0.25$, $p=0.777$] and there were also no interaction effects between trait and congruency [$F(2,30)=1.88$, $p=0.170$].

Figure 8.1 displays the mean reaction times in the main experimental conditions of this experiment. As can be observed, apart from the attractiveness condition, the mean reaction times in the congruent and incongruent trials are not noticeably different.

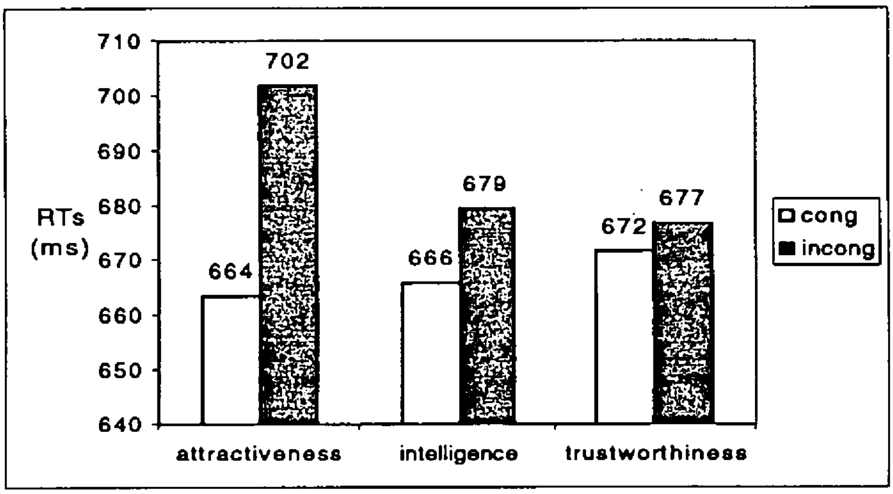


Figure 8.1: Mean reaction times in congruent and incongruent trials for attractiveness, intelligence and trustworthiness (cong = congruent trials; incong = incongruent trials; RTs = reaction times).

Nevertheless, and although not statistically significant, an overall tendency towards slower reaction times in the incongruent trials in comparison to the congruent trials can be observed. This tendency is in the expected direction and is consistent with the findings from the previous experiment. Further analysis was carried out to investigate in more detail possible effects of other factors that could have influenced these results.

8.3.1 *Subsidiary Analysis*

Table 8.2 presents a summary of participants' mean reaction times and standard deviations in all of the experimental conditions of Experiment 2. The main Table with the individual means for each participant can be examined in Appendix XII.

		HIGH				LOW			
		Male Faces		Female Faces		Male Faces		Female Faces	
		Cong	Inc	Cong	Inc	Cong	Inc	Cong	Inc
ATTRACTIVENESS	M sub	660	604	610	626	614	666	652	703
	(SD)	91	55	72	74	89	86	68	96
	F sub	756	689	677	690	700	769	724	788
	(SD)	102	105	82	129	126	56	90	107
	Overall	708	646	643	658	657	718	688	745
	(SD)	106	92	82	107	115	88	86	106
INTELLIGENCE	M sub	649	657	661	632	659	692	631	667
	(SD)	91	82	93	62	89	97	56	78
	F sub	732	616	691	693	667	722	691	707
	(SD)	99	76	71	158	102	126	142	99
	Overall	690	637	676	662	663	707	661	687
	(SD)	101	79	81	120	93	110	109	89
TRUSTWORTHINESS	M sub	615	649	649	638	654	627	646	659
	(SD)	64	101	41	88	111	43	88	41
	F sub	725	668	708	723	661	756	739	675
	(SD)	87	80	72	117	103	116	150	76
	Overall	670	658	678	681	657	691	692	667
	(SD)	93	89	64	109	103	108	128	60

Table 8.2: Mean reaction times in ms and standard deviations for the congruent and incongruent trials, across all the different experimental conditions (cong = congruent trials; incong = incongruent trials; SD = standard deviation).

A repeated measures analysis of variance (ANOVA) of the response reaction times was carried out with four within-subject factors, trait (attractiveness, intelligence and trustworthiness), level (high and low rated faces), face gender and congruency (congruent trials and incongruent trials), and one between-subjects factor, which was subject gender. The ANOVA summary table can be observed in Appendix XIII.

This analysis revealed one significant main effect and several significant interactions. There was a significant main effect of level of the characteristic [$F(1,14)=15.45$, $p<0.005$], showing overall slower reaction times when responding to the low level faces ($M=686$ ms, $SD=76$) than to the high level faces ($M=667$ ms, $SD=72$). This means that it took generally longer to respond to the unattractive, unintelligent, or untrustworthy faces, than to the attractive, intelligent and trustworthy faces. This might suggest that participants take longer in examining the low level faces in comparison to the high level faces.

The main effect of congruency approached significance [$F(1,14)=3.12$, $p<0.1$], suggesting an overall tendency to take longer to respond to the incongruent trials (M=680 ms, SD=73) in comparison with the congruent trials (M=674 ms, SD=75). This tendency is in line with the findings from the previous experiment, where participants were consistently slower in the incongruent trials.

A significant 2-way interaction between level and congruency was also found [$F(1,14)=5.99$, $p<0.05$]. Simple main effects analysis revealed significantly slower reaction times in the incongruent trials only for the low level faces, as well as significantly slower responses to the low level faces amongst the incongruent trials. This interaction can be observed in Figure 8.2.

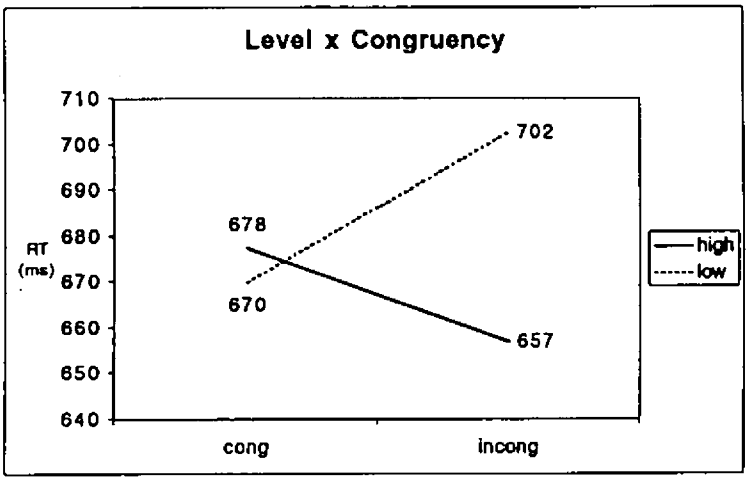


Figure 8.2: Mean reaction times in the congruent and incongruent trials for the high and low level faces (cong = congruent trials; incong = incongruent trials; high = high level faces; low = low level faces; RTs = reaction times).

A second 2-way interaction was found between trait and level [$F(2,28)=4.53$, $p<0.05$]. As can be observed in Figure 8.3, simple main effects analysis demonstrated a significant effect of level in the attractiveness condition ($p<0.001$), with slower reaction times to the low level faces. This same effect only approached significance in the intelligence condition ($p<0.1$) and was not significant in the trustworthiness condition.

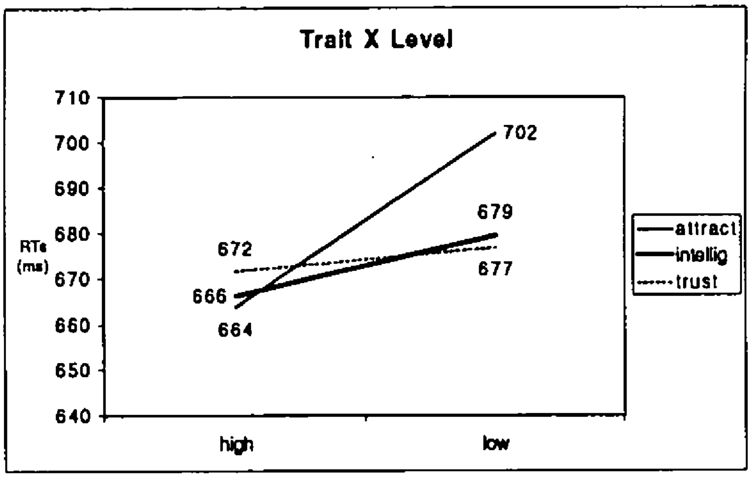


Figure 8.3: Mean reaction times for the high and low level faces in the attractiveness, intelligence and trustworthiness conditions (attract = attractiveness; intellig = intelligence; trust = trustworthiness; high = high level faces; low = low level faces; RTs = reaction times).

The main ANOVA also revealed four more significant 3-way interactions. Again, as in the first experiment, a 3-way interaction between trait, face gender and congruency also emerged [$F(2,28)=5.06$, $p<0.01$]. However, in Experiment 2, simple main effects analysis for each of the traits separately revealed a significant difference between the congruent and incongruent trials, with slower reaction times in the incongruent trials, only for the female faces in the Attractiveness condition, as Figure 8.4 illustrates.

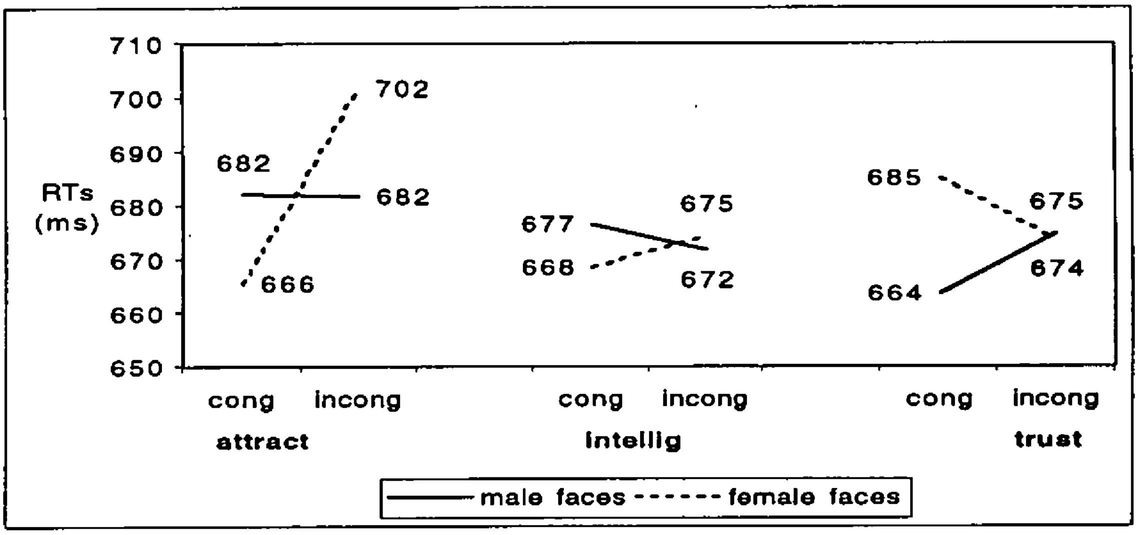


Figure 8.4: Mean reaction times in the congruent and incongruent trials, for the male and female faces, in the attractiveness, intelligence and trustworthiness conditions (attract = attractiveness; intellig = intelligence; trust = trustworthiness; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

In the intelligence and trustworthiness conditions no significant effects were found, as well as any consistent tendency. These findings are opposite to the findings of experiment

1, as there the significant congruency effect was for the male faces in the attractiveness condition and for the female faces in the intelligence and trustworthiness conditions.

Another 3-way interaction was found between level, face gender and congruency [$F(1,14)=5.49$, $p<0.05$]. Simple main effects analysis for male and female faces independently revealed that, within the male faces, participants' reaction times were significantly slower in the incongruent trials for the low level faces, but were, contrarily, significantly faster in the incongruent trials for the high level faces. No effects of congruency at all were found for the female faces, being the only effect the slower reaction times for the low level faces within the incongruent trials. This effect was also found for the male faces. These interactions are better illustrated in Figure 8.5.

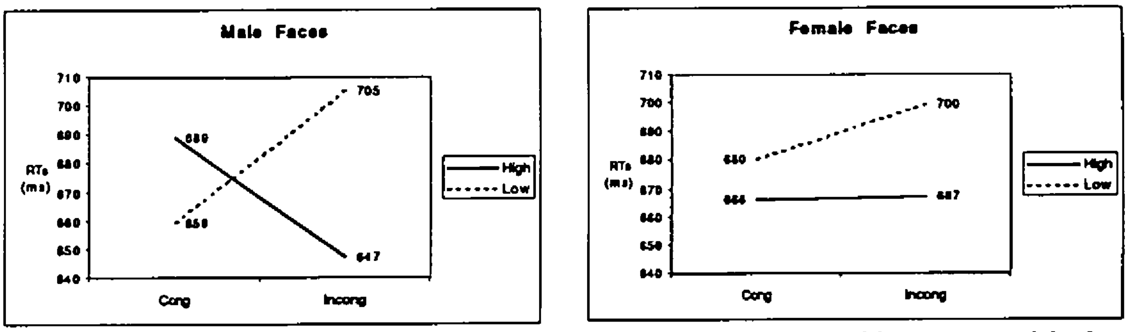


Figure 8.5: Mean reaction times for the male and female faces, in congruent and incongruent trials, for the high and low level faces, with the data collapsed across trait (cong = congruent trials; incong = incongruent trials; high = high level faces; low = low level faces; RTs = reaction times).

Again, these results are opposite to the results obtained in experiment 1, as in the first experiment the congruency effect within the male faces, with slower reaction times to the incongruent trials, was only found for the high level faces. Within the female faces both the high and low level faces showed that congruency effect.

The third 3-way interaction revealed by the 5-way ANOVA was between trait, level and face gender [$F(2,28)=7.47$, $p<0.005$]. This interaction was once more analysed by simple main effects analysis for each trait separately. In the attractiveness condition, participants were significantly slower in responding to the low level faces than to the high level faces within the female faces. The difference within the male faces was in the same direction, but not significant. Simultaneously, within the high level faces, participants showed slower reaction times when responding to the male faces, but within the low level faces, they were significantly slower in responding to female faces. Figure 8.6 illustrates this interaction.

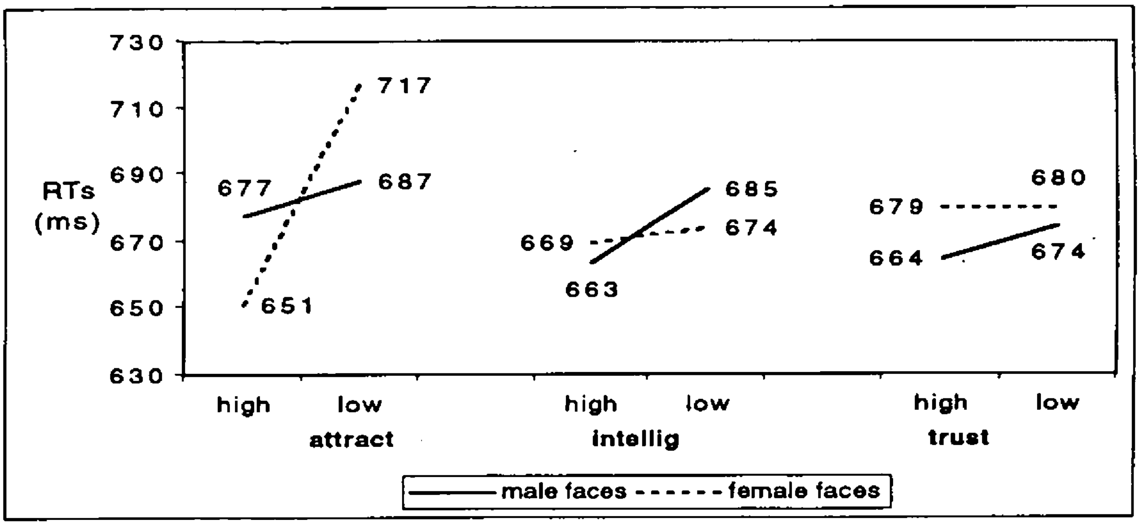


Figure 8.6: Mean reaction times for the high and low level faces, within the male and female faces, for the attractiveness, intelligence and trustworthiness conditions (attract = attractiveness; intellig = intelligence; trust = trustworthiness; high = high level faces; low = low level faces; RTs = reaction times).

In the Intelligence condition, participants were also significantly slower in their reaction times to the low level faces, but only within the male faces, and no other significant differences were found. In the Trustworthiness condition, no significant effects at all were found.

Finally, there was also a 3-way interaction between subject gender, trait and face gender [$F(2,28)=3.15$, $p<0.06$]. Although this interaction was not strongly significant, simple main effects analysis for male and female subjects independently was carried out, revealing as the only significant effect the difference in reaction times amongst the male subjects to the male and female faces in the attractiveness condition. Male participants were significantly slower when responding to the female faces. No other significant effects were found (Figure 8.7).

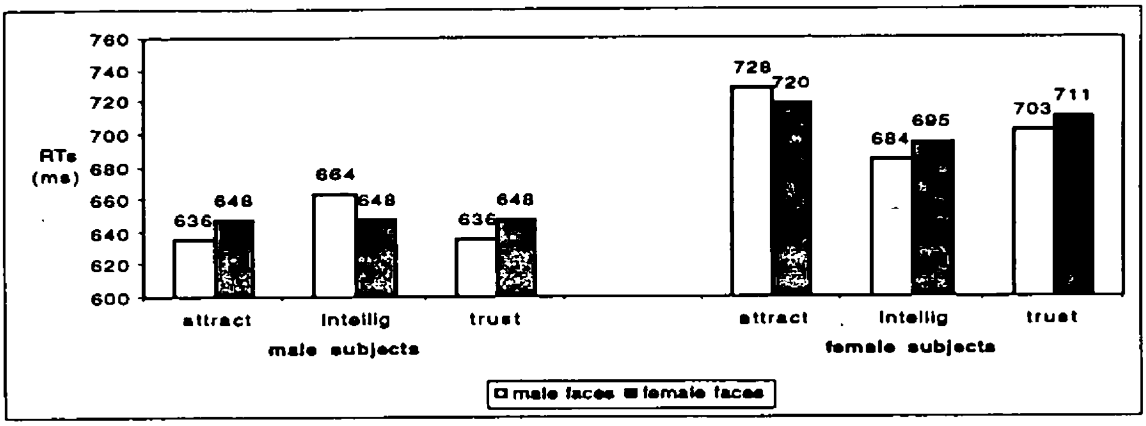


Figure 8.7: Mean reaction times from the male and female subjects to the male and female faces in the attractiveness, intelligence and trustworthiness conditions (attract = attractiveness; intellig = intelligence; trust = trustworthiness; RTs = reaction times).

Two more 4-way interactions emerged from the data analysis. The first one is between subject gender, trait, face gender and congruency [$F(2,28)=3.52$, $p<0.05$]. Simple main effects analysis for male and female subjects and for each trait separately indicate that this interaction follows generally the same pattern of effects of the previously reported 3-way interaction of trait, face gender and congruency (Figures 8.8 and 8.9). That is, there is a significant congruency effect with slower reaction times in the incongruent trials than in the congruent ones, for the female faces in the attractiveness condition, which is carried out both by the male and the female subjects. The only difference appears in the intelligence condition, where the female subjects show significantly faster reaction times in the incongruent trials for the male faces, which does not happen with the male subjects, that do not show any significant effect besides the one mentioned in the attractiveness condition. This interaction seems substantially meaningless with respect to the objectives of the present experiment and its theoretical basis.

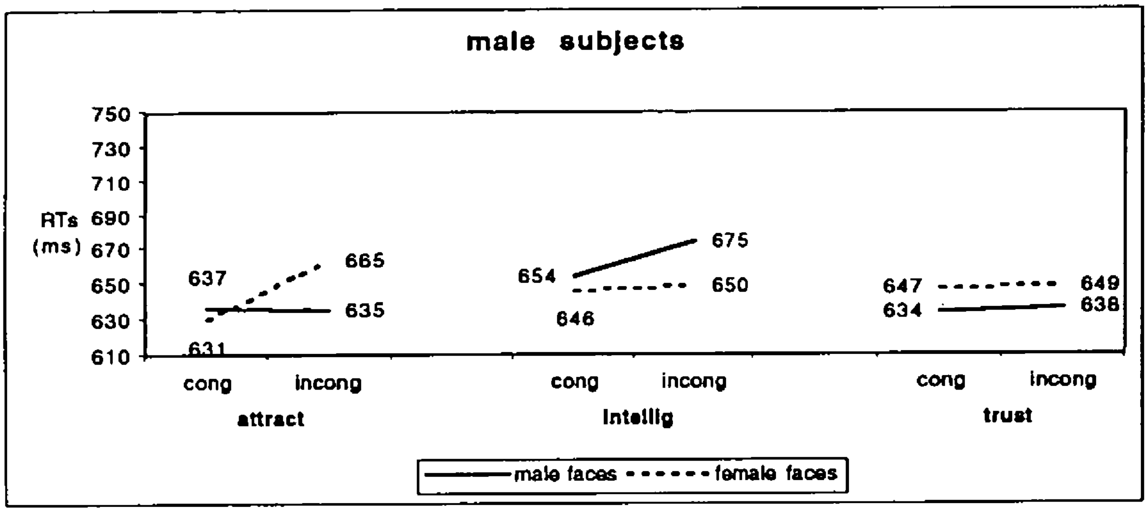


Figure 8.8: Mean reaction times from the male subjects in the congruent and incongruent trials to the male and female faces, in the attractiveness, intelligence and trustworthiness conditions (attract = attractiveness; intellig = intelligence; trust = trustworthiness; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

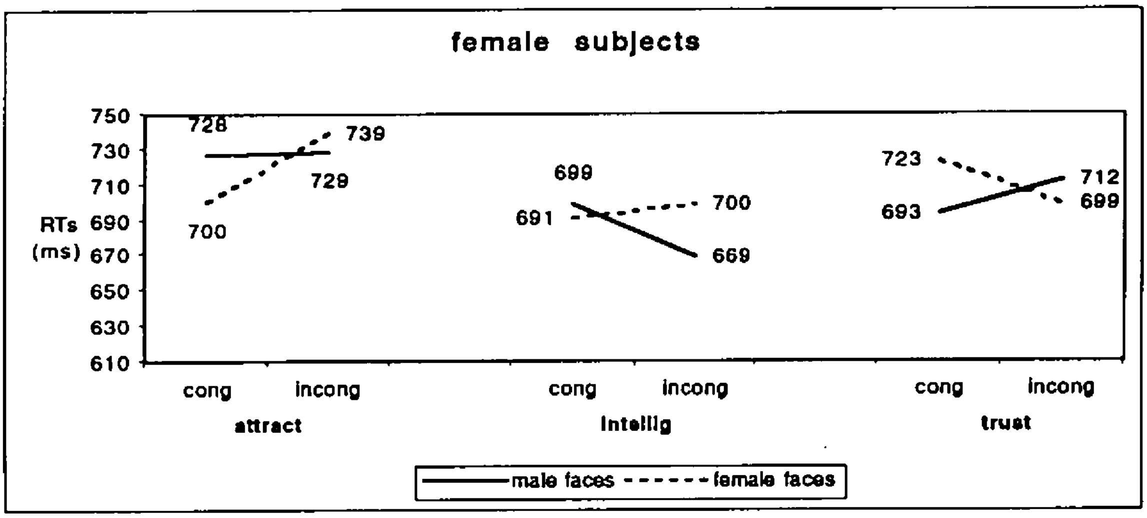


Figure 8.9: Mean reaction times from the female subjects in the congruent and incongruent trials to the male and female faces, in the attractiveness, intelligence and trustworthiness conditions (attract = attractiveness; intellig = intelligence; trust = trustworthiness; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

The second 4-way interaction evident in the statistical analysis was between subject gender, level, face gender and congruency [$F(1,14)=8.62$, $p<0.01$]. Simple main effects analysis breaking down this interaction reveal that the previously reported strong interaction between level and congruency within the male faces, with slower reaction times in the incongruent trials for the low level faces, but faster reaction times in the incongruent trials for the high level faces, is mainly carried out by the female subjects, as can be observed in Figures 8.10 and 8.11.

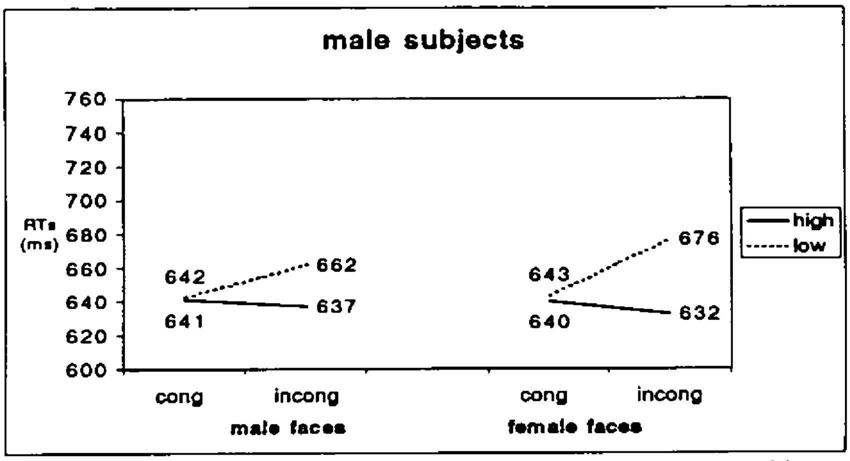


Figure 8.10: Mean reaction times from the male subjects in the congruent and incongruent trials to the high and low level male and female faces (high = high level faces; low = low level faces; cong = congruent trials; incong = incongruent trials).

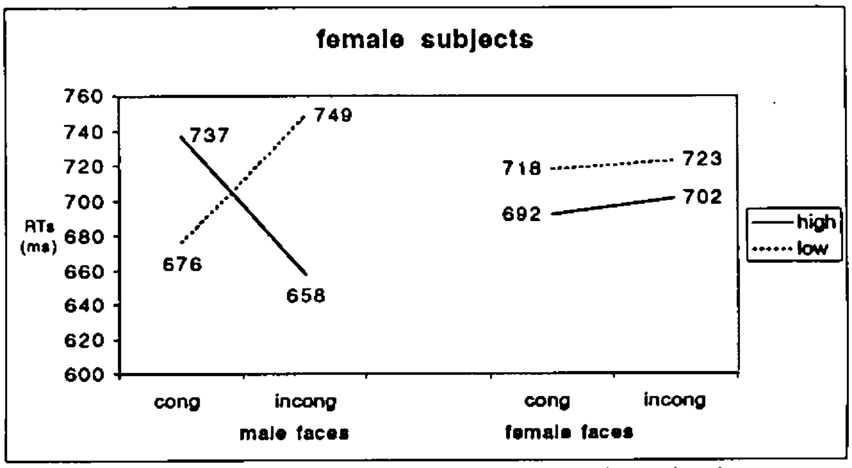


Figure 8.11: Mean reaction times from the female subjects in the congruent and incongruent trials to the high and low level male and female faces (high = high level faces; low = low level faces; cong = congruent trials; incong = incongruent trials)

For the male subjects when responding to the female faces, there is also a significant effect of congruency within the low level faces, with slower reaction times for the incongruent trials in comparison with the congruent trials. Within the incongruent trials for the female faces, male participants are also significantly slower for the low level ones than for the high level ones. This suggests that it is more difficult to give a positive label to a face when that face is not congruent with the label, than give a negative incongruent label when the face is a high level one in the considered trait (for example, it seems to be more difficult to say "attractive" to an unattractive face than say "unattractive" to an attractive face).

Some of the interactions mentioned above seem to involve gender related issues and to show effects which investigation is beyond the aims of this research work. Consequently, they will not be explored or mentioned further on, as they do not seem to be related to the theoretical issues under examination in these experiments.

8.4 Discussion

Having found evidence for the activation of facial stereotypes through a significant congruency effect on a learning paradigm, the second experiment was designed to further investigate how automatically these stereotypes could be activated. For that purpose, this experiment was based on an *Irrelevant Feature Paradigm*, based on Simon Paradigm (De Houwer, Hermans & Eelen, 1998; De Houwer & Eelen, 1998). This is a type of interference paradigm, which involves a *relevant feature* that determines what the correct response should be, an *irrelevant feature* that has to be ignored, and a *response* that is meaningfully related to the irrelevant feature but not to the relevant feature.

Giving an example from the present experiment, in one of the experimental conditions, participants were instructed to say aloud the word "attractive" (*response*) to all the male faces that they would see and the word "unattractive" to all the female faces that they would see (face gender was the *relevant feature*). The faces had been previously manipulated in terms of their attractiveness (*irrelevant feature*), so that only high attractiveness and low attractiveness faces were shown. So, the irrelevant feature (the level of attractiveness of the faces) was meaningfully related to the response that had to be produced (either the word "attractive" or the word "unattractive"), but should be ignored, as the face gender was in fact the relevant feature that determined which should be the correct response.

It has been demonstrated that, under certain conditions, a feature of the stimulus target that is *irrelevant* to the response that has to be produced and should be ignored, can influence the response times and accuracy of response. It can be assumed that, if the irrelevant feature proves to have an effect on the response times, it is because it must have been processed in some way. It can also be argued that this processing was, at least partially, automatic, as during the experiment there is no explicit mention to that irrelevant feature.

The results only partially confirmed the experimental predictions. Once more, the error analysis showed a generally low error rate and did not show any significant differences in response accuracy between the congruent and incongruent trials. So, the accuracy of participants' responses did not seem to be influenced by the possible activation of the stereotypes.

From the analysis of the reaction times, several interactions have emerged. However, not all of them are meaningful in regard to the theoretical issues under investigation in the present research work, and the possible interpretation of some of the observed effects are beyond the scope of these studies. Thus, the most meaningless interactions will not be discussed further on, as they have already been fully mentioned in the Results section.

Regarding the main analysis, contrary to the first experiment, a main effect of congruency was not found. However, the data showed a tendency towards slower reaction times in the incongruent trials in comparison with the congruent trials, as it was expected from the experimental hypothesis. This tendency was supported by a main effect of congruency that approached significance in the subsidiary analysis. The tendency for slower reaction times in the incongruent trials was more pronounced in the Attractiveness condition, although the results in the Intelligence and Trustworthiness conditions were also in the same direction.

The fact that the difference in reaction times between the congruent and incongruent trials was not significant, although in the expected direction, was probably due to the nature of the task that was used in this experiment. The main task was a gender decision task, which can probably be performed before other information about the facial features is processed. Thus, it is possible that the activation of the facial stereotype did not have any effect on participants performance because the facial characteristics that are associated with the stereotype were not fully processed.

Further analysis revealed a three-way interaction between trait, face gender and congruency. Participants evidenced slower reaction times in the incongruent trials when compared to congruent trials only when responding to the female faces in the attractiveness condition, whereas in the intelligence and trustworthiness conditions, no significant effects were found. This result might also be understood considering the nature of a gender decision task, as it has been explained above. It is generally thought that attractiveness is probably the characteristic that is more readily extracted and judged from facial appearance. Thus, it is not surprising that the attractiveness facial stereotype might have been the only one which activation affected participants performance on a gender decision task. In the same way, considering the fact that attractiveness might be more valued in women than in men, it is conceivable that attractiveness-related features are processed more automatically in female faces than in male faces, having stronger interference in task performance and slowing down reaction times in the incongruent trials for the female faces.

The subsidiary analysis also showed an interaction between level of the characteristic and congruency, with a congruency effect for the low level faces, but not for the high level faces. That is, participants were slower in responding to the incongruent trials than to the congruent trials amongst the low level faces, but the same did not happen amongst the high level faces. This evidence suggests that there was an activation of the facial stereotype, as indicated by the slower reaction times in the incongruent trials, only within the low level faces (unattractive, unintelligent or untrustworthy faces). This result contrasts with the results from the previous experiment, where a congruency effect was present only for the high level faces both in the attractiveness and intelligence conditions.

Moreover, a three-way interaction between level of the characteristic, face gender and congruency indicates that the previous two-way interaction between level and congruency is mainly due to the male faces. Main effects analysis revealed a surprising pattern, as within the male faces, participants were significantly slower in the incongruent trials than in the congruent trials for the low level faces, but were significantly faster in the incongruent trials than in the congruent trials for the high level faces. This result might be due to gender related issues, which are beyond the main concerns of this work, and will not be explored. However, it is also not possible to discard the hypothesis that these results are originated by specific characteristics of this particular set of male faces.

A significant four-way interaction between subject gender, level of the characteristic, face gender and congruency reveals that the above mentioned 3-way interaction between level and congruency within the male faces is mainly dependent on data from the female subjects. Thus, in future studies, it might be worth considering, in theoretical terms, eventual interactions between subject gender and face gender, and other issues related to gender stereotypes.

9. *Experiment 3*

9.1 Introduction

Some researchers have suggested that the inference of personality characteristics based on facial appearance might be largely based on the perceived attractiveness of the face. So, attractiveness would be a sort of underlying variable, determining to some extent all the other judgements that are made about the person. In fact, attractiveness has proven to influence several judgements of other people when these are based on facial appearance (Bull & Rumsey, 1988).

The design of the third experiment is related to this idea that attractiveness might influence other personality judgements. So, if another characteristic is manipulated together with attractiveness, it might be expected that the perceived attractiveness of the face could influence the perceived level of the other characteristic, and therefore have an influence in tasks where facial stereotypes are expected to be activated.

The second characteristic chosen to be included in this experiment was Intelligence, as it was the characteristic that was less correlated with attractiveness, according to the initial ratings. So, a new set of 40 faces was chosen from the initial database, in such a way that there were 10 faces (5 male and 5 female) in each of the following four groups: high attractiveness and high intelligence faces, high attractiveness and low intelligence faces, low attractiveness and high intelligence faces, and low attractiveness and low intelligence faces.

The results from experiment 2 have shown a congruency effect for the female faces in the attractiveness condition, with slower reaction times in the incongruent trials. These results are compatible with a possible activation of the facial stereotype, which might have interfered with the task of labelling the faces, slowing down the reaction times when the label to be attributed and the facial appearance were not congruent.

If the perceived attractiveness of the face can indeed influence the judgement of other characteristics, then it can be expected that the activation of a facial stereotype related to attractiveness might influence the reaction times in a task of attribution of labels related to intelligence. That is, if the faces are manipulated in such a way that high or low levels of intelligence are always combined with high or low levels of attractiveness, the effect of the activation of the intelligence facial stereotype might suffer from the influence of the automatic activation of the attractiveness stereotype.

The third experiment was based again on an *Irrelevant Feature Paradigm* and the task was very similar to the task in experiment 2. However, the experimental stimuli were manipulated in such a way that the faces were simultaneously characterised by a high or low level of attractiveness and a high or low level of intelligence. The same set of faces was used both in the attractiveness and intelligence conditions.

So, in the intelligence condition, it was expected that the activation of the attractiveness stereotype would influence the participants' reaction times, in such a way that saying, for example, "unintelligent" to a high intelligent and high attractive face would take longer than saying "unintelligent" to a high intelligent but low attractive face. Although both situations are incongruent in relation to intelligence, the first one can be considered "more incongruent" as the high attractiveness level of the face might influence and enhance the perceived level of intelligence. The activation of the attractiveness stereotype would influence the activation of the intelligence stereotype. That is, the perceived attractiveness of the face would influence the automatic judgement of intelligence.

The inverse effect was not expected to occur in the attractiveness condition, as it is not expected that the perceived intelligence of the face might influence the judgement of attractiveness. So, a simple congruency effect with slower reaction times in the incongruent trials was expected in the attractiveness condition (when the labels to be attributed are "attractive" or "unattractive"), with no influence of the intelligence level of the faces.

An overall effect of congruency, with slower reaction times in the incongruent trials was also expected, across both the attractiveness and intelligence experimental conditions.

9.2 Method

9.2.1 *Participants and Overview*

Twenty-four students of the University of York participated in this third study about facial stereotypes, again for monetary compensation or fulfilment of course requirements.

In line with the previous experiments, the purpose of this study was again to look at the potential effects of the activation of facial stereotypes on the reaction times and accuracy of response in a task of arbitrary labelling male and female faces. In this experiment, however, stimuli were manipulated in a different way from the previous experiments, although the paradigm used was the same as in experiment 2 (the *Irrelevant Feature Paradigm*).

This time the traits included were only Attractiveness and Intelligence, and new facial stimuli were selected. The male and female faces were still selected according to their high and low level on those characteristics, but this time the criterion was based on a specific combination of their level in attractiveness and intelligence at the same time, for each set of stimuli.

In this experiment the stimuli were exactly the same for all the experimental conditions. Again, as in the previous experiment, half of the participants were asked to label the female faces with one trait and the male faces with the opposite trait, and the instructions were reversed for the other half of participants. Once more, they should say the labels verbally as soon as possible after the faces appeared on the computer screen, and the reaction times were registered by the computer software via the voice key device.

The experiment was based on an *Irrelevant Feature Paradigm*, and the task was very similar to the task used in Experiment 2. Again, face gender can be considered the relevant feature, while the facial stereotype is the irrelevant feature and the label to be attributed to the faces is the response to be given.

The major interest of the experiment was again to have a close look at the difference both in the reaction times and accuracy of response between the congruent and incongruent trials, across all the experimental conditions. In the previous experiment with the same paradigm, an overall congruency effect was demonstrated only for attractiveness. In this experiment, it was expected that the simultaneous manipulation of the attractiveness level of the faces, together with the intelligence level of the faces, would have an effect on the participants' reaction times in the intelligence condition. This effect would be due to the unintentional activation of the facial stereotype related to attractiveness which, taking into account the conclusions from the previous experiment, was automatically activated in the presence of the facial stimuli.

9.2.2 *Materials*

A new set of 40 coloured photographs of caucasian male and female adult faces was selected for this experiment. Some of the stimuli had already been used in the two previous experiments, but most of them were new. The photographs were again selected based on the ratings previously obtained after collecting the face database. This time the faces were selected according to their high and low level of Attractiveness and Intelligence, in such a way that there were all the possible combinations of both levels of the two characteristics. The selected faces can be seen in Appendix XIV.

So, there were four different sets of stimuli:

- Low attractiveness and low intelligence faces,
- Low attractiveness and high intelligence faces,
- High attractiveness and low intelligence faces, and
- High attractiveness and high intelligence faces.

Each of these four sets contained 10 different faces, of which 5 were male faces and the other 5 were female faces. The sets were matched so that the overall mean ratings of the high and low level faces in each of them was equivalent both for attractiveness and intelligence. Table 9.1 presents the mean ratings and standard deviations for each of the selected sets of faces (the mean ratings for each individual stimulus can be observed in Appendix XV). Unfortunately it was not possible to match all the sets on perceived mean age, as the different combinations of both levels of attractiveness and intelligence did not cover the same range of ages, according to the obtained ratings. For example, the faces rated simultaneously high on attractiveness and low on intelligence were mainly from young people, whereas the faces rated low on attractiveness and high on intelligence were mainly from older people.

Low Attractiveness – Low Intelligence			
		Attractiveness	**Intelligence**
Female Faces	**Mean**	**2.8**	**2.8**
	SD	0.2	0.3
Male Faces	**Mean**	**2.8**	**2.9**
	SD	0.2	0.2
	Overall Mean	2.8	2.9
	Overall SD	0.2	0.3
Low Attractiveness – High Intelligence			
		Attractiveness	**Intelligence**
Female Faces	**Mean**	**3.2**	**4.8**
	SD	0.7	0.3
Male Faces	**Mean**	**2.5**	**5.6**
	SD	0.1	0.4
	Overall Mean	2.9	5.2
	Overall SD	0.6	0.5
High Attractiveness – Low Intelligence			
		Attractiveness	**Intelligence**
Female Faces	**Mean**	**5.2**	**2.8**
	SD	0.3	0.4
Male Faces	**Mean**	**5.3**	**3.0**
	SD	0.5	0.3
	Overall Mean	5.3	2.9
	Overall SD	0.4	0.3
High Attractiveness – High Intelligence			
		Attractiveness	**Intelligence**
Female Faces	**Mean**	**5.3**	**5.4**
	SD	0.3	0.3
Male Faces	**Mean**	**5.2**	**5.3**
	SD	0.1	0.2
	Overall Mean	5.3	5.3
	Overall SD	0.2	0.2

Table 9.1: Mean ratings and standard deviations (SD) for the sets of faces selected for Experiment 3.

As in the previous experiments, all the faces had been cropped around the face and hair, so that the minimum possible clothing and background would be visible. The photographs were all the same height (150 pixels; around 5cm on screen display).

9.2.3 *Procedure*

As already mentioned, the experimental paradigm was the *Irrelevant Feature Paradigm*. Participants were told that they were going to be asked to label some male and female faces with traits related to attractiveness and intelligence. However, it was made clear that the labelling would not be related to objectively classifying the stimuli nor to personal opinions about them, that is, the labelling would not be in any way based on gender-related prejudices.

The instructions for the experiment were first given in written format (Appendix XVI) and after the participants had read them, the experimenter made sure that there were no doubts about the procedures. Before each part of the experiment started, the participants were given specific instructions about which labels they should attribute to each of the faces. As the labels to the male and female faces were reversed after each block, and to avoid any possible confusions regarding the labels, a small sheet of paper was placed below the computer screen before each block started, displaying the labels corresponding to the male and female faces.

The faces were presented in blocks of 40, corresponding to the 10 faces in each of the four different sets previously mentioned. The same block of 40 faces was repeated a total of 8 times, being 4 times for the labels related to attractiveness (attractiveness condition), and the other 4 times to the labels related to intelligence (intelligence condition). So, this time the faces were exactly the same in the attractiveness and in the intelligence conditions.

The faces within each block were always presented in random order and the order of the experimental conditions (attractiveness or intelligence) was counterbalanced across participants, as well as the instructions regarding the labels that should be attributed to the male and female faces. Nevertheless, the four blocks corresponding to each of the characteristics were always presented together.

So, similarly to the previous experiment, for example, for the Attractiveness condition, in the first and third presentation of the block, half of the participants were instructed to say "attractive" to all the female faces and "unattractive" to all the male faces. In the second and fourth presentation of the block, the instructions were reversed and they would have to say "unattractive" to the female faces and "attractive" to the male faces. As the order in which the labels were given to the faces was counterbalanced across participants, the other half of participants would start by saying "unattractive" to the female faces and "attractive" to the male faces, and so on. As each block of 40 faces was repeated four times for each characteristic, each participant would perform a total of 320 trials (being 160 trials for each trait).

The trials were again coded as congruent or incongruent depending on the specific instructions that were given before each block started (that is, which labels should be attached to the male and female faces, either related to attractiveness or intelligence, whichever was the relevant dimension). Moreover, the trials were also coded as congruent or incongruent in the irrelevant dimension in each condition (that is, if it was a trial that belonged to the Intelligence Condition, the irrelevant dimension would be Attractiveness, and *vice-versa*). As it has been previously mentioned, the interest on the congruency of the irrelevant dimension of the facial stimuli with the task instructions was related to its possible influence on the perception of the relevant dimension. Considering an example for the **Intelligence Condition** (where intelligence was the relevant dimension and attractiveness was the irrelevant dimension), if a participant had been instructed to say **"intelligent" to all the male faces** and **"unintelligent" to all the female faces**, in a specific block, the trials would be coded like it follows (Table 9.2):

MALE FACES		**Intelligence (Relevant Dimension - RD)**	
		High	Low
Attractiveness (Irrelevant Dimension - ID)	High	RD: congruent	RD: incongruent
		ID: congruent	ID: congruent
	Low	RD: congruent	RD: incongruent
		ID: incongruent	ID: incongruent

FEMALE FACES		**Intelligence (Relevant Dimension - RD)**	
		High	Low
Attractiveness (Irrelevant Dimension - ID)	High	RD: incongruent	RD: congruent
		ID: incongruent	ID: incongruent
	Low	RD: incongruent	RD: congruent
		ID: congruent	ID: congruent

Table 9.2: Example of trial coding for the Intelligence Condition, when participants were instructed to say "intelligent" to all the male faces and "unintelligent" to all the female faces.

The trials would be coded according to the same logic in the other possible variation of the instructions and similarly in the attractiveness condition.

There would then be two types of trials: trials where both dimensions were consistent with each other (either both dimensions are congruent or incongruent with the task instructions), and trials where the relevant and irrelevant dimensions are inconsistent with each other (one of the dimensions is congruent and the other one is incongruent with the task instructions). It was expected that the consistency of the two dimensions would have an effect on the results, slowing down the reaction times in the trials where the relevant and irrelevant dimensions were inconsistent with each other in terms of congruency.

The faces were displayed on an Apple Macintosh computer screen using the Experimenter Generator Package SuperLab Pro 1.74. Before each part of the experiment started, the participants were instructed about the labels that they should attribute to the faces. Then the experiment would start with a white cross in the middle of a black screen, indicating the participants that an experimental stimulus would come afterwards and that they should direct the attention to it, in order to give a response as quickly as possible. The white cross was displayed for 500 ms and after an interval of 500 ms more a face was displayed in the middle of the screen. The face was displayed until the participant had given a response or until a time limit of 5000 ms. Then an interval of 1500 ms would follow, before the next white cross appeared, and the same sequence was repeated.

Participants were instructed to give their oral verbal responses as quickly and as accurately as possible. The reaction times were registered by the computer software when the vocal sound triggered the microphone. The actual responses (the words that the participants said) were registered by the experimenter. Before the data analysis, both the errors made by the participants and the trials where there was any problem with the voice key were excluded from the data set.

In the previous experiment, using the same experimental paradigm, a congruency effect with slower reaction times in the incongruent trials was demonstrated for the female faces in the attractiveness condition. Some researchers argue that judgements on some personality characteristics might largely be based on the perceived attractiveness of those persons. So, it could be that, if attractiveness and intelligence levels were manipulated at the same time, the activation of the attractiveness stereotype would influence the effects of the intelligence stereotype on the task performance.

If that was the case, it was expected that the attractiveness level of the faces would also influence the congruency effect in the intelligence condition. For example, it would take longer to say "intelligent" to a high intelligence face if that face was simultaneously unattractive (the two dimensions are inconsistent with each other), than if the face was both high intelligence and high attractive (the two dimensions are consistent with each other). This effect was expected considering the idea that the inference of several characteristics from the face might be to some extent based on the perceived attractiveness. So, the same effect was not expected in the attractiveness condition, as it was not assumed that the perceived intelligence would have any influence on the perception of attractiveness of the face.

Besides the previous effect, an overall congruency effect with slower reaction times on the incongruent trials when compared to the congruent trials was again expected for both attractiveness and intelligence. Incongruent trials are still classified like that when the label to be attributed and the facial appearance are not congruent regarding the characteristic related to the label (the relevant dimension).

9.3 Results

The mean reaction times and standard deviations for each experimental condition were calculated for each individual participant. As in the previous experiments, from the total of 320 trials (160 trials for each condition), trials where a voice key failure occurred and trials where participants made mistakes were excluded from the data set and analysed separately. In Table 9.3 there is the summary of the error data from experiment 3. The absolute number of errors made by each participant in each of the main experimental conditions can be observed in Appendix XVII.

	ATTRACTIVENESS CONDITION		INTELLIGENCE CONDITION	
	CONG	INCONG	CONG	INCONG
Mean	1.8	1.6	2.0	1.8
SD	(1.6)	(1.4)	(2.1)	(2.3)
%	[2.25%]	[2.00%]	[2.50%]	[2.25%]

Table 9.3: Means, standard deviations and percentage of errors in congruent and incongruent trials for the attractiveness and intelligence conditions (CONG = congruent trials; INCONG = incongruent trials; SD = standard deviation).

As in experiment 2, the error rates are low. And again, a t-test analysis with paired samples did not reveal any significant differences between the error rates in the congruent and incongruent trials, for any of the traits. This suggests that the possible activation of the facial stereotypes did not have any influence on the response accuracy.

Considering the main prediction of an overall congruency effect for both attractiveness and intelligence, a 2x2 repeated measures analysis of variance (ANOVA) of the reaction times, with trait and congruency as within-subjects factors was carried out. No significant main effect of congruency was found in this analysis [F(1,23)=2.66, p=0.117], as well as no interaction between trait and congruency [F(1,23)=0.28, p=0.601]. As can be observed in Figure 9.1, the overall reaction times for the congruent and incongruent trials were not significantly different in the two main experimental conditions. Although there is an apparent overall tendency for slower reaction times in the incongruent trials, the difference is not statistically significant.

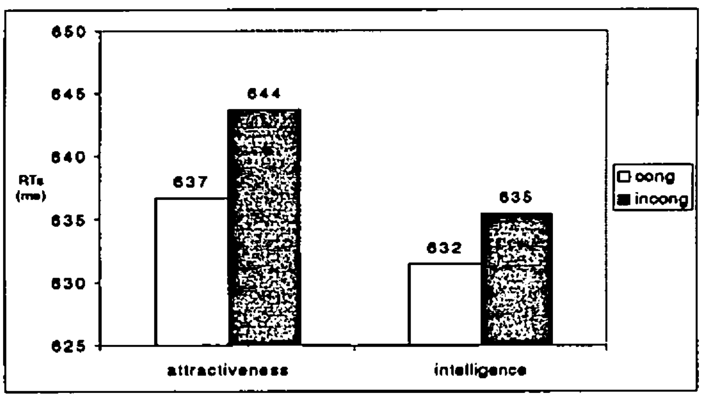


Figure 9.1: Mean reaction times in congruent and incongruent trials for the attractiveness and intelligence conditions (cong = congruent trials; incong = incongruent trials; RTs = reaction times).

The other main interest of this experiment was to investigate whether the perception of one characteristic would be influenced by the perception of the other characteristic, more specifically if the perception of intelligence based on facial appearance would be influenced by the level of attractiveness of the faces. With that purpose, another main analysis was carried out, introducing the factor "consistency of the relevant and irrelevant dimensions" in the previous two-way ANOVA. The trials were considered to be consistent if both the relevant and irrelevant dimensions were similarly coded in terms of congruency (either both congruent or both incongruent) and inconsistent if the relevant and irrelevant dimensions had different congruency codes (one of them was congruent and the other incongruent). The objective was to explore if this factor would have any effect on the results. In general terms, it was expected that the inconsistency of both dimensions would have a disrupting effect, slowing down the reaction times on those trials, in particular in the intelligence condition.

So, a 3-way repeated measures ANOVA was carried out, with condition (intelligence or attractiveness condition), congruency (congruent and incongruent trials) and consistency (trials where the relevant and irrelevant dimensions were consistent, and trials where the relevant and irrelevant dimensions were inconsistent) as within subjects factors. This analysis did not reveal any main effect. A 2-way interaction between condition and consistency was found [$F(1,23)=4.51$, $p<0.05$], as well as a 3-way interaction between condition, congruency and consistency [$F(1,23)=8.87$, $p<0.01$].

Simple main effects breaking down the 2-way interaction showed a significant effect of consistency in the attractiveness condition [$F(1,23)=5.08$, $p<0.05$], with slower reaction times in the trials where the relevant and irrelevant dimensions are consistent (M=644ms; SD=73) in comparison with the trials where both dimensions are inconsistent with each other (M=637ms; SD=70). This result is in the opposite direction of the predictions, as faster reaction times were predicted for the trials where both dimensions were consistent. Moreover, the effects were predicted for the intelligence condition and not for the attractiveness condition. It can be considered that these results do not seem to have experimental meaning. Despite the statistical significance of the results, the difference between the reaction times is considerably small (7 ms) and could be a result of the intrinsic fluctuation of the participants' reaction times or due to sampling errors.

The three-way interaction between condition, congruency and consistency can be observed from the graph in Figure 9.2.

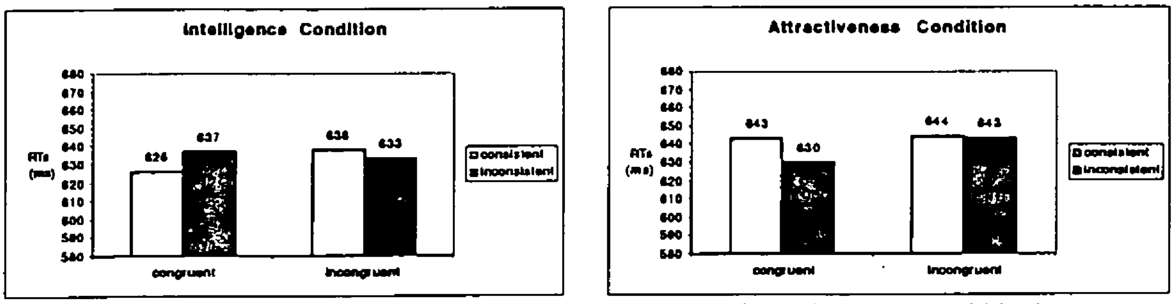


Figure 9.2: Mean reaction times in the trials in the consistent and inconsistent trials, within the congruent and incongruent trials, in the Intelligence Condition and in the Attractiveness Condition (RTs = reaction times)

This interaction is due to the opposite direction of the difference between the consistent and inconsistent trials, amongst the congruent trials, between the intelligence and the attractiveness conditions. As can be seen, in the intelligence condition, although not statistically significant, the difference between the consistent and inconsistent trials within the congruent trials is in the expected direction, with a tendency for slower reaction times when the relevant and irrelevant dimensions are inconsistent with each other. However, in the attractiveness condition that difference is in the opposite direction and, as it has been said, does not seem to have any experimental meaning. Amongst the incongruent trials, consistency of both dimensions does not seem to have any effect at all.

Despite the fact that an effect of the irrelevant dimension on the perception of the relevant dimension was not found, the already mentioned tendency towards slower reaction times in the incongruent trials would have to be further investigated. So, similarly to the previous experiments, a subsidiary analysis was carried out, including the other factors that might have had an influence on the results.

9.3.1 *Subsidiary Analysis*

Before analysing the data, a specific precaution was taken. As already mentioned, in this experiment the same set of stimuli was used both in the attractiveness and intelligence conditions. Although the order of presentation of the experimental conditions was counterbalanced across participants, it is important to notice that when participants were presented with the second condition, they had already seen and somehow judged the facial stimuli before, in the previous condition. As this could have an influence on the results, preliminary analysis was carried out in order to verify if the order of presentation of the experimental conditions had any effect on the results.

				Attractiveness Condition		Intelligence Condition	
				ORDER 1	ORDER 2	ORDER 1	ORDER 2
HIGH ATTRA.	HIGH INTEL.	MALE FACES	Cong	690 [108]	656 [115]	659 [104]	657 [69]
			Incong	597 [67]	594 [63]	600 [85]	640 [113]
		FEMALE FACES	Cong	646 [83]	657 [70]	620 [70]	634 [74]
			Incong	631 [116]	625 [123]	618 [89]	628 [75]
	LOW INTEL.	MALE FACES	Cong	686 [119]	670 [75]	581 [66]	615 [76]
			Incong	598 [60]	612 [124]	676 [96]	631 [91]
		FEMALE FACES	Cong	610 [70]	638 [92]	603 [81]	653 [113]
			Incong	653 [82]	603 [78]	613 [94]	638 [116]
LOW ATTRA.	HIGH INTEL.	MALE FACES	Cong	590 [58]	597 [92]	673 [100]	649 [85]
			Incong	675 [94]	668 [73]	588 [87]	627 [103]
		FEMALE FACES	Cong	642 [80]	607 [64]	668 [75]	653 [118]
			Incong	675 [92]	663 [91]	654 [112]	640 [75]
	LOW INTEL.	MALE FACES	Cong	615 [70]	600 [69]	569 [53]	625 [98]
			Incong	707 [89]	685 [112]	677 [93]	687 [80]
		FEMALE FACES	Cong	666 [101]	616 [77]	601 [73]	646 [84]
			Incong	656 [84]	657 [63]	610 [88]	641 [95]

Table 9.4: Mean reaction times and standard deviations in the attractiveness and intelligence conditions, for order 1 and order 2 of presentation of the experimental conditions (High Attra. = high attractiveness faces; Low Attra. = low attractiveness faces; High Intel. = high intelligence faces; Low Intel. = low intelligence faces; Cong = congruent trials; Incong = incongruent trials).

The mean overall reaction times in each condition for both orders of presentation are shown in Table 9.4. In order 1 participants did first the attractiveness condition and in second place the intelligence condition, and in order 2 first was the intelligence condition and second the attractiveness condition. To test the statistical significance of the differences in reaction times in all the variables between order 1 and order 2, a one-way multivariate ANOVA of the reaction times was performed on the data. This analysis did not reveal any significant differences between orders in any variable. So, data was collapsed across this variable in further analysis. Appendix XVIII shows the individual mean reaction times for each participant in the different experimental conditions, with data collapsed across order of presentation.

For the data analysis, a 6-way mixed design ANOVA was used. This analysis included subject gender as the between subjects factor, and five within-subjects factors. These factors were Condition (attractiveness condition and intelligence condition), Attractiveness Level (high attractiveness faces and low attractiveness faces), Intelligence Level (high intelligence faces and low intelligence faces), Face Gender (male and female faces) and Congruency (congruent trials and incongruent trials). Therefore this was a 2x2x2x2x2x2 mixed design. The ANOVA source table can be observed in Appendix XIX.

As could be expected from such a complex design, a considerable number of interactions emerged from this analysis. Although not all of them are interesting and meaningful in terms of the experimental and theoretical predictions, all of them will be mentioned and completely described. However, only the relevant effects will be fully commented in the discussion section.

The only main effect revealed by this analysis was of Attractiveness Level [$F(1,22)=17.39$, $p<0.001$]. Participants were overall slower in responding to the low attractiveness faces (M=641 ms, SD=66) than to the high attractiveness faces (M=632 ms, SD=69).

A significant two-way interaction between subject gender and face gender [$F(1,22)=5.03$, $p<0.05$] showed that the male subjects are generally slower in responding to the male faces than to the female faces, whereas the female subjects are slower in responding to the female faces than to the male faces (Figure 9.3).

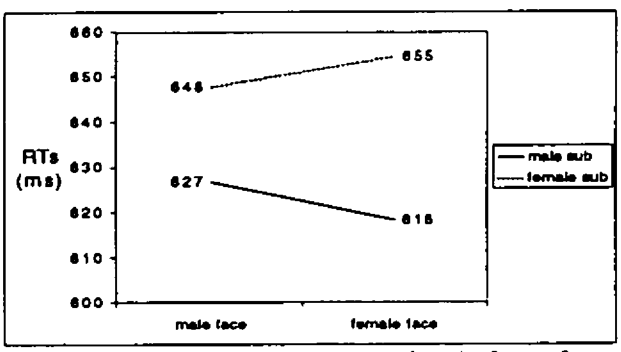


Figure 9.3: Mean reaction times to the male and female faces, from the male and female subjects (male sub = male subjects; female sub = female subjects; RTs = reaction times).

There was also a 2-way interaction between condition and intelligence level [$F(1,22)=4.26$, $p<0.06$] that approached significance, suggesting that, in the intelligence condition, the reaction times to the high and low intelligence faces tend to differ significantly, with slower reaction times to the high intelligence faces. The same effect does not seem to occur in the attractiveness condition (Figure 9.4).

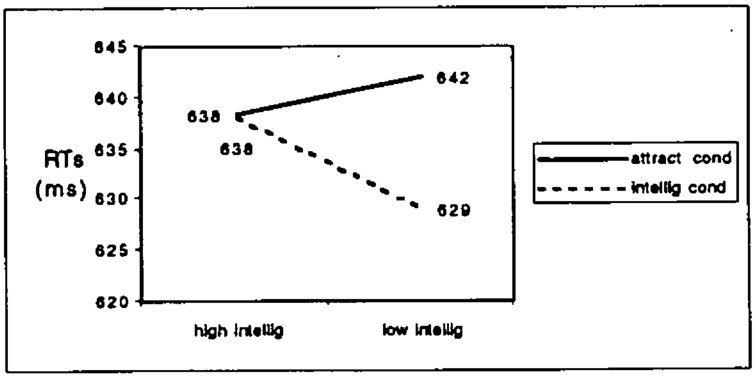


Figure 9.4: Mean reaction times to the high and low intelligence faces, in the attractiveness and intelligence conditions (high intellig = high intelligence faces; low intellig = low intelligence faces; attract cond = attractiveness condition; intellig cond = intelligence condition; RTs = reaction times).

A 3-way interaction between subject gender, attractiveness level and intelligence level [$F(1,22)=6.29$, $p<0.05$] was analysed through simple main effects for each gender separately. For the male subjects, the reaction times within the high intelligence faces were significantly slower for the low attractiveness faces than for the high attractiveness ones and there is no significant difference within the low intelligence faces. Contrarily, for the female subjects this same difference is significant only within the low intelligence faces. Still for the female subjects, there is also a significant effect of intelligence level within the high attractiveness faces, with slower reaction times for the high intelligence faces than for the low intelligence ones (Figure 9.5).

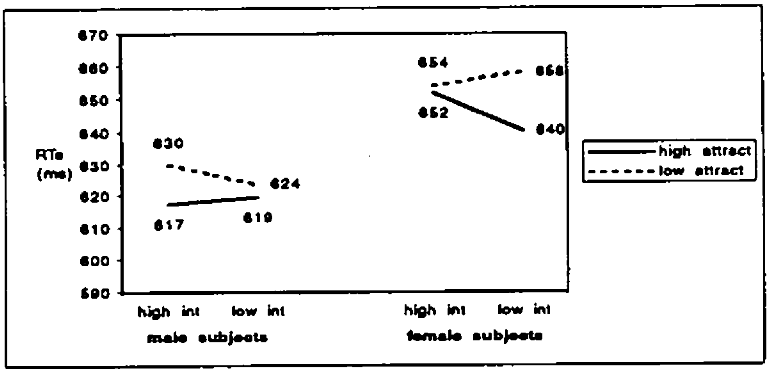


Figure 9.5: Mean reaction times from the male and female subjects to the high and low intelligence faces, within the high and low attractiveness faces (high int = high intelligence faces; low int = low intelligence faces; high attract = high attractiveness faces; low attract = low attractiveness faces; RTs = reaction times).

There are two significant 2-way interactions between attractiveness level and congruency [$F(1,22)=49.75$, $p<0.001$], and between intelligence level and congruency [$F(1,22)=11.24$, $p<0.01$], as can be observed in Figure 9.6. Simple main effects analysis revealed the same effect in both interactions. So, for the first one, it is observed that participants are significantly slower in responding to the incongruent trials than to the congruent trials for the low attractiveness faces, whereas their reaction times are significantly faster to the incongruent trials than to the congruent ones for the high attractiveness faces. The same happens for the intelligence level x congruency interaction, with slower reaction times to the incongruent trials only in the low intelligence faces. The difference between the reaction times to the congruent and incongruent trials in the high intelligence faces approaches significance, with faster reaction times in the incongruent trials.

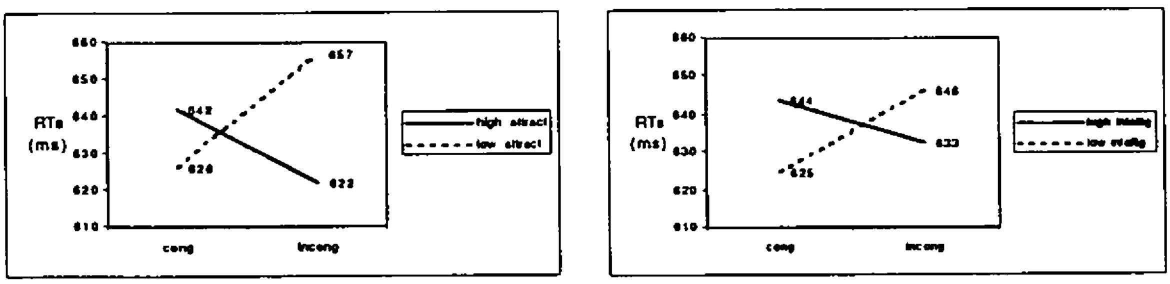


Figure 9.6: Mean reaction times for the congruent and incongruent trials both for the high attractiveness and low attractiveness faces, and for the high intelligence and low intelligence faces (high attract = high attractiveness faces; low attract = low attractiveness faces; high intellig = high intelligence faces; low intellig = low intelligence faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

These two interactions are supported and further explained by two other 3-way interactions that emerged from the analysis. So, there is an interaction between condition, attractiveness level and congruency [$F(1,22)=34.60$, $p<0.001$], which indicates that the previously mentioned interaction between attractiveness level and congruency only occurs in the attractiveness condition. In the intelligence condition, the congruency effect is not significant considering the attractiveness level of the faces, and there is only a tendency for overall slower reaction times in the low attractiveness faces in comparison with the high attractiveness faces (Figure 9.7).

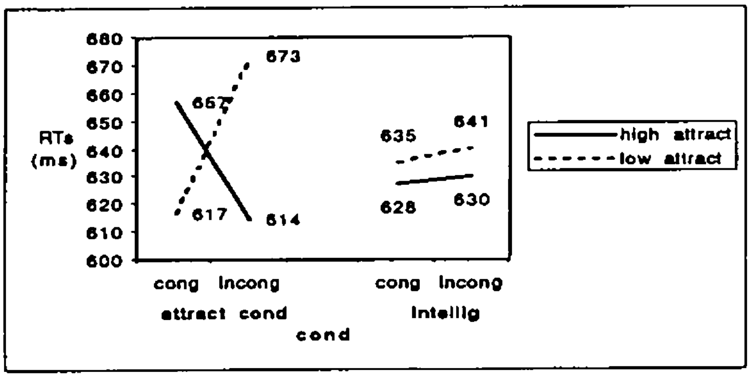


Figure 9.7: Mean reaction times in the Attractiveness and Intelligence Conditions for the congruent and incongruent trials within the high and low attractiveness faces (attract cond = attractiveness condition; intellig cond = intelligence condition; high attract = high attractiveness faces; low attract = low attractiveness faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

The other 3-way interaction is, similarly, between condition, intelligence level and congruency [$F(1,22)=6.35$, $p<0.05$], and also shows that the previously reported interaction between intelligence level and congruency is carried out by the results in the intelligence condition, as can be observed from Figure 9.8.

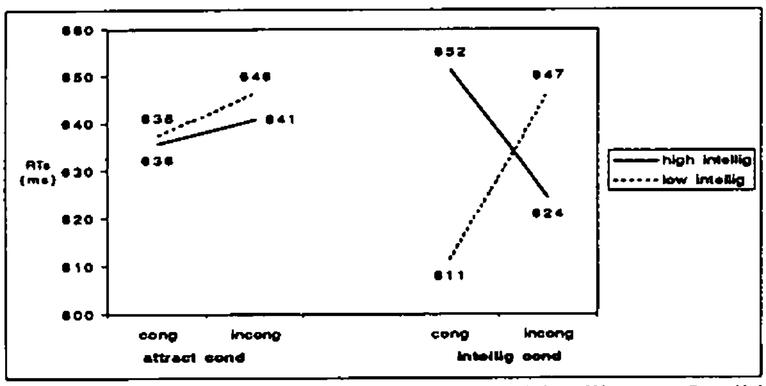


Figure 9.8: Mean reaction times in the Attractiveness and Intelligence Conditions for the congruent and incongruent trials within the high and low intelligence faces (attract cond = attractiveness condition; intellig cond = intelligence condition; high intellig = high intelligence faces; low intellig = low intelligence faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

Still two other 3-way interactions help to better specify what is happening in the previous 2-way interactions between attractiveness level and congruency, and intelligence level and congruency. The first of these interactions is between attractiveness level, face gender and congruency [F(1,22)=9.10, p<0.01]. As Figure 9.9 illustrates, this interaction indicates that the reversed congruency effect with significantly slower reaction times in the congruent trials for the high attractiveness faces is carried out by the male faces.

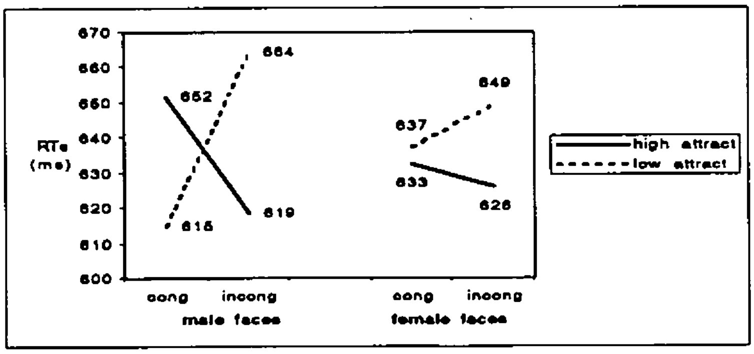


Figure 9.9: Mean reaction times for the male and female faces for the congruent and incongruent trials within the high and low attractiveness faces (high attract = high attractiveness faces; low attract = low attractiveness faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

The other relevant 3-way interaction can be observed in Figure 9.10 and is between intelligence level, face gender and congruency [F(1,22)=7.97, p<0.01]. Again, this interaction demonstrates that the reversed congruency effect previously mentioned with slower reaction times in the congruent trials for high intelligence faces is also carried out by the male faces.

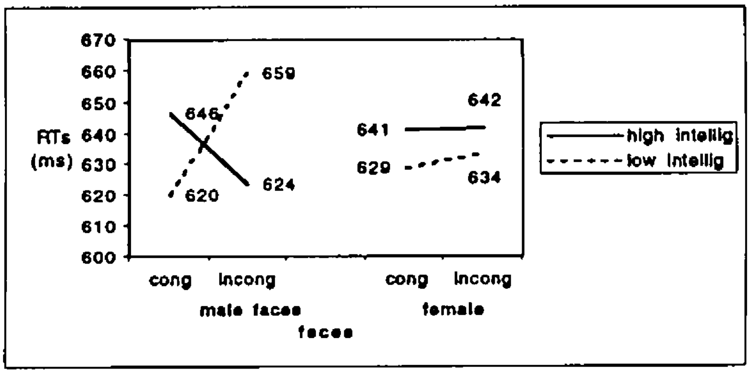


Figure 9.10: Mean reaction times for the male and female faces for the congruent and incongruent trials within the high and low intelligence faces (high intellig = high intelligence faces; low intellig = low intelligence faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

Two 4-way interactions were also found, that confirm and combine the above mentioned 3-way interactions. The first one is between condition, attractiveness level, face gender and congruency [$F(1,22)=6.50$, $p<0.05$] and can be visualised in Figures 9.11 and 9.12, where data was split according to the experimental conditions.

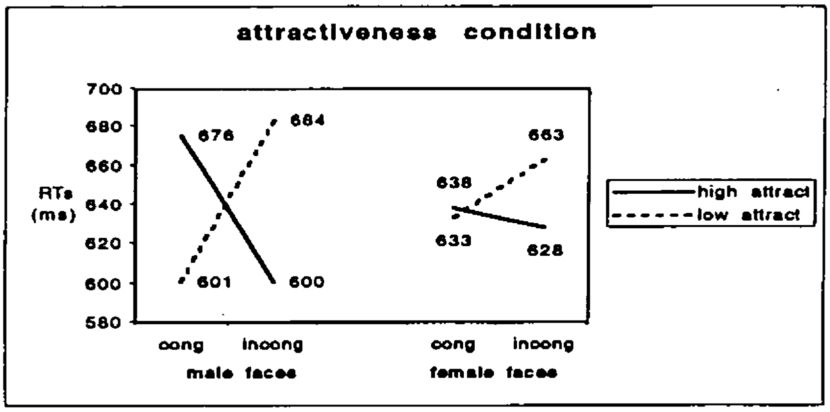


Figure 9.11: Mean reaction times in the congruent and incongruent trials, in the attractiveness condition, to male and female high and low attractiveness faces (high attract = high attractiveness faces; low attract = low attractiveness faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

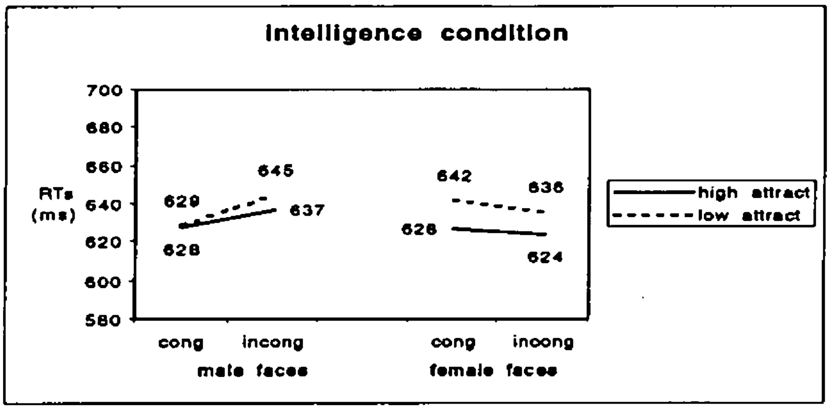


Figure 9.12: Mean reaction times in the congruent and incongruent trials, in the intelligence condition, to male and female high and low attractiveness faces (high attract = high attractiveness faces; low attract = low attractiveness faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

This interaction confirms the previous ones, showing that the unexpected congruency effect with significantly slower reaction times to the congruent trials in comparison with the incongruent trials is carried out by the high attractive male faces and is evident only in the attractiveness condition.

The other 4-way interaction that combines the previous ones only approaches significance but will still be mentioned as the tendency of the effects is evident from Figures 9.13 and 9.14, again with data separated between the two experimental conditions. This interaction is between condition, intelligence level, face gender and congruency [F(1,22)=3.12, p<0.1].

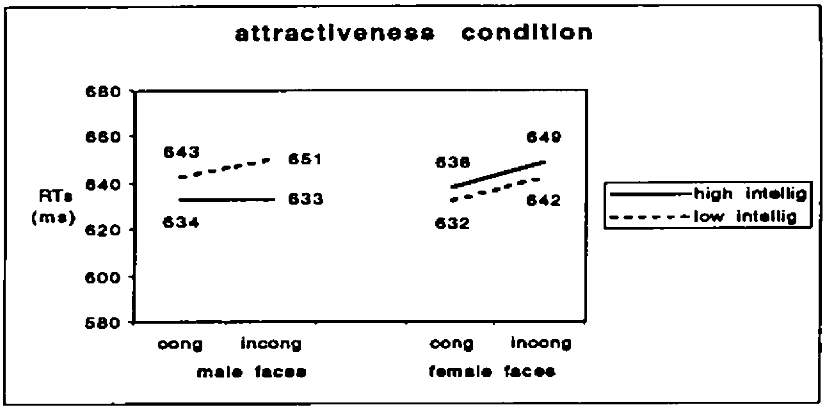


Figure 9.13: Mean reaction times in the congruent and incongruent trials, in the attractiveness condition, to male and female high and low intelligence faces (high intellig = high intelligence faces; low intellig = low intelligence faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

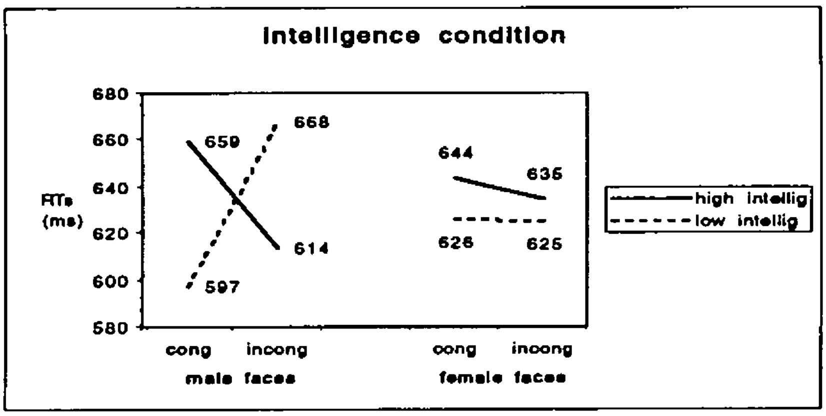


Figure 9.14: Mean reaction times in the congruent and incongruent trials, in the intelligence condition, to male and female high and low intelligence faces (high intellig = high intelligence faces; low intellig = low intelligence faces; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

As in the previous 4-way interaction, this one also seems to confirm that the reversed congruency effect previously reported for the high intelligence faces is carried out by the male faces and only occurs in the intelligence condition. So, the significantly slower reaction times in the congruent trials in comparison with the incongruent trials, which is contrary to what was expected, have occurred only for the high intelligence male faces in the intelligence condition.

A significant 3-way interaction between subject gender, attractiveness level and congruency also came up [$F(1,22)=4.95$, $p<0.05$], evidencing that the reversed congruency effect mentioned previously in the 2-way interaction between attractiveness level and congruency is mainly carried out by the female subjects (Figure 9.15). The difference between the reaction times in the congruent and incongruent trials for the high attractiveness faces is not significant for the male subjects, although there is also a tendency for faster reaction times to the incongruent faces.

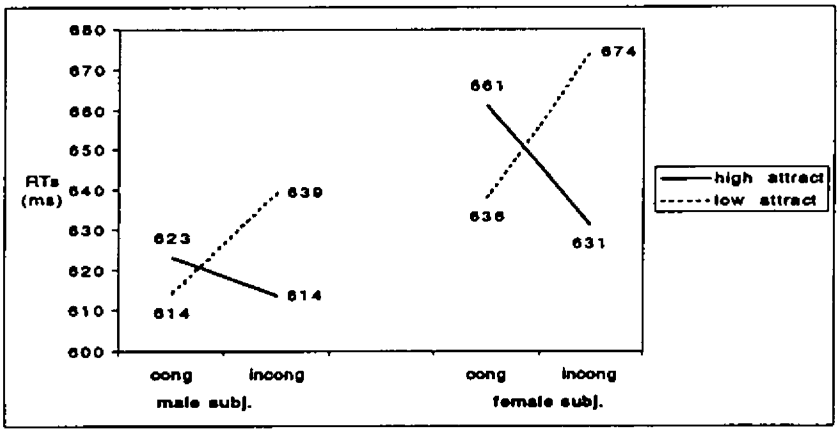


Figure 9.15: Mean reaction times from the male and female subjects in the congruent and incongruent trials for the high attractiveness and low attractiveness faces (high attract = high attractiveness faces; low attract = low attractiveness faces; male subj = male subjects; female subj = female subjects; cong = congruent trials; incong = incongruent trials; RTs = reaction times).

A 2-way significant interaction between intelligence level and face gender [$F(1,22)=9.31$, $p<0.01$), indicates that participants are significantly slower in responding to the high intelligence female faces than to the low intelligence female faces, and no similar effect is evident for the male faces. However, within the low intelligence faces, participants tend to be significantly slower in responding to the male faces than to the female faces (Figure 9.16).

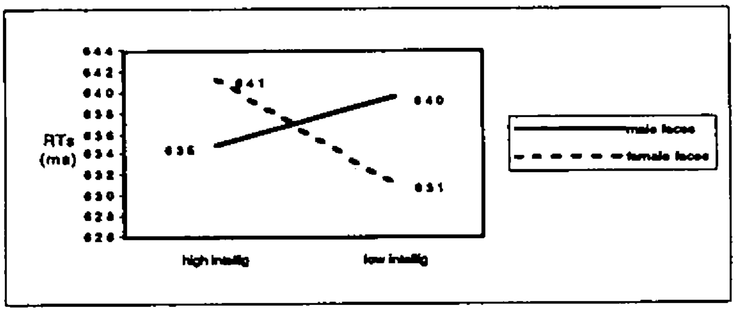


Figure 9.16: Mean reaction times from the male and female high and low intelligence faces (high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

A 4-way interaction between subject gender, condition, intelligence level and face gender that approaches significance [$F(1,22)=3.75$, $p<0.07$] shows that the previous 2-way interaction between intelligence level and face gender is mainly carried out by the male subjects in the intelligence condition and by the female subjects in the attractiveness condition, as can be observed in Figures 9.17 and 9.18.

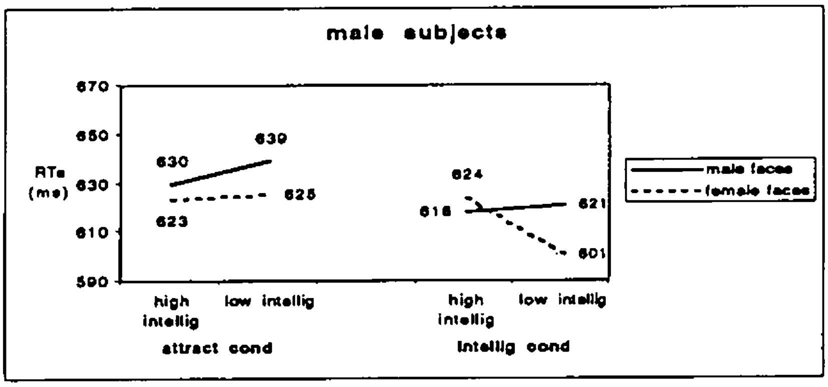


Figure 9.17: Mean reaction times from the male subjects to the high and low intelligence male and female faces, within attractiveness and intelligence conditions (attract cond = attractiveness condition; intellig cond = intelligence condition; high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

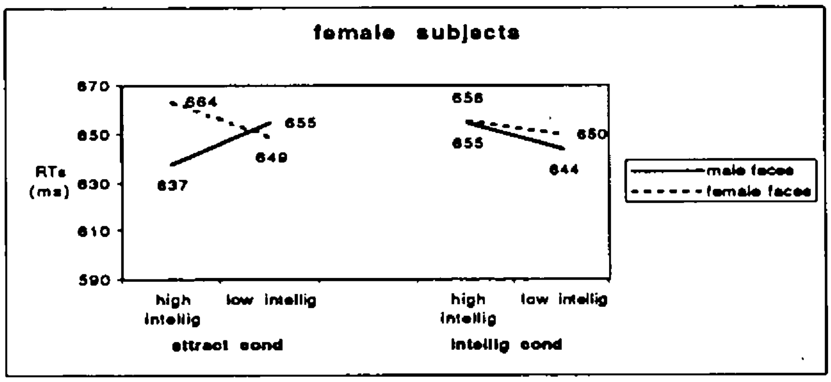


Figure 9.18: Mean reaction times from the female subjects to the high and low intelligence male and female faces, within attractiveness and intelligence conditions (attract cond = attractiveness condition; intellig cond = intelligence condition; high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

The 3-way interaction between condition, attractiveness level and intelligence level [$F(1,22)=4.36$, $p<0.05$] is displayed in Figure 9.19. As can be observed, in the Attractiveness Condition, participants take significantly longer to respond to the low intelligence and low attractiveness faces than to the high intelligence and low attractiveness faces. Within the low intelligence faces, the reaction times are significantly slower to the low attractiveness faces than to the high attractiveness faces. Considering the Intelligence Condition, the only significant difference is between the high and low attractiveness faces within the high intelligence faces, with slower reaction times to the low attractiveness ones.

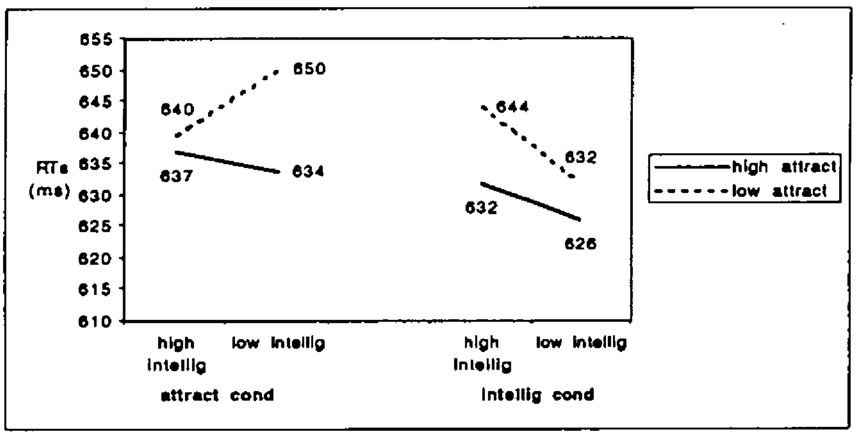


Figure 9.19: Mean reaction times in the Attractiveness and Intelligence Conditions for both the high and low attractiveness faces and the high and low intelligence faces (attract cond = attractiveness condition; intellig cond = intelligence condition; high attract = high attractiveness faces; low attract = low attractiveness faces; high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

There is also a 3-way interaction between attractiveness level, intelligence level and face gender [$F(1,22)=7.01$, $p<0.05$]. Simple main effects analysis revealed that, within the male faces, participants are significantly slower in responding to the low attractiveness faces than to the high attractiveness faces just when these are simultaneously low intelligence faces. The opposite happens with the female faces, as the significantly slower reaction times to the low attractive faces occur only for the high intelligence faces. Furthermore, for the male faces within the low attractiveness faces, participants take significantly longer to respond to the low intelligence faces than to the high intelligence faces, whereas the contrary happens with the female faces. So, for the female faces within the low attractiveness faces, participants have significantly slower reaction times to the high intelligence faces than to the low intelligence faces. These effects can be observed in Figure 9.20.

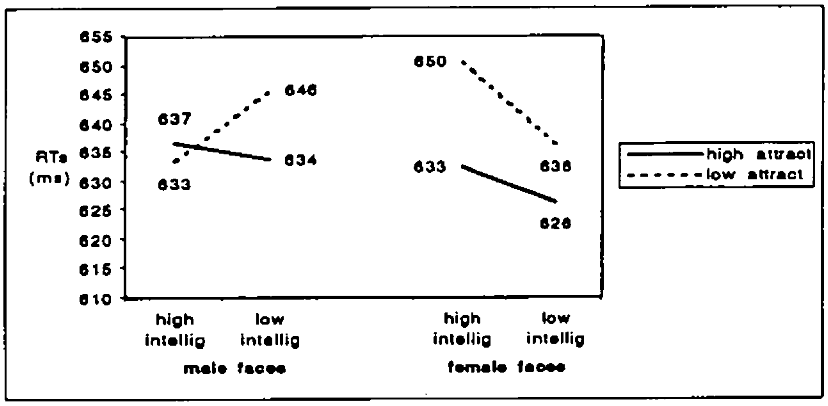


Figure 9.20: Mean reaction times for the male and female faces for both high and low attractiveness faces and high and low intelligence faces (high attract = high attractiveness faces; low attract = low attractiveness faces; high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

Finally, and important to the experimental predictions of this study, there is a 4-way interaction between Condition, Attractiveness Level, Intelligence Level and Congruency [$F(1,22)=8.63$, $p<0.01$]. Considering the aim of this experiment, it was important to examine this interaction in a way that would directly give evidence about how the level of attractiveness would influence the judgement of intelligence and *vice-versa*. So, simple main effects were conducted on the congruent and incongruent trials separately, for each of the experimental conditions. In this way, it would be possible to understand whether or not giving a congruent label related, for example, to intelligence to a face would be affected by the level of attractiveness of that same face. Figures 9.21 and 9.22 illustrate the simple effects from this 4-way interaction.

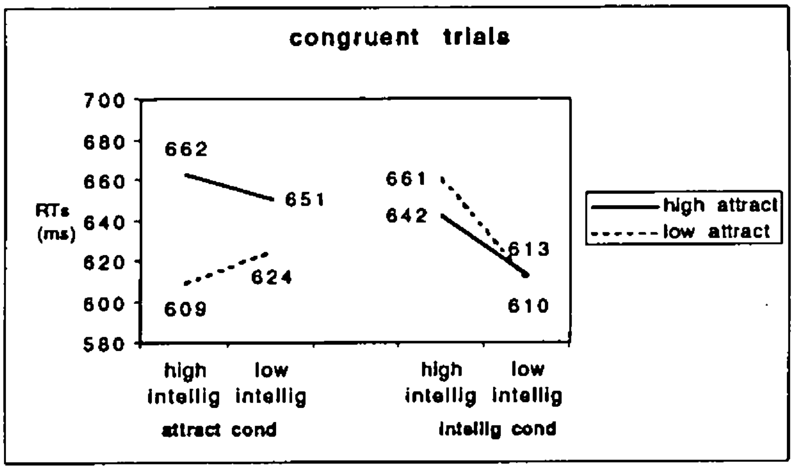


Figure 9.21: Mean reaction times on the congruent trials in the attractiveness and intelligence conditions, for both the high and low attractiveness faces and the high and low intelligence faces (attract cond = attractiveness condition; intellig cond = intelligence condition; high attract = high attractiveness faces; low attract = low attractiveness faces; high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

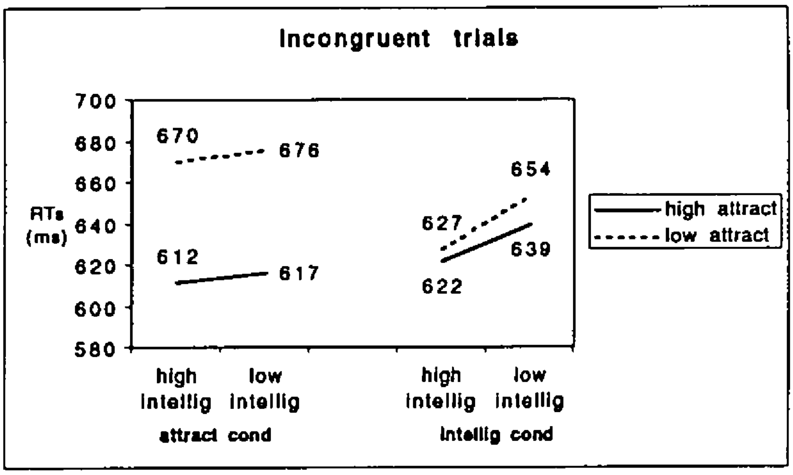


Figure 9.22: Mean reaction times on the incongruent trials in the attractiveness and intelligence conditions, for both the high and low attractiveness faces and the high and low intelligence faces (attract cond = attractiveness condition; intellig cond = intelligence condition; high attract = high attractiveness faces; low attract = low attractiveness faces; high intellig = high intelligence faces; low intellig = low intelligence faces; RTs = reaction times).

Simple main effects for the congruent trials revealed that, in the attractiveness condition, participants were significantly slower in responding to the high attractiveness faces than to the low attractiveness faces, both within the high and the low intelligence faces. Important is the observation that within the low attractiveness faces, the reaction times to the low intelligence faces tend to be longer than to the high intelligence faces. This is contrary to the predictions, as it suggests that it takes longer to say "unattractive" to a low attractiveness face when this face is also unintelligent than when it is perceived as an intelligent face.

In the congruent trials of the intelligence condition, however, participants were significantly slower to respond to the high intelligence faces when these were simultaneously low attractiveness faces than when they were also high attractiveness faces. This is in accordance with what was expected, and seems to indicate that it takes longer to say "intelligent" to a high intelligent face when this face is unattractive than when the face is highly attractive. This observation might indicate that there is an influence of the perceived attractiveness of a face on judgements about intelligence. Not so meaningful, there were also slower reaction times to the high intelligence faces both within the high and the low attractiveness faces.

As concerns the incongruent trials, simple main effects for the attractiveness condition only show that the reaction times are significantly slower to the low attractiveness faces, both within the high and low intelligence faces. This is a consequence of a main effect of attractiveness level also evident, with overall slower reactions to the low attractiveness faces when compared to the high attractiveness faces.

In the incongruent trials of the intelligence condition, simple main effects reveal another important effect, consistent with the experimental predictions. Participants are significantly slower to respond to the low intelligence faces when these faces are, at the same time, low attractiveness faces than when they are high attractiveness faces. This may suggest that it is more difficult to say "intelligent" to an unintelligent face when this face is also unattractive, than when the face is very attractive. Again, the attractiveness level of the face seems to influence the perceived level of intelligence. It can also be observed that within the low attractiveness faces, the reaction times are slower to the low intelligence faces than to the high intelligence faces.

9.4 Discussion

Physical attractiveness has been shown to influence the perception of other characteristics of the people (Bull & Rumsey, 1988; Dion, Berscheid & Walster, 1972), and this idea has been in the basis of the design of the third experiment. It was hypothesised that if another characteristic was manipulated simultaneously with facial attractiveness than, under this theory, it would be expected that the perception of that characteristic would be influenced by the level of attractiveness of the face.

So, in this experiment, attractiveness and intelligence were manipulated simultaneously, in such a way that there were four different sets of facial stimuli: high attractiveness and high intelligence faces, high attractiveness and low intelligence faces, low attractiveness and high intelligence faces, and low attractiveness and low intelligence faces. The experimental paradigm was similar to the one in the previous experiment, and the task was the same. But, there were only two experimental conditions, as there were only two characteristics of the faces that had been manipulated (attractiveness and intelligence). In the attractiveness condition, the verbal labels that the participants would have to say were related to attractiveness ("attractive" and "unattractive") and in the intelligence condition the verbal labels were related to intelligence ("intelligent" and "unintelligent").

The main objective of this experiment was to investigate whether the perception of the relevant dimension in each condition would be influenced by the experimental manipulation of the irrelevant dimension. In light of the findings that other personality characteristics are influenced by physical attractiveness, it was expected that the perception of intelligence in the Intelligence Condition (relevant dimension) would be influenced by the level of attractiveness of the faces (irrelevant dimension). However, the opposite was not expected, that is, it was not expected that the level of intelligence in the Attractiveness Condition (irrelevant dimension) would influence the perception of attractiveness (relevant dimension).

The hypothesised influence of the irrelevant dimension (attractiveness) in the Intelligence Condition was expected to influence the level of activation of the relevant dimension stereotype (intelligence stereotype), in terms of a facilitation or interference effect, and thus reflect on the participants' reaction times. For example, it was expected that having to say "intelligent" to an unintelligent face (incongruent trial in terms of the relevant dimension) would be easier if that face was simultaneously an attractive face (being a congruent trial in terms of the irrelevant dimension) than if the face was also unattractive (being an incongruent trial in both the relevant and irrelevant dimensions).

As in the previous experiments, the first analysis was concerned with the main congruency effect, in which it was expected that, in general, the reaction times in the incongruent trials would be slower than the reaction times in the congruent trials. However, as in experiment 2, a statistically significant main effect of congruency was not found, although a tendency towards slower reaction times in the incongruent trials could be observed, and again most markedly in the attractiveness condition.

Regarding the issue of investigating whether the perception of one characteristic would be influenced by the level of the other characteristic, another analysis was carried out with three within subjects factors: condition (attractiveness and intelligence), congruency (congruent and incongruent trials) and consistency (trials where the relevant and irrelevant dimensions were consistent, and trials where the relevant and irrelevant dimensions were inconsistent). Contrary to what was expected, this analysis also did not reveal any main effect. So, consistency did not prove to have a significant overall impact on the perception of the relevant dimension in each experimental condition.

Nevertheless, a two-way interaction between condition and consistency was found, indicating a significant effect of consistency in the attractiveness condition. Participants' reaction times were slower in the trials where the relevant and irrelevant dimensions are consistent in comparison with trials where both dimensions are inconsistent with each other. This result is actually in the opposite direction of the predictions, as faster reaction times were expected in the trials where both dimensions were consistent, and mainly in the intelligence condition. However, the difference observed in the mean reaction times between the two types of trials ($\mu_{consistent}$ = 644 ms; $\mu_{inconsistent}$ = 637 ms) is considerably small and could be due to a normal fluctuation in the participants' reaction times or sampling errors, thus not having any evident experimental meaning.

Another interaction resulted from this analysis, between condition, congruency and consistency. It can be observed that, in the intelligence condition, the difference between the consistent and inconsistent trials within the congruent trials, although not statistically significant, is in the expected direction, with a tendency for slower reaction times when the relevant and irrelevant dimensions are inconsistent with each other. In the attractiveness condition, that difference is in the opposite direction, although, as it has been said, it does not seem to be a meaningful result. The tendency observed in the intelligence condition suggests that it took slightly longer to say, for example, "intelligent" to an intelligent face when this face was simultaneously unattractive (the irrelevant dimension is incongruent) than when the face was simultaneously attractive (the irrelevant dimension is congruent). This might be taken to suggest that there could have been an influence of the level of the irrelevant dimension (attractiveness) on the activation of the facial stereotype related to the relevant dimension (intelligence), which is in line with the experimental predictions.

Similarly to the previous experiments, a subsidiary analysis was carried out with a six-way mixed design ANOVA (with subject gender as the between subjects factor, and condition, attractiveness level, intelligence level, face gender and congruency, as within subjects factors). Due to the complexity of this design, a considerable number of high order interactions have emerged, which have been fully mentioned in the results section. However, here only the more relevant ones in terms of the theoretical predictions and the experimental hypothesis will be mentioned.

A group of second and third order interactions revealed that participants were significantly slower in responding to the incongruent trials than to the congruent trials for the low attractiveness faces in the attractiveness condition, and for the low intelligence faces in the intelligence condition. These results are in line with the experimental predictions. However, the high level faces show a reversed pattern in each of the experimental conditions respectively, which was totally unexpected. That is, in the attractiveness condition, participants evidenced significantly faster reaction times in the incongruent trials than in the congruent trials for the highly attractive faces, and the same happened to the highly intelligence faces in the intelligence condition. Two other 4-way interactions (between condition, attractiveness level, face gender and congruency, and another one between condition, intelligence level, face gender and congruency) show that these reversed congruency effects for the high level faces in each of the experimental conditions are mainly carried out by the male faces in each condition. Thus, it might be hypothesised that there is something wrong going on with the male faces in this experiment, which is contributing to results which are in the opposite direction to the experimental predictions.

Finally, a four-way interaction between condition, attractiveness level, intelligence level and congruency was observed, which is quite important in relation to the experimental predictions of this study. This interaction suggested that in the congruent trials of the intelligence condition participants were significantly slower to respond to the high intelligence faces when these faces were simultaneously low in attractiveness then when they were also high in attractiveness. The results indicate that it takes longer to say "intelligent" to a high intelligence face when this face is also unattractive then when the face is very attractive.

Furthermore, in the incongruent trials of the intelligence condition, participants were significantly slower to respond to the low intelligence faces when these faces were at the same time low attractiveness faces than when the were high attractiveness faces. This may suggest that it is more difficult to say "intelligent" to an unintelligent face when this face is also unattractive, than when the face is highly attractive. These observations confirm the previously found interaction between condition, congruency and consistency in the initial analysis and are in accordance with the formulated hypothesis. So, there seems to be some evidence supporting the hypothesis that the perceived facial attractiveness has some influence on facial judgements about intelligence.

However, in the attractiveness condition, within the low attractiveness faces amongst the congruent trials, the reaction times to the low intelligence faces tended to be longer than to the high intelligence faces. This observation is in opposition to the predictions, as it suggests that it takes longer to say "unattractive" to a low attractiveness face when this face is also unintelligent than when it is perceived as an intelligent face. It was predicted that the perceived intelligence should not influence the perception of facial attractiveness, which seems to be contradicted by these results. And, even if any influence was expected, these results seem to be in the opposite direction of what would be predicted, as it was supposed that it would take less time to respond when both dimensions were congruent with the verbal label that would have to be attributed. Thus, this result can not be explained in terms of the theoretical predictions, and it is not possible to discard the possibility that it has been due to normal fluctuations in the participants' reaction times, as it has been previously suggested for the similar observation that emerged from the first analysis including Consistency between both dimensions as a factor.

SECTION III – GENERAL DISCUSSION AND CONCLUSIONS

10. General Discussion

The existence of facial stereotypes has been commonly accepted, as people show high agreement in personality judgements about other people based on their face. Numerous studies have found evidence for agreement on judgements of characteristics such as honesty, intelligence, attractiveness, intentions, occupation, etc., based on facial appearance (Abdi, 1986; Shepherd, 1989; Cook, 1939; Zebrowitz, 1998). The observation that facial stereotypes seem to be consistently held, despite their poor external validity, makes it interesting to better understand their underlying mechanisms.

In line with that interest, the present research work has been focused on the processes that underlie the activation of social stereotypes based on facial appearance. More specifically, these experiments have been designed to investigate the potential interference of the activation of social stereotypes, either in learning labels attached to male and female adult faces, or in the reaction times and response accuracy in an Irrelevant Feature Paradigm (a type of interference paradigm), based on Simon Paradigm (De Houwer, Hermans & Eelen, 1998; De Houwer & Eelen, 1998). The learning paradigm was chosen to maximise the possibility that the characteristics of the stimuli which are related to the corresponding stereotype would be picked up and processed in a way that would ensure the activation and application of the stereotype. In order to learn verbal labels attached to facial stimuli it would be necessary that some characteristics of the faces would be picked up and associated with the label. When the information to be learned was congruent with the facial appearance, the association between the physical traits and the verbal labels was expected to be easier and more effective than when the label and appearance were incongruent with each other, leading to slower reaction times when recalling the information in the incongruent trials than in the congruent trials. On the other hand, in the second and third experiments, participants were required to perform a gender decision task, which did not necessarily require that the facial characteristics associated with the stereotype would be processed in order to effectively give an answer.

The objective was to investigate whether the activation of the facial stereotype would automatically interfere with the performance on a task of this nature.

In the learning experiment, participants were first presented with a set of faces, one at a time, each one with a verbal label attached. In each experimental condition, participants were required to learn the verbal labels and recall them later on, in a task where they were presented the faces again and had to press one of two keys, according to the corresponding label. So, it was necessary to establish some association between the features of each face and the corresponding label. As the labels were directly related to each one of the traits that were manipulated during the experiment (for example, for intelligence the labels were "intelligent" and "unintelligent") it was expected that the facial stereotypes would be activated in the presence of the facial triggering stimulus. So, when participants were trying to extract features that would enable them to represent in memory an association between a certain face and a certain label, it was expected that their task would be facilitated when the label and the facial appearance were congruent in stereotypical terms. That is, if participants had to learn the label "intelligent" attached to a high intelligence face, the representation of that association would be much easier, less resource consuming and stronger than the association between the label "unintelligent" and a high intelligence face, as stereotype relevant information seems to be processed and detected with more ease when associated material needs to be represented in memory (Macrae, Stangor & Milne, 1994). The ease of representing that association would also be reflected in the time of retrieval, as the activation of the stereotype would facilitate the accessibility and recall of information that is congruent with the stereotype.

Many researchers have argued and demonstrated that stereotypes seem to operate as energy-saving devices that serve the important cognitive function of simplifying information processing and response generation (Bodenhausen & Lichtenstein, 1987; Gilbert & Hixon, 1991; Stangor & Duan, 1991; Macrae, Hewstone & Griffiths, 1993; Macrae, Milne & Bodenhausen, 1994). So, when a stereotype is activated, it is likely that subjects will pick up more readily the features that link the face and the verbal information, and this process would be more efficient when associating faces and stereotype congruent information. Thus, faster reaction times in the congruent trials are likely to be the result of an automatic use of stereotypes in associating the faces and the verbal information in terms of their stereotypical congruency.

In fact, in the learning paradigm, when examining the recall of information that was either congruent or incongruent with a certain facial stereotype, a preferential recall for information that is congruent with the stereotype has been demonstrated, as shown by a significant main effect of congruency across all experimental conditions. Participants have responded significantly faster in the congruent trials than in the incongruent trials for the three traits included in the study: attractiveness, intelligence and trustworthiness. It has then been argued that this observation could be taken to suggest that the facial stereotypes had been activated in the presence of the triggering stimuli, and, to some extent, this activation was supposed to be automatic. During the experiment there was no explicit mention to the facial appearance of the people displayed in the photographs and participants were deliberately told that the verbal labels had been randomly attributed to the faces. So, this means that the presence of the visual stimuli was enough to trigger the activation of the facial stereotype, which interfered with the recall of information that was incongruent with the stereotype, as suggested by the slower reaction times in the incongruent trials.

The results obtained from this study are consistent with other lines of research on stereotypes, as preferential recall for stereotype-consistent information has been demonstrated under high-load processing conditions (Stangor & Duan, 1991; Macrae, Hewstone & Griffiths, 1993). Furthermore, cognitive business seems to increase the likelihood that an activated stereotype will be applied (Gilbert & Hixon, 1991). It has also been demonstrated that, following stereotype activation, subjects process stereotype relevant information with more ease on tasks requiring the representation of associated material in memory. It seems that the representation of confirmatory information in memory after stereotype activation makes reduced demands upon perceivers' processing resources (Macrae, Milne & Bodenhausen, 1994; Macrae, Stangor & Milne, 1994). Moreover, once activated, stereotypes also appear to facilitate the detectibility of associated stereotypic information (Macrae, Stangor & Milne, 1994).

With respect to the recall of information in the incongruent trials, the strategy used by the participants is likely to be different from the one used in the congruent trials. In the incongruent trials, the facial stereotype was likely to be activated as well, due to the presence of the facial stimuli and to the label related to the dimension that had been manipulated in each condition. However, the information associated with the stereotype, that was also automatically activated, was of no use in learning the association between a certain facial stimulus and the corresponding label, as this was incongruent with the stimulus' features. So, both the representation of information in memory and its subsequent retrieval in the recalling task would not benefit from the activation of the stereotype, being consequently less efficient and more time consuming. Even if subjects tried to memorise the association in terms of "the face looking the opposite to the label meaning" (trying to make use of the activated stereotypical information), this would involve more steps in the mental process, being also time consuming and hindering the efficiency of retrieval of the information represented in memory. This would presumably be a conscious strategy and subjects would probably be more aware of the need to associate the face and the verbal information in some way, than in the congruent trials. As is well known, conscious processes are more time consuming and less effective than automatic ones. Because of this, the responses were expected to be slower in the incongruent trials, in comparison with the congruent trials, which actually happened, giving some support to the theoretical predictions.

Some studies have found evidence for a superior recall of incongruent information, challenging the common assumption that perceivers are always more likely to attend and remember information that is congruent with their expectations (Hamilton, Driscoll & Worth, 1989; Hastie & Kumar, 1979; Sherman & Hamilton, 1994; Srull, Lichtenstein & Rothbart, 1985; Wyer & Gordon, 1982). An *inconsistency-resolution process* has been suggested to account for these results (Srull & Wyer, 1989). According to this process, the difficulty of integrating incongruent information with previously existing impressions requires additional thought, and results in the establishment of more associative pathways between the incongruent items and the pre-existing information, in order to resolve the apparent inconsistency of that information during the encoding process. As a result of this enhanced associative activity, there will be more retrieval routes leading to those items, increasing the probability that they will be assessed during recall, which may contribute to better recall of incongruent information. On the other hand, expectancy-congruent and irrelevant information is processed rather effortlessly, and those items are represented only in association with the target node, having a lower probability of being retrieved (Srull & Wyer, 1989; Srull, 1981).

However, this *inconsistency-resolution process* has been demonstrated to be less likely to occur under certain processing conditions, and, consequently, the superior recall of congruent information will prevail under those conditions (Bodenhausen & Lichtenstein, 1987; Macrae, Hewstone & Griffiths, 1993; Srull, Lichtenstein & Rothbart, 1985; Stangor & Duan, 1991; Stangor & McMillan, 1992; Stern, Marrs, Millar & Cole, 1984; Wyer, Srull & Gordon, 1984). One of the conditions under which the inconsistency-resolution process is less likely to occur is with high-load processing conditions, as there are not enough available resources to carry out that process (Macrae, Hewstone & Griffiths, 1993; Stangor & Duan, 1991). The results from the learning experiment do not show any evidence for the operation of an inconsistency-resolution process, as the reaction times are clearly slower in the incongruent trials. This may suggest that the task conditions were sufficiently demanding and resource constraining to hinder the occurrence of any inconsistency-resolution process during the mental representation of the stereotypical-inconsistent information. In fact, the facial stimuli were presented fairly quickly after each other, and participants were required to learn the label associated with each stimulus after only one presentation, in blocks of 10 different faces of the same gender presented sequentially and in random order, which can be considered as quite demanding processing conditions.

Thus, the evidence from the learning experiment suggests that, after the activation of facial stereotypes, participants show superior recall of stereotype congruent information under fairly restrictive processing conditions. Altogether, the evidence supports the existence of facial stereotypes (at least for the dimensions included in this study, which were attractiveness, intelligence and trustworthiness), which produced the same effects as other social stereotypes, that have been thoroughly investigated in the social psychology literature.

Despite this overall main effect of congruency, it also became evident from Experiment 1 that participants were generally slower in the incongruent trials than in the congruent trials for the high level faces, but not for the low level faces, both in the attractiveness and in the intelligence conditions. However, the results for the trustworthiness condition were in the opposite direction, with slower reaction times in the incongruent trials only for the low trustworthiness faces, and not for the very trustworthy faces.

Although not initially expected, these results might be better understood by looking at the different social importance of the three traits. As indicated by the results, there seems to have been an effect of the activation of facial stereotypes only for the high attractiveness and high intelligence faces, and for the low trustworthiness faces. The attractiveness stereotype could be considered to be socially more important and valued in its positive pole (highly attractive faces) than in its negative pole (unattractive faces), as seems to be demonstrated by the *attractiveness halo effect* (Zebrowitz, 1998). According to this effect, highly attractive people seem to be also positively regarded in a number of other aspects, such as personality traits, social desirability, occupations, life achievements, etc. (Bull & Rumsey, 1988; Dion, Berscheid & Walster, 1972). Thus, it is conceivable that people could be mostly influenced by highly attractive faces, which could have contributed to the stronger influence of the activation of the attractiveness stereotype on the reaction times to the high attractiveness faces than to the low attractiveness faces.

The same logic can be applied to the perception of intelligence, as the high professional and social demands of the world in which we live nowadays certainly place a great importance on that personal characteristic. So, in the same way as attractiveness, a "high intelligence" face could be more influential than a low intelligence face, due to the social value of its detection, and could be considered a stronger triggering stimulus in terms of the effects of the activation of the intelligence facial stereotype.

Regarding trustworthiness, it can be considered that its detection is most valued exactly in the opposite direction. That is, if we consider an evolutionary perspective, the quick detection of untrustworthy individuals would be highly adaptive, in terms of protection, to avoid threatening and dangerous situations. So, the strongest influence of the activation of the trustworthiness facial stereotype on participants' reaction times for the low trustworthiness faces could be due to a natural advantage to detect more readily untrustworthy faces.

In fact, Öhman, Flykt & Lundqvist (1999) have presented some evidence supporting the idea of a special tuning for the detection of potentially threatening stimuli, as the detection of threatening (angry) schematic faces seems to be faster than the detection of non-threatening (happy) faces. Moreover, Adolphs *et al.*'s patients (Adolphs, Tranel & Damasio, 1998) judged unfamiliar faces as being significantly more trustworthy and more approachable than did control-subjects. This seems to suggest that bilateral amygdala damage strongly impairs the ability to extract from faces the information that is relevant to make social judgements in line with the social stereotypes consistently attributed by the majority of the subjects. The human amygdala appears to be implicated in triggering the retrieval of socially and emotionally relevant information in response to facial stimuli, and reinforces the possible natural advantage to the detection of threatening faces.

In Experiment 2, the same set of facial stimuli and the same dimensions as in Experiment 1 have been used (attractiveness, intelligence and trustworthiness). However, a new paradigm was introduced. The experimental design was based on an Irrelevant Feature Paradigm, which is a type of interference paradigm, based on the affective Simon Paradigm (De Houwer, Hermans & Eelen, 1998; De Houwer & Eelen, 1998). In this experiment, the main task was a gender decision task, and participants would have to say aloud a verbal label when they saw a female face and a different verbal label if they saw a male face. This type of irrelevant feature paradigm involves a *relevant feature* that determines what the correct response should be (in this case, it is face gender), an *irrelevant feature* that should be ignored (which is the manipulated dimension of the facial appearance: attractiveness, intelligence or trustworthiness), and a *response*, that is meaningfully related to the irrelevant feature but not to the relevant feature (the verbal label that participants have to say aloud; for example, in the attractiveness condition, the labels were either "attractive" or "unattractive").

Again, participants' reaction times were closely examined, having in mind the expected differences between the congruent and incongruent trials. Despite the evident tendency towards slower reaction times in the incongruent trials than in the congruent trials across the three dimensions included in the experiment, no significant main effect of congruency was found. This observation might be due to the particular nature of the task used in this experiment. As it has been said, it was a gender decision task, which can be considered to be quite an easy task and can be performed by relying on certain characteristics of the face that might require only a fairly superficial processing of the facial features. The gender of a facial stimulus can probably be determined before other information about the facial features is processed automatically. To make a gender decision task, people may rely mainly on features such as length of hair, overall face shape, mouth shape, etc., and not process the face as a whole, with all its characteristics, which may be insufficient to process the facial characteristics that might be associated with the facial stereotypes. So, an influence of the activation of the stereotype on participants' reaction times could not be clearly evident in a task of this nature.

It was initially expected that the activation of the facial stereotype would be strong enough to have a significant differentiated effect on the reaction times to the congruent and incongruent trials. However, this proved not to be the case, and there seems to be a reason to believe that this was due to the nature of the task, especially when compared with the results from the previous experiment, where a significant congruency effect was evident for all the three dimensions.

Another point could be made, regarding the specific instructions used in this experiment, in comparison with the instructions used by De Houwer, Hermans & Eelen (1998), in the original affective variant of Simon Paradigm, in which the present experiment was based. In De Houwer, Hermans & Eelen's experiment, participants were explicitly informed that all the persons in the photographs could display a negative, a positive or a neutral expression, but that this was unimportant and had to be ignored. However, in the present experiment, no mention of the manipulated dimension of the faces was made during the whole experiment. This aspect could be taken to argue that the conditions were not enough to possibly activate the facial stereotypes, and that would be why there was no evident congruency effect. However, it does not seem highly probable that this might have happened, as the labels were obviously related to the manipulated facial dimensions and they were presented with stimuli had had been consistently rated as high and low in the corresponding characteristics. Besides that, in the previous experiment there was also no mention to the three dimensions, and the presence of the same facial stimuli together with the same labels as in experiment 2 was enough to activate the facial stereotypes. So, there seems to be a basis to believe that the obtained results are directly related to the nature of the present task, and not to the specific instructions that were given.

Further analysis of the data revealed a significant effect of congruency within the female faces in the attractiveness condition. That is, participants were significantly slower in responding to the incongruent trials than to the congruent trials, in relation to the female faces when attractiveness was manipulated. Given the previously explained nature of the present task, it is not totally surprising that a congruency effect had emerged only in the attractiveness condition. In fact, attractiveness is probably the dimension that is more readily judged from facial appearance and that most influences perceivers. So, it makes sense that the attractiveness stereotype is more accessible and that the information that is associated with it is more strongly represented, being more readily picked up and having more automatic effects on people's reactions and perceptions.

The explanation of the fact that the congruency effect was only significant for the female faces within the attractiveness condition seems to be less obvious. Nonetheless, it might be understood if the assumption that attractiveness is a characteristic that is more promptly judged and more valued in women than in men has in fact some validity. In a task where faces are perceived in a very quick way, in order to make a very fast and easy decision, it is likely that only if the facial stereotype is very strong, its automatic activation will interfere with the task performance and have an influence on participants' reaction times. And it would not be entirely surprising that the female facial attractiveness stereotype would be comparatively stronger than the male facial attractiveness stereotype, originating the observed results.

Another unexpected result was the congruency effect within the low level faces, but not within the high level faces, across the three traits. Participants were slower in responding to the incongruent trials than to the congruent trials amongst the low level faces (unattractive, unintelligent or untrustworthy faces), but the same effect was not present for the high level faces. At first glance, this result could seem contradictory with the findings from the previous experiment. However, a different explanation might be able to account for the observed results. Regarding trustworthiness, the results are in line with the previous experiment, with a congruency effect only within the low level faces. As already mentioned, this might be due to a kind of evolved mechanism to detect preferentially untrustworthy faces, in order to increase protection against threatening or dangerous situations.

However, for attractiveness and intelligence, the results seem more puzzling. Due to the previously mentioned reasons, mainly social ones, it is probable that people have stronger representations of the positive poles of the attractiveness and intelligence facial stereotypes. So, it seems reasonable to believe that it would be more difficult to say the label "attractive" when looking at an "unattractive" face then the opposite, especially in a task of this nature. That is, the visual stimulus is present only for a very short time and its processing should only be the absolutely necessary to make a gender decision. So, it might be possible that the weight of the verbal label could be more interfering with task performance than the visual stimulus itself, leading to a congruency effect only in the observed direction (that is, only for the low level faces), in this type of experimental paradigm.

Whereas in the previous experiment participants had to learn to associate a certain label to a certain facial stimulus, in the present experiment they only had to give a verbal response (attribute a label) according to the gender of the perceived face. As the positive pole of the stereotype is believed to be more strongly represented and have a bigger social importance, it could seem more difficult to attribute the verbal label "attractive" to a visually unattractive face (incongruent trials for the low level faces) than to attribute the verbal label "unattractive" to a visually attractive face, because the first label has a stronger stereotypical representation. And the same reasoning can be applied to both attractiveness and intelligence. Accordingly, a congruency effect with slower reaction times for the incongruent trials would be expected for the low level faces, but not for the high level faces, in both dimensions, which would fit what was observed.

Nevertheless, further analysis suggested that this effect is mainly carried out by the female subjects in response to the male faces. So, the possibility that the observed effect is, in part, due to some gender related issue, or any peculiar characteristics of the specific set of faces used in this experiment, can not be discarded. However, issues more related to gender differences are beyond the scope of the present work, and will not be further explored.

Experiment 3 was designed based on the claim that physical attractiveness seems to influence the perception of other characteristics (Bull & Rumsey, 1988; Dion, Berscheid & Walster, 1972). In line with this idea, it was hypothesised that, if another characteristic was manipulated simultaneously with facial attractiveness, than it would be expected that the perception of that characteristic would be influenced by the level of attractiveness of the face. However, the contrary was not predicted and the level of the other characteristic was not expected to influence the perception of attractiveness. So, in this experiment, attractiveness and intelligence were manipulated simultaneously, and this time a different set of faces from the previous experiments had to be selected. The experimental paradigm was again an Irrelevant Feature Paradigm, similar to the one in Experiment 2, and the main task was also a gender decision task.

Results have suggested that, in the intelligence condition, there was a tendency towards slower reaction times when the relevant (intelligence) and irrelevant (attractiveness) dimensions are incongruent with each other. This is in line with the experimental predictions, and might be taken to suggest that there was an influence from the level of the irrelevant dimension (attractiveness) on the activation of the facial stereotype corresponding to the relevant dimension (intelligence). Results seem to indicate that it took slightly longer to say, for example, "intelligent" to an intelligent face when this face was simultaneously unattractive (the irrelevant dimension is incongruent) than when the face was simultaneously attractive (the irrelevant dimension is congruent).

However, a significant consistency effect was also found for the attractiveness condition, but it was in fact in the opposite direction. That is, participants were slower in the trials where the relevant and irrelevant dimensions were consistent, in comparison with the trials where both dimensions are inconsistent with each other. However, the very small difference in the mean reaction times between the two types of trials (only 7ms) and the fact that this result was totally unexpected, might be taken to support the possibility that this result was due to a normal fluctuation in the participants' reaction times or to sampling errors.

Subsequent analysis also revealed a four-way interaction between condition, attractiveness level, intelligence level and congruency, which gives further support to the experimental predictions of this study. This interaction suggested that, in the congruent trials of the intelligence condition, participants were significantly slower to respond to the high intelligence faces when those faces were simultaneously low in attractiveness then when they were also high in attractiveness. As in the example given above, it seems to take longer to say "intelligent" to a high intelligence and unattractive face than to a high intelligence and very attractive face. Moreover, in the incongruent trials, also of the intelligence condition, participants were also slower in responding to the low intelligence and low attractiveness faces, than to the low intelligence but high attractiveness faces. So, it seems that it is more difficult to say "intelligent" to an unintelligent and unattractive face, than to an unintelligent but attractive face, which is exactly in line with the experimental predictions. So, this evidence seems to give support to the observation that perceived facial attractiveness has some influence on judgements about other characteristics of the people, namely on facial judgements about intelligence, as it is suggested by this experiment.

Regarding the analysis of congruency effects, similarly to the previous experiment, data suggested again a tendency towards overall slower reaction times in the incongruent than in the congruent trials, in both conditions, but more markedly for attractiveness, although this effect was not overall statistically significant. Thus, there seems to exist in fact a tendency for a congruency effect, that replicates across studies, and it is necessary to give some thought to the idea that its non-significance might be indeed due to the specific characteristics of the present experimental paradigm.

Similarly to Experiment 2, a congruency effect only amongst the low level faces, both for attractiveness and intelligence, also emerged in Experiment 3. Again, participants were significantly slower to respond to the incongruent trials than to the congruent trials only within the low attractiveness and low intelligence faces. As the experimental paradigm is the same both in Experiment 2 and Experiment 3, the replication of this effect, which was not initially expected, gives some support the possible explanation that was suggested above. It might be, indeed, that this effect is due to the higher social importance of the positive poles of both the attractiveness and the intelligence stereotypes, and the specific cognitive demands of the task used in this experiment. So, it seems that, at least under certain conditions, the effect of the stereotypical information activated by a verbal label may be stronger then that of similar stereotypical information, but activated by a visual stimulus, in this case, a face.

Again, this effect was carried mainly by the male faces. As the set of faces used in this experiment was different from the one used in Experiment 2, it might be worth thinking what it is about the male faces that contributes to these effects, and not so much that there is something about this specific set that is causing the effect. However, as it has been said, exploring issues related to stereotypical gender differences was not within the aims of the present research, and will not be further discussed at the moment.

10.1 Conclusions and Further Directions

The present experimental work has provided evidence that supports the existence of facial stereotypes, as has been previously suggested by research showing that people tend to agree notably on their judgements of other people's attractiveness, intelligence, honesty, intentions, occupations, etc., based on facial appearance (Abdi, 1986; Shepherd, 1989; Cook, 1939; Zebrowitz, 1998). In the present studies, the stereotypes that have been addressed were related to attractiveness, intelligence and trustworthiness. Moreover, the data presently obtained suggests that facial stereotypes seem to operate based on fairly the same mechanisms that the vast research in social psychology and social cognition has demonstrated to underlie other types of social stereotypes.

Specifically, the present work has provided evidence for preferential recall of stereotype congruent information, after automatic activation of the facial stereotype, under fairly high load processing conditions, in a learning paradigm. The first experiment not only demonstrated that facial stereotypes could be activated, but also that they influence the representation in memory of information that is associated with the stereotype. In order to better learn arbitrary labels, some of the information extracted from the faces had to be ignored (due to the existence of incongruent trials), and it was demonstrated that that information can not be ignored. These observations are compatible with similar previous findings about information describing social groups or occupational groups (Stangor & Duan, 1991; Macrae, Hewstone & Griffiths, 1993). The learning paradigm format was believed to maximise the probability that stereotypical information would be picked up and used for the representation of the information in memory, in such a way that stereotype activation would facilitate the recall of congruent information and interfere with the recall of incongruent information. The results support this hypothesis, evidencing a congruency effect with slower reaction times in the incongruent trials than in the congruent ones.

The following two studies (Experiment 2 and Experiment 3) using an interference paradigm did not show a significant main effect of congruency, although a tendency towards that congruency effect has been found in both experiments. The fact that a significant congruency effect was not observed might suggest that the task used in this paradigm (a gender decision task) did not require the actual processing of the characteristics that are associated with the facial stereotypes. It is probable that a gender classification task could be performed relying on cues different from the ones related to the stereotypes.

In the second experiment, a congruency effect has been demonstrated only for the female faces in the attractiveness condition. Attractiveness is one of the more readily judged characteristics from people's facial appearance, due both to its social importance (Bull & Rumsey, 1988) and to its claimed biological and evolutionary importance (Thornhill & Gangestad, 1999). Thus, it is not surprising that the attractiveness facial stereotype is one of the strongest ones, if not the strongest one, having also stronger representations of the information associated with it. So, it is likely that, in a task that does not require detailed processing of the facial features, only a very strong stereotype will probably be automatically activated and show an effect on task performance. That is probably why, in such a paradigm, the only effect due to stereotype activation was observed for the female faces when attractiveness was manipulated.

Some evidence has also been presented that supports the idea that facial attractiveness influences the way people are perceived in other personality and social dimensions (Bull & Rumsey, 1988; Dion, Berscheid & Walster, 1972). Specifically, it has been observed that the level of attractiveness of the face influenced the perception of intelligence. Participants took longer to respond in the congruent trials for intelligence when the faces were high in intelligence and low in attractiveness than when the faces were high in both dimensions. In the incongruent trials, also in the intelligence condition, responses were slower to the low intelligence and low attractiveness faces than to the low intelligence but highly attractive faces.

These results are consistent with the idea that the perceived attractiveness had an influence on how intelligence was perceived, mediating as well the effects of the activation of the intelligence facial stereotype. Attractiveness seems either to enhance or decrease the perceived intelligence, in such a way that an intelligent face that also looks unattractive will probably seem less intelligent, and an unintelligent looking face that is at the same time very attractive will probably seem a bit more intelligent. This effect had, in turn, an influence on the congruency effect of the intelligence stereotype, affecting participants' differential performance on the congruent and incongruent trials.

Although some of the data from these studies give support to part of the experimental predictions and are in line with the main theoretical lines underlying this research work, one should be careful about the conclusions that can be drawn. The research in this specific field, addressing the issue of facial stereotypes through a cognitive and experimental approach, is scarce, and although it is tempting to make some assumptions based on the present results, further research is necessary to consolidate and investigate in more detail the facts now observed.

It would be necessary to be able to generalise the conclusions from these studies to other different sets of faces. In this type of studies, unless some replications with different sets of stimuli are made, it is not possible to rule out the chance that some of the observed effects are due to specific characteristics of this particular set of faces. Although the individual ratings and high inter-rater agreement give a reasonably good guarantee on the reliability of the selected stimuli, it is always advisable to replicate the same findings in other studies.

Moreover, in order to increase the reliability of the selected stimuli in terms of the consistency with which they are judged in the different dimensions, it might be argued that the faces should be rated by a larger number of raters. However, as the age and culture of the raters themselves and of the participants in the experimental studies were similar, and there was significant inter-rater agreement about the judgements on the different traits, it is possible to be confident about the ratings obtained for these studies. Nevertheless, it would be interesting to carry out similar experiments with both raters and participants from other age groups, to investigate to what extent do the different facial stereotypes and its effects hold on across different age groups.

It might also be profitable to have a larger number of facial stimuli in the original database. This would increase the probability of finding stimuli varying simultaneously in all the dimensions included in the study, in order to control better for some variables. In the last experiment that was carried out, it was not possible to absolutely control for all the variables, having sets of faces that differed between them only in the manipulated dimension. For instance, all the high attractiveness and low intelligence faces tended to be mainly of young people, while the low attractiveness and high intelligence faces belonged mainly to older people. Although a database of 600 photographs seemed initially large and varied enough, it might be desirable to have even a larger database, to increase the variation amongst the different dimensions.

In terms of future directions, it would also be interesting to manipulate other dimensions, such as facial distinctiveness or age. Those dimensions could be manipulated together with the target characteristic (attractiveness, intelligence, etc.), in order to explore whether those variables would have any effect on the perception of the other characteristics and on the possible activation of facial stereotypes.

The present research work made used of both a learning paradigm and an irrelevant feature paradigm. It would be important to explore the nature of the processes underlying the activation and application of facial stereotypes on other paradigms, namely different types of priming paradigms or interference paradigms. Additional conclusions about the automaticity of those processes could then be withdrawn, hopefully giving further support to the initial observations based on the current work.

Evidence for the automatic activation of facial stereotypes and their influence to recall arbitrary information attached to a face has been found in the present studies. Participants seemed to have automatically associated the facial stereotypical information with the verbal labels that they were required to learn, which hindered the representation and recall of information that was incongruent with the facial appearance. Participants were not explicitly instructed to make the association between the face and the label in terms of the faces' stereotypical appearance, so this seems to have been an automatic strategy. The effective learning of arbitrary information requires that stereotypical information be ignored. However, the activation of the facial stereotypes could not apparently be switched off, as participants showed a significant superior recall of stereotype congruent information, in the form of significantly faster reaction times in the congruent trials than in the incongruent ones.

This effect was observed for all the dimensions included in the studies, which were attractiveness, intelligence and trustworthiness. Despite the thoroughly investigated importance of attractiveness on person judgement, intelligence and trustworthiness have not been so many times in the spot of researchers' attention. Thus, these results are important in supporting the existence of stereotypes for facial appearance for other characteristics besides attractiveness, namely, intelligence and trustworthiness. However, the results from a different paradigm, using a task with different requirements in terms of face processing (a gender decision task) only showed significant congruency effects for attractiveness. This observation also reinforces the idea that attractiveness might be one of the characteristics more quickly and automatically judged based on facial appearance, eventually supporting the evolutionary perspective on the importance of the detection of attractiveness (Thornhill & Gangestad, 1999).

Moreover, some evidence has also been found supporting the hypothesis that physical attractiveness influences the perception of other characteristics based on facial appearance. Those observations give experimental support to the commonly accepted stereotype of "what is beautiful is good" (Dion, Berscheid & Walster, 1972). The perception of intelligence and the effects of stereotype activation in the performance on congruent and incongruent trials seem to have been moderated by the attractiveness level of the faces.

There are several personality characteristics that people usually believe they can judge from other's facial appearance. So, it is likely that, similarly to intelligence, trustworthiness and attractiveness, the facial stereotypes for those characteristics might also be activated in the presence of the facial stimuli. It would be important and interesting to investigate if the observed results of the present research work replicate in relation to other stereotypes.

In conclusion, the evidence provided by these studies can be considered encouraging. The activation of facial stereotypes has been demonstrated in a learning paradigm, which gives support to the social reality of these stereotypes. Moreover, stereotype activation has been shown to automatically influence the representation of information in memory and interferes with the recall of stereotype consistent and inconsistent information. Regarding an irrelevant feature paradigm involving a gender decision task, stereotype activation only seemed to have a significant effect on task performance when attractiveness was manipulated. This is probably related to the intrinsic nature of the task, and gives further support to the social relevance of attractiveness and to its claimed biological and evolutionary importance. Moreover, the evidence also supports the idea that facial attractiveness seems to influence the perception of other characteristics from the face, namely intelligence. Thus, the present research work is believed to have demonstrated that facial stereotypes are a valid research area that could be fruitfully explored in further studies.

References

ABDI, H. (1986). Faces, Prototypes, and Additive Tree Representations. In: Hadyn D. Ellis, Malcolm A. Jeeves, Freda Newcombe & Andy Young (Eds.), *Aspects of Face Processing* (pp. 178-184). NATO ASI Series, Series D: Behavioural and Social Sciences, No. 28. Lancaster: Martinus Nijhoff Publishers.

ACORN, D. A., HAMILTON, D. L. & SHERMAN, S. J. (1988). Generalization of biased perceptions of groups based on illusory correlations. *Social Cognition, 6*, 345-372.

ADOLPHS, R. & TRANEL, D. (1999). Preferences for visual stimuli following amygdala damage. *Journal of Cognitive Neuroscience, 11(6)*, 610-616.

ADOLPHS, R., TRANEL, D. & DAMASIO, A. R. (1998). The Human Amygdala in Social Judgement. *Nature, 393*, 470-474.

ADOLPHS,R. (1999). Social cognition and the human brain. *Trends in Cognitive Sciences, 3(12)*, 469-479.

ALLEY, T. R. (1988). Physiognomy and Social Perception. In: T. R. Alley (Ed.), *Social and Applied Aspects of Perceiving Faces* (pp. 167-186). New Jersey: Lawrence Erlbaum Associates.

AUGOUSTINOS, M. & WALKER, I. (1995). *Social Cognition: An Integrated Introduction* (pp. 207-261). London: Sage Publications.

BARGH, J. A. (1994). The Four Horsemen of Automaticity: Awareness, Intention, Efficiency and Control in Social Cognition. In: Robert S. Wyer Jr. & Thomas K. Srull (Eds.), *Handbook of Social Cognition, Volume 1: Basic Processes, 2nd ed* (pp. 1-40). New Jersey: Lawrence Erlbaum Associates.

BARGH, J. A. (1997). The Automaticity of Everyday Life. In: Robert S. Wyer Jr. (Ed.), *The Automaticity of Everyday Life* (pp. 1-62). New Jersey: Lawrence Erlbaum Associates.

BARTLETT, J.C. & SEARCY, J. (1993). Inversion and configuration of faces. *Cognitive Psychology, 25*, 281-316.

BELLUGI, U., ADOLPHS, R., CASSADY, C. & CHILES, M. (1999). Towards the neural basis for hypersociability in a genetic syndrome. *Neuroreport, 10*, 1653-1657.

BERRY, D. & ZEBROWITZ-MCARTHUR, L. (1988). What's in a face? Facial Maturity and the Attribution of Legal Responsibility. *Personality and Social Psychology Bulletin, 14(1)*, 23-33.

BERRY, D. S. & MCARTHUR, L. Z. (1986). Perceiving character in faces: the impact of age-related craniofacial changes on social perception. *Psychological Bulletin, 100(1)*, 3-18.

BERSCHEID, E. & WALSTER, E. (1974). Physical attractiveness. In: L. Berkowitz (Ed.), *Advances in Experimental Social Psychology,* Vol. 7. (pp. 158-186). New York: Academic Press.

BLAIR, I. V. & BANAJI, M. R. (1996). Automatic and Controlled Processes in Stereotype Priming. *Journal of Personality and Social Psychology, 70 (6),* 1142-1163.

BODENHAUSEN, G. V. & LICHTENSTEIN, M. (1987). Social stereotypes and information-processing strategies: the impact of task complexity. *Journal of Personality and Social Psychology, 52(5),* 871-880.

BORKAN, G. A., BACHMAN, S. S. & NORRIS, A. H. (1982). Comparison of visually estimated age with physiologically predicted age as indicators of rates of ageing. *Social Science and Medicine, 16,* 197-204.

BRADSHAW, J.L. & WALLACE, G. (1971). Models for the processing and identification of faces. *Perception and Psychophysics, 9,* 443-448.

BRENNEN, T., DAVID, D., FLUCHAIRE, I. & PELLAT, J. (1996). Naming faces and objects without comprehension: a case study. *Cognitive Neuropsychology, 13(1),* 93-110.

BRUCE, V. & LANGTON, S. (1994). The use of pigmentation and shading information in recognising the sex and identities of faces. *Perception, 23(7),* 803-822.

BRUCE, V. & YOUNG, A. (1998). *In the Eye of the Beholder: The Science of Face Perception.* Oxford: Oxford University Press.

BRUCE, V. & YOUNG, A.W. (1986). Understanding face recognition. *British Journal of Psychology, 77,* 305-327.

BRUCE, V. (1982). Changing faces: visual and non-visual coding processes in face recognition. *British Journal of Psychology, 73,* 105-116.

BRUCE, V. (1995). Perceiving and recognizing faces. In: Ilona Roth & Vicki Bruce (Eds.), *Perception and Representation* (pp. 137-193). Buckingham: Open University Press.

BRUCE, V., BURTON, A.M. & HANCOCK, P.J. (1995). Missing dimensions of distinctiveness. In: Tim Valentine (Ed.), *Cognitive and Computational Aspects of Face Recognition – Explorations in Face Space* (p. 138-158). London: Routledge.

BRUYER, R., LATERRE, C., SERON, X., FEYEREISEN, P., STRYPSTEIN, E., PIERRARD, E. & RECTEM, D. (1983). A case of prosopagnosia with some preserved covert remembrance of familiar faces. *Brain and Cognition, 2,* 257-284.

BULL, R. & RUMSEY, N. (1988). *The Social Psychology of Facial Appearance.* New York: Springer-Verlag.

BURTON, A.M., BRUCE, V. & JOHNSTON, R.A. (1990). Understanding face recognition with as interactive activation model. *British Journal of Psychology, 81,* 361-380.

BURTON, A.M. & VOKEY, J.R. (1998). The face-space typicality paradox: understanding the face-space metaphor. *The Quarterly Journal of Experimental Psychology, 51A(3)*, 475-483.

BUSS, D. M. (1989). Sex differences in human mate preferences: evolutionary hypothesis tested in 37 cultures. *Behavioral and Brain Sciences, 12*, 1-49.

CACIOPPO, J. T., MARSHALL-GOODELL, B. S., TASSINARY, L. G. & PETTY, R. E. (1992). Rudimentary determinants of attitudes: classical conditioning is more effective when prior knowledge about the attitude stimulus is low than high. *Journal of Experimental Social Psychology, 28*, 270-233.

CALDER, A.J., YOUNG, A.W., BENSON, P.J. & PERRETT, D.I. (1996). Self-priming from distinctive and caricatured faces. *British Journal of Psychology, 87*, 141-162.

CAMPBELL, R. & DE HAAN, E. (1994). Developmental prosopagnosia: a functional analysis and implications for remediation. In: M.J. Riddoch & G.W. Humphreys (Eds.), *Cognitive Neuropsychology and Cognitive Rehabilitation* (pp. 77-101). United Kingdom: Lawrence Erlbaum Associates Ltd.

CAMPBELL, R., LANDIS, T. & REGARD, M. (1986). Face recognition and lipreading: a neurological dissociation. *Brain, 109(3)*, 509-521.

CAREY, S. & DIAMOND, R. (1977). From piecemeal to configurational representation of faces. *Science, 195*, 312-314.

CHURCH, V. & WINOGRAD, E. (1986). Face recognition is not unique: evidence from individual differences. In: Hadyn D. Ellis, Malcolm A. Jeeves, Freda Newcombe and Andy Young (Eds.), *Aspects of Face Processing* (p. 71-77). The Netherlands: Martinus Nijhoff Publishers.

COOK, S.W. (1939). The judgement of intelligence from photographs. *Journal of Abnormal and Social Psychology, 34*, 384-389.

CRAIGIE, M. & HANLEY, J.R. (1997). Putting faces to names. *British Journal of Psychology, 88*, 157-171.

CROSS, J. F. & CROSS, J. (1971). Age, sex, race and the perception of facial beauty. *Developmental Psychology, 5*, 433-439.

CUNNINGHAM, M. R., BARBEE, A.P. & PIKE, C. L. (1990). What do women want? Facialmetric assessment of multiple motives in the perception of male physical attractiveness. *Journal of Personality and Social Psychology, 59*, 61-72.

CUNNINGHAM, M. R., ROBERTS, A. R., WU, C-H., BARBEE, A. P. & DRUEN, P. B. (1995). "Their ideas of beauty are, on the whole, the same as ours": Consistency and variability in the cross-cultural perception of female physical attractiveness. *Journal of Personality and Social Psychology, 68*, 261-279.

DAMASIO, A. R. (1990). Category-related recognition defects as a clue to the neural substrates of knowledge. *Trends in Neuroscience, 13(3)*, 95-98.

DAMASIO, A. R., TRANEL, D. & DAMASIO, H. (1990). Face agnosia and the neural substrates of memory. *Annual Review of Neuroscience, 13*, 89-109.

DE HOUWER, J. & EELEN, P. (1998). An Affective Variant of the Simon Paradigm. *Cognition and Emotion, 12 (1)*, 45-61.

DE HOUWER, J., HERMANS, D. & EELEN, P. (1999). Affective Simon Effects Using Facial Expressions as Affective Stimuli. Submetido para publicação.

DEVINE, P. (1989). Stereotypes and prejudice: their automatic and controlled components. *Journal of Personality and Social Psychology, 56*, 5-18.

DIAMOND, R. & CAREY, S. (1986). Why faces are and are not special: An effect of expertise. *Journal of Experimental Psychology: General, 115*, 101-117.

DION, K. (1972). Physical attractiveness and evaluation of children's transgressions. *Journal of Personality and Social Psychology, 24*, 285-290.

DION, K. (1973). Young children's stereotyping of facial attractiveness. *Developmental Psychology, 9*, 183-188.

DION, K., BERSCHEID, E. & WALSTER, E. (1972). What is Beautiful is Good. *Journal of Personality and Social Psychology, 24 (3)*, 285-290.

DOVIDIO, J. F., EVANS, N. & TYLER, R. B. (1986). Racial stereotypes: the contents of their cognitive representations. *Journal of Experimental Social Psychology, 22*, 22-37.

EAGLY, A. H., ASHMORE, R. D., MAKHIJANI, M. G. & LONGO, L. C. (1991). What is beautiful is good, but...: a meta-analysis review of research on the physical attractiveness stereotype. *Psychological Bulletin, 110*, 109-128.

EKMAN, P., FRIESEN, W. V. & ELLSWORTH, P. (1982). Does the face provide accurate information? In: P. Ekman (Ed.), *Emotion in the human face* (2nd ed., p. 56-97). Cambridge, England: Cambridge University Press.

ELLIS, A.W. & YOUNG, A.W. (1997). *Human Cognitive Neuropsychology* (pp. 87-111). United Kingdom: Psychology Press.

ELLIS, H. D. (1975). Recognizing faces. *British Journal of Psychology, 66(4)*, 409-426.

ELLIS, H.D. & YOUNG, A.W. (1989). Are faces special? In: Andrew W. Young and Hadyn D. Ellis (Eds.), *Handbook of Research on Face Processing* (p. 1-26). The Netherlands: Elsevier Science Publishers.

ELLIS, H.D. & YOUNG, A.W. (1998). Faces in their social and biological context. In: Andrew W. Young (Ed.), *Face and Mind* (p. 67-95). Oxford: Oxford University Press.

ELLIS, H.D., JONES, D.M. & MOSDELL, N. (1997). Intra- and inter-modal repetition priming of familiar faces and voices. *British Journal of Psychology, 88*, 143-156.

FAZIO, R. H., JACKSON, J. R., DUNTON, B. C. & WILLIAMS, C. J. (1995). Variability in automatic activation as an unobtrusive measure of racial attitudes: a bona fide pipeline? *Journal of Personality and Social Psychology, 69*, 1013-1027.

FEINGOLD, A. (1990). Gender differences in effects of physical attractiveness on romantic attraction: a comparison across five research paradigms. *Journal of Personality and Social Psychology, 59*, 981-993.

FIEDLER, K., RUSSER, S. & GRAMM, K. (1993). Illusory correlations and memory performance. *Journal of Experimental Social Psychology, 29*, 111-136.

GAUTHIER, I., TARR, M.J., MOYLAN, J., PAWEL SKUDLARSKI, J.C.G. & ANDERSON, A.W. (2000). The fusiform "face area" is part of a network that processes faces at the individual level. *Journal of Cognitive Neuroscience, 12(3)*, 495-504.

GILBERT, D. T. & HIXON, J. G. (1991). The Trouble of Thinking: Activation and Application of Stereotypic Beliefs. *Journal of Personality and Social Psychology, 60 (4)*, 509-517.

GOLDSTEIN, A. G. (1983). Behavioral scientists' fascination with faces. *Journal of Nonverbal Behavior, 7*, 223-255.

HAMILTON, D. L. (1981). Illusory correlation as a basis for stereotyping. In: ... (pp. 115-142).

HAMILTON, D. L., DRISCOLL, D. M. & WORTH, L. T. (1989). Cognitive organisation of impressions: effects of incongruency in complex representations. *Journal of Personality and Social Psychology, 58*, 1-14.

HAMILTON, D., DUGAN, P. M. & TROLIER, T. K. (1985). The formation of stereotypic beliefs: further evidence for distinctiveness-based illusory correlations. *Journal of Personality and Social Psychology, 48*, 5-17.

HASSIN, R. & TROPE, Y. (2000). Facing faces: studies on the cognitive aspects of physiognomy. *Journal of Personality and Social Psychology, 78(5)*, 837-852.

HASTIE, R. & KUMAR, P. A. (1979). Person memory: personality traits as organising principles in memory for behaviour. *Journal of Personality and Social Psychology, 37*, 25-38.

HAY, D.C. & YOUNG, A.W. (1982). The human face. In: A. W. Ellis (Ed.), *Normality and Pathology in Cognitive Functions* (pp. 173-202). London: Academic Press.

HEIDER, F. (1958). *The psychology of interpersonal relations*. London: Wiley and Sons.

HILL, T., LEWICKI, P., CZYEWSKA, M. & BOSS, A. (1989). Self-perpetuating development of encoding biases in person perception. *Journal of Personality and Social Psychology, 57*, 373-387.

HILL, T., LEWICKI, P., CZYEWSKA, M. & SCHULLER, G. (1990). The role of learned inferential encoding rules in the perception of faces: effects of nonconscious self-perpetuation of a bias. *Journal of Experimental Social Psychology, 26*, 350-371.

HILLIS, S.K., HISCOCK, M. & REXER, J.L. (1995). Dual-task interference patterns reveal differential processing of upright and inverted faces. *Brain and Cognition, 28*, 155-172.

HILTON, J. L. & VON HIPPEL, W. (1996). Stereotypes. *Annual Review of Psychology, 47*, 237-71.

HODGES, J.R. & GREENE, J.D.W. (1998). Knowing about people and naming them: can Alzheimer's disease patients do one without the other? *The Quarterly Journal of Experimental Psychology, 51A(1)*, 121-134.

HOSIE, J.A. & MILNE, A.B. (1995). Distinctiveness and memory for unfamiliar faces. In: Tim Valentine (Ed.), *Cognitive and Computational Aspects of Face Recognition – Explorations in Face Space* (p. 95-112). London: Routledge.

JOHNSTON,L. C. & MACRAE, C. N. (1994). Changing social stereotypes: the case of the information seeker. *European Journal of Social Psychology, 24*, 581-592.

JONES, R. A., SCOTT, J., SOLERNOU, J., NOBLE, A., FIALA, J. & MILLER, K. (1977). Availability and formation of stereotypes. *Perceptual and Motor Skills, 44*, 631-638.

JUDD, C. M. & PARK, B. (1988). Out-group homogeneity: judgements of variability at the individual and group levels. *Journal of Personality and Social Psychology, 54*, 778-788.

KANWISHER, N. (2000). Domain specificity in face perception. *Nature Neuroscience, 3(8)*, 759-763.

KEATING, C. F. & BAI, D. L. (1986). Children's attributions of social dominance from facial cues. *Child Development, 57*, 1269-1276.

KISSLER, J. & BÄUML, K.H. (2000). Effects of the beholder's age on the perception of facial attractiveness. *Acta Psychologica, 104*, 145-166.

KLEIN, S. B., LOFTUS, J., TRAFTON, J. G. & FUHRMAN, R. W. (1992). Use of exemplars and abstractions in trait judgements: a model of trait knowledge about the self and the others. *Journal of Personality and Social Psychology, 63*, 739-753.

KUNDA, Z. (1999). *Social Cognition: Making Sense of People* (pp. 313-393). Massachusetts: The MIT Press.

LANGLOIS, J. H, ROGGMAN, L. A., CASEY, R.J., RITTER, L. A., RIESER-DANNER, L. A. & JENKINS, V. Y. (1987). Infant preferences for attractive faces: rudiments of a stereotype? *Developmental Psychology, 23*, 363-369.

LANGLOIS, J.H. & ROGGMAN, L.A. (1990). Attractive faces are only average. *Psychological Science, 1(2)*, 115-121.

LEWICKI, P. (1986). Processing Information about Associations that Cannot be Articulated. *Journal of Experimental Psychology: Learning, Memory and Cognition, 12*, 135-146.

LIGGETT, J. C. (1974). *The Human Face*. New York: Stein & Day.

MACKIE, D. M., SHERMAN, J. W. & WORTH, L. T. (1993). On-line and memory-based processes in group variability judgements. *Social Cognition, 11*, 44-69.

MACRAE, C. N. & BODENHAUSEN, G. V. (2000). Social cognition: thinking categorically about others. *Annual Review of Psychology, 51*, 93-120.

MACRAE, C. N. & SHEPHERD, J. W. (1989). Stereotypes and social judgements. *British Journal of Social Psychology, 28*, 319-325.

MACRAE, C. N., BODENHAUSEN, G. V. & MILNE, A. B. (1995). The dissection of selection in person perception: inhibitory processes in social stereotyping. *Journal of Personality and Social Psychology, 69(3)*, 397-407.

MACRAE, C. N., BODENHAUSEN, G. V. & MILNE, A. B. (1998). Saying no to unwanted thoughts: self-focus and the regulation of mental life. *Journal of Personality and Social Psychology, 74(3)*, 578-589.

MACRAE, C. N., BODENHAUSEN, G. V., MILNE, A. B. & CALVINI, G. (1999). Seeing more than we can know: visual attention and category activation. *Journal of Experimental Social psychology, 35*, 590-602.

MACRAE, C. N., BODENHAUSEN, G. V., MILNE, A. B. & FORD, R. L. (1997). On the regulation of recollection: the intentional forgetting of stereotypical memories. *Journal of Personality and Social Psychology, 72(4)*, 709-719.

MACRAE, C. N., BODENHAUSEN, G. V., MILNE, A. B., THORN, T. M. J. & CASTELLI, L. (1997). On the Activation of Social Stereotypes: The Moderating Role of Processing Objectives. *Journal of Experimental Social Psychology, 33*, 471-489.

MACRAE, C. N., HEWSTONE, M. & GRIFFITHS, R. J. (1993). Processing-load and memory for stereotype-based information. *European Journal of Social Psychology, 23*, 77-87.

MACRAE, C. N., MILNE, A.B. & BODENHAUSEN, G. V. (1994). Stereotypes as energy-saving devices: a peek inside the cognitive toolbox. *Journal of Personality and Social Psychology, 66(1)*, 37-47.

MACRAE, C.N., STANGOR, C. & MILNE, A. B. (1994). Activating social stereotypes: a functional analysis. *Journal of Experimental Social Psychology, 30*, 370-389.

MANIS, M. & PASKEWITZ, J. R. (1987). Assessing psychopathology in individuals and groups: aggregating behavior samples to form overall impressions. *Personality and Social Psychology Bulletin, **13***, 83-94.

MCARTHUR, L. Z. & FRIEDMAN, S. A. (1980). Illusory correlation in impression formation: variations in the shared distinctiveness effect as a function of the distinctive person's age, race, and sex. *Journal of Personality and Social Psychology, **39***, 615-624.

MCCALL, R. B. & KENNEDY, C. B. (1980). Attention of 4-month infants to discrepancy and babyishness. *Journal of Experimental Child Psychology, **29***, 189-201.

MCCONNELL, A. R., SHERMAN, S. J. & HAMILTON, D. L. (1994a). Illusory correlation in the perception of groups: an extension of the distinctiveness-based account. *Journal of Personality and Social Psychology, **67***, 414-429.

MCCONNELL, A. R., SHERMAN, S. J. & HAMILTON, D. L. (1994b). The on-line and memory-based aspects of individual and group target judgements. *Journal of Personality and Social Psychology, **67***, 173-185.

MCKELVIE, S.J. (1995). Emotional expression in upside-down faces: evidence for configurational and componential processing. *British Journal of Social Psychology, **34***, 325-334.

MCNEIL, J.E. & WARRINGTON, E.K. (1993). Prosopagnosia: a face-specific disorder. *Quarterly Journal of Experimental Psychology, **46A***, 1-10.

MEALEY, L., BRIDGSTOCK, R. & TOWNSEND, G. C. (1999). Symmetry and perceived facial attractiveness: a monozygotic co-twin comparison. *Journal of Personality and Social Psychology, **76(1)***, 151-158.

MEALEY, L., DAOOD, C. & KRAGE, M. (1996). Enhanced memory for faces of cheaters. *Ethology and Sociobiology, **17***, 119-128.

MONTEPARE, J. M. & ZEBROWITZ-MCARTHUR, L. (1989). Children's perceptions of babyfaced adults. *Perceptual and Motor Skills, **69***, 467-472.

MOSCOVITCH, M., WINOCUR, G. & BEHRMANN, M. (1997). What is special about face recognition? Nineteen experiments on a person with visual object agnosia and dyslexia but normal face recognition. *Journal of Cognitive Neuroscience, **9(5)***, 555-604.

MUELLER, J. H., THOMPSON, W. B. & VOGEL, J.M. (1988). Perceived honesty and face memory. *Personality and Social Psychology Bulletin, **14(1)***, 114-124.

MUSCARELLA, F. & CUNNINGHAM, M. R. (1996). The evolutionary significance and social perception of male pattern baldness and facial hair. *Ethology and Sociobiology, **17***, 99-117.

NACHSON, I. (1995). On the modularity of face recognition: the riddle of domain specificity. *Journal of Clinical and Experimental Neuropsychology, **17(2)***, 256-275.

NISBETT, R. E. & WILSON, T. D. (1977). The halo effect: evidence for unconscious alteration of judgements. *Journal of Personality and Social Psychology, 35*, 250-256.

NOSOFSKY, R. M., PALMERI, T. J. & MCKINLEY, S. C. (1994). Rule-plus-exception model of classification learning. *Psychological Review, 101*, 53-79.

OAKES, P. J., HASLAM, S. A. & TURNER, J. C. (1994). *Stereotyping and Social Reality.* Oxford: Blackwell Publishers.

ÖHMAN, A., FLYKT, A. & LUNDQVIST, D. (1999). Unconscious emotion: evolutionary perspectives, psychophysiological data, and neuropsychological mechanisms. In: R. Lane & L. Nadel (Eds.), *The cognitive neuroscience of emotion* (p. 296-327). New York: Oxford University Press.

PAUNONEN, S. V., EWAN, K., EARTHY, J., LEFAVE, S. & GOLDBERG, H. (1999). Facial Features as Personality Cues. *Journal of Personality, 67 (3)*, 555-583.

PENTON-VOAK, I. S.,PERRETT, D. I., CASTLES, D. L, KOBAYASHI, T., BURT, D. M., MURRAY, L. K. & MINAMISAWA, R. (1999). Menstrual cycle alters face preference. *Nature, 399*, 741-742.

PERRETT, D. I., LEE, K. J., PENTON-VOAK, I., ROWLAND, D., YOSHIKAWA, S., BURT, D. M., HENZI, S. P., CASTLES, D. L. & AKAMATSU, S. (1998). Effects of sexual dimorphism on facial attractiveness. *Nature, 394*, 884-887.

PHELPS, E.A., O'CONNOR, K.J., CUNNINGHAM, W.A., FUNAYAMA, E.S., GATENBY, J.C., GORE, J.C. & BANAJI, M.R. (2000). Performance on indirect measures of race evaluation predicts amygdala activation. *Journal of Cognitive Neuroscience, 12(5)*, 729-738.

RHODES, G. & MCLEAN, I.G. (1990). Distinctiveness and expertise effects with homogeneous stimuli: towards a model of configural coding. *Perception, 19*, 773-794.

RHODES, G. (1995). Face recognition and configural coding. In: Tim Valentine (Ed.), *Cognitive and Computational Aspects of Face Recognition – Explorations in Face Space* (p. 47-68). London: Routledge.

RHODES, G., BRENNEN, S.E. & CAREY, S. (1987). Identification and ratings of caricatures: implications for mental representations of faces. *Cognitive Psychology, 19*, 473-497.

RHODES, G., HICKFORD, C. & JEFFERY, L. (2000). Sex-typicality and attractiveness: are supermale and superfemale faces super-attractive? *British Journal of Psychology, 91*, 125-140.

ROSS, B. H., PERKINS, S. J. & TENPENNY, P. L. (1990). Reminding-based category learning. *Cognitive Psychology, 22*, 460-492.

ROTH, I. & BRUCE, V. (1995). *Perception and Representation.* Buckingham: Open University Press.

SANBONMATSU, D. M., SHERMAN, S. J. & HAMILTON, D. L. (1987). Illusory correlation in the perception of individuals and groups. *Social Cognition, 5*, 1-25.

SCAPINELLO, K.F. & YARMEY, A.D. (1970). The role of familiarity and orientation in immediate and delayed recognition of pictorial stimuli. *Psychonomic Science, 21*, 329-331.

SCHALLER, M. & MAASS, A. (1989). Illusory correlation and social categorisation: toward an integration of motivational and cognitive factors in stereotype formation. *Journal of Personality and Social Psychology, 56*, 709-721.

SCHWEICH, M. & BRUYER, R. (1993). Heterogeneity in the cognitive manifestations of prosopagnosia: the study of a group of single cases. *Cognitive Neuropsychology, 10(6)*, 529-547.

SERGENT, J. (1984). An investigation into component and configural processes underlying face recognition. *British Journal of Psychology, 75*, 221-242.

SERGENT, J. (1994). Cognitive and neural structures in face processing. In: Andrew Kertesz (Ed.), *Localization and Neuroimaging in Neuropsychology* (pp. 473-494). California: Academic Press Inc.

SHEPHERD, J. (1989). The Face and Social Attribution. In: A. W. Young and H. D. Ellis (Eds.), *Handbook of Research on Face Processing* (pp. 289-320). North-Holland: Elsevier Science Publishers B. V.

SHERMAN, J. W. & HAMILTON, D. L. (1994). On the formation of interitem associative links in person memory. *Journal of Experimental Social Psychology, 30(3)*, 203-217.

SHERMAN, J. W. & KLEIN, S. B. (1994). The development and representation of personality impressions. *Journal of Personality and Social Psychology, 67*, 972-983.

SHERMAN, J. W. (1996). Development and Mental Representation of Stereotypes. *Journal of Personality and Social Psychology, 70 (6)*, 1126-1141.

SHUTTLEWORTH, E.C. JR, SYRING, V. & ALLEN, N. (1982). Further observations on the nature of prosopagnosia. *Brain and Cognition, 1*, 307-322.

SINCLAIR, L. & KUNDA, Z. (1999). Reactions to a black professional: motivated inhibition and activation of conflicting stereotypes. *Journal of Personality and Social Psychology, 77(5)*, 885-904.

SMITH, E. R. & ZARATE, M. A. (1990). Exemplar and prototype use in social categorisation. *Social Cognition, 8*, 243-262.

SMITH, M.M., COLLINS, A.F., MORRIS, P.E. & LEVY, P. (1994). *Cognition in Action* (pp. 1-30). United Kingdom: Lawrence Erlbaum Associates Ltd.

SNYDER, M., TANKE, E. D. & BERSCHEID, E. (1977). Social perception and interpersonal behaviour: on the self-fulfilling nature of social stereotypes. *Journal of Personality and Social Psychology, 35*, 656-666.

SPEARS, R., VAN DER PLIGT, J. & EISER, J. R. (1985). Illusory correlation in the perception of group attitudes. *Journal of Personality and Social Psychology, 48*, 863-875.

SPEARS, R., VAN DER PLIGT, J. & EISER, J. R. (1986). Generalization of the illusory correlation effect. *Journal of Personality and Social Psychology, 51*, 1127-1134.

SPENCER, S. J., FEIN, S., WOLFE, C. T., FONG, C. & DUNN, M. A. (1998). Automatic activation of stereotypes: the role of self-image threat. *Personality and Social Psychology Bulletin, 24(11)*, 1139-1152.

SRULL, T. K. & WYER, R. S. (1989). Person memory and judgement. *Psychological Review, 96*, 58-83.

SRULL, T. K. (1981). Person memory: some tests of associative storage and retrieval models. *Journal of Experimental Psychology: Human Learning and Memory, 7*, 440-463.

SRULL, T. K., LICHTENSTEIN, M. & ROTHBART, M. (1985). Associative storage and retrieval processes in person memory. *Journal of Experimental Psychology, 11*, 316-345.

STANGOR, C. & DUAN, C. (1991). Effects of multiple task demands upon memory for information about social groups. *Journal of Experimental Social Psychology, 27*, 357-378.

STANGOR, C. & MCMILLAN, D. (1992). Memory for expectancy-congruent and expectancy-incongruent social information: a meta-analytic review of the social psychological and social developmental literatures. *Psychological Bulletin, 111(1)*, 42-61.

STENENAGE, S. V. & MCKAY, Y. (1999). Model applicants: the effect of facial appearance on recruitment decisions. *British Journal of Psychology, 90*, 221-234.

STERN, L. D., MARRS, S., MILLAR, M. G. & COLE, E. (1984). Processing time and the recall of inconsistent and consistent behaviours of individuals and groups. *Journal of Personality and Social Psychology, 47*, 253-262.

STEVENAGE, S.V. (1995). Expertise and the caricature advantage. In: Tim Valentine (Ed.), *Cognitive and Computational Aspects of Face Recognition – Explorations in Face Space* (p. 24-46). London: Routledge.

STÜRZEL, F. & SPILLMANN, L. (2000). Thatcher illusion: dependence on angle of rotation. *Perception, 29*, 937-942.

STYCZYNSKI, L. & LANGLOIS, J. G. (1977). The effects of familiarity on behavioural stereotypes associated with physical attractiveness in young children. *Child Development, 48*, 1137-1141.

TANAKA, J.W. & FARAH, M.J. (1993). Parts and wholes in face recognition. *Quarterly Journal of Experimental Psychology, 46A*, 225-246.

TARR, M.J. & GAUTHIER, I. (2000). FFA: a flexible fusiform area for subordinate-level visual processing automatized by expertise. *Nature Neuroscience, 3(8)*, 764-769.

THAKERAR, J. N. & IWAWAKI, S. (1979). Cross-cultural comparisons in interpersonal attraction of females towards males. *Journal of Social Psychology, 108*, 121-122.

THOMPSON, P. (1980). Margaret Thatcher – a new illusion. *Perception, 9*, 483-484.

THORNHILL, R. & GANGESTAD, S. W. (1999). Facial attractiveness. *Trends in Cognitive Sciences, 3(12)*, 452-460.

TIBERGHIEN, G. & CLERC, I. (1986). The cognitive locus of prosopagnosia. In: R. Bruyer (Ed.), *The neuropsychology of face perception and facial expression* (p. 39-62). Hillsdale, NJ: Erlbaum.

TOVÉE, M.J. & COHEN- TOVÉE, E.M. (1993). The neural substrates of face processing models: a review. *Cognitive Neuropsychology, 10(6)*, 505-528.

VALENTINE, T. & BRUCE, V. (1985). What's up? The Margaret Thatcher illusion revisited. *Perception, 14*, 515-516.

VALENTINE, T. & BRUCE, V. (1986). The effect of race, inversion and encoding activity upon face recognition. *Acta Psychologica, 61*, 259-273.

VALENTINE, T. & BRUCE, V. (1986a). Recognising familiar faces: the role of distinctiveness and familiarity. *Canadian Journal of Psychology, 40*, 300-305.

VALENTINE, T. & BRUCE, V. (1986b). The effect of distinctiveness in recognising and classifying faces. *Perception, 15*, 525-535.

VALENTINE, T. & ENDO, M. (1992). Towards an exemplar model of face processing: the effects of race and distinctiveness. *Quarterly Journal of Experimental Psychology, 44A*, 671-703.

VALENTINE, T. (1991). A unified account of the effects of distinctiveness, inversion and race in face recognition. *Quarterly Journal of Experimental Psychology, 43A*, 161-204.

VALENTINE, T. (1995). *Cognitive and Computational Aspects of Face Recognition – Explorations in Face Space*. London: Routledge.

VALENTINE, T., CHIRORO, P. & DIXON, R. (1995). An account of the own-race bias and the contact hypothesis based on a "face space" model of face recognition. In: Tim Valentine (Ed.), *Cognitive and Computational Aspects of Face Recognition – Explorations in Face Space* (p. 69-94). London: Routledge.

WAGATSUMA, E. & KLEINKE, C. L. (1979). Ratings of facial beauty by Asian-American and Caucasian females. *Journal of Social Psychology, 109*, 299-300.

WARRINGTON, E.K. & JAMES, M. (1967). An experimental investigation of facial recognition in patients with unilateral cerebral lesions. *Cortex, 3*, 317-326.

WEGNER, D. M. & ERBER, R. (1992). The hyperaccessibility of suppressed thoughts. *Journal of Personality and Social Psychology, 63*, 903-912.

WHEELER, L. & KIM, Y. (1997). What is beautiful is culturally good: the physical attractiveness stereotype has different content in collectivistic cultures. *Personality and Social Psychology Bulletin, 23(8)*, 795-800.

WYER, R. S. & GORDON, S. E. (1982). The recall of information about persons and groups. *Journal of Experimental Social Psychology, 18*, 128-164.

WYER, R. S., SRULL, T. K. & GORDON, S. E. (1984). The effects of predicting a person's behaviour on subsequent trait judgements. *Journal of Personality and Social Psychology, 43*, 674-688.

YIN, R.K. (1969). Looking at upside-down faces. *Journal of Experimental Psychology, 81*, 141-145.

YOUNG, A. & BRUCE, V. (1991). Perceptual categories and the computation of "grandmother". *European Journal of Cognitive Psychology, 3(1)*, 5-49.

YOUNG, A.W. & BURTON, A.M. (1999). Simulating face recognition: implications for modelling cognition. *Cognitive Neuropsychology, 16(1)*, 1-48.

YOUNG, A.W. (1998). Finding the mind's construction in the face. In: Andrew W. Young (Ed.), *Face and Mind* (p. 67-95). Oxford: Oxford University Press.

YOUNG, A.W., HAY, D.C. & ELLIS, A.W. (1985). The faces that launched a thousand slips: everyday difficulties and errors in recognising people. *British Journal of Psychology, 76*, 495-523.

YOUNG, A.W., HELLAWELL, D.J. & HAY, D.C. (1987). Configurational information in face processing. *Perception, 16*, 747-759.

ZEBROWITZ, L. A. & MONTEPARE, J. M. (1992). Impressions of babyfaced males and females across the lifespan. *Developmental Psychology, 28*, 1143-1152.

ZEBROWITZ, L. A. (1990). *Social Perception.* Milton Keynes: Open University Press.

ZEBROWITZ, L. A. (1998). *Reading Faces: Window to the Soul?* United Kingdom: Westview Press.

ZEBROWITZ, L. A., COLLINS, M. A. & DUTTA, R. (1998). The relationship between appearance and personality across the life span. *Personality and Social Psychology Bulletin, 24(7)*, 736-749.

ZEBROWITZ, L. A., MONTEPARE, J. M. & LEE, H. K. (1993). They don't all look alike: Individuated impressions of other racial groups. *Journal of Personality and Social Psychology, 65*, 85-101.

ZEBROWITZ, L. A., OLSON, K. & HOFFMAN, K. (1992). Stability of babyfaceness and attractiveness across the life span. *Journal of Personality and Social Psychology, 64*, 453-466.

ZEBROWITZ, L. A., VOINESCU, L. & COLLINS, M. A. (1996). "Wide-eyed" and "crooked-faced": determinants of perceived and real honesty across the life span. *Personality and Social Psychology Bulletin, 22(12)*, 1258-1269.

Appendices

List of Appendices

Appendix I

Instructions for the Ratings

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult male and female faces. We would like you to rate those faces on INTELLIGENCE, according to what you think of the person displayed in the photograph.

Your ratings should be made on a 1 to 7 scale, with:

- **1** meaning that the person is very **unintelligent**, and
- **7** meaning that the person is very **intelligent**.

Please type the number equivalent to your judgement for every face that is shown on the screen. You can have as much time as you need for making a decision about each face.

You will have a practice block of 20 photographs, so that you can become familiar with the scale and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult male and female faces. We would like you to rate those faces on ATTRACTIVENESS, according to what you think of the person displayed in the photograph.

Your ratings should be made on a 1 to 7 scale, with:

- **1** meaning that the person is very **unattractive**, and
- **7** meaning that the person is very **attractive**.

Please type the number equivalent to your judgement for every face that is shown on the screen. You can have as much time as you need for making a decision about each face.

You will have a practice block of 20 photographs, so that you can become familiar with the scale and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult male and female faces. We would like you to rate those faces on KINDNESS, according to what you think of the person displayed in the photograph.

Your ratings should be made on a 1 to 7 scale, with:

- **1** meaning that the person is very **unkind**, and
- **7** meaning that the person is very **kind**.

Please type the number equivalent to your judgement for every face that is shown on the screen. You can have as much time as you need for making a decision about each face.

You will have a practice block of 20 photographs, so that you can become familiar with the scale and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult male and female faces. We would like you to rate those faces on TRUSTWORTHINESS, according to what you think of the person displayed in the photograph.

Your ratings should be made on a 1 to 7 scale, with:

- **1** meaning that the person is very **untrustworthy**, and
- **7** meaning that the person is very **trustworthy**.

Please type the number equivalent to your judgement for every face that is shown on the screen. You can have as much time as you need for making a decision about each face.

You will have a practice block of 20 photographs, so that you can become familiar with the scale and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

Appendix I (continued)

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult male and female faces. We would like you to rate those faces on AGE, according to what you think of the person displayed in the photograph.

Your ratings should be made on a 1 to 7 scale, with:

- 1 meaning that the person is a young adult, and
- 7 meaning that the person is an old adult.

Please type the number equivalent to your judgement for every face that is shown on the screen. You can have as much time as you need for making a decision about each face.

You will have a practice block of 20 photographs, so that you can become familiar with the scale and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult male and female faces. We would like you to rate those faces on DISTINCTIVENESS, according to what you think of the person displayed in the photograph. Imagine that you are meeting someone at the rail station. If that person has a very distinctive appearance, it will be easier to recognise their face, than if the person has a very typical appearance.

Your ratings should be made on a 1 to 7 scale, with:

- 1 meaning that the person has a very typical appearance, and
- 7 meaning that the person has a very distinctive appearance.

Please type the number equivalent to your judgement for every face that is shown on the screen. You can have as much time as you need for making a decision about each face.

You will have a practice block of 20 photographs, so that you can become familiar with the scale and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

STUDY ON PERSONALITY TRAITS AS PERCEIVED FROM FACES

You are going to see some photographs of adult faces. You will be asked if the person is a **male or a female.** Please type:

- M for male, and
- F for female.

You will also be asked if you can **recognise** the person displayed in the photograph (i.e., if it is a famous person). Please type:

- Y (for yes) if you do recognise the person, and
- N (for no) if you don't recognise the person.

Finally, you will be asked if you know **the name of the person** displayed in the photograph.

- If you know their name, please type the name and then press the 9 key;
- If you don't know their name, please press only the 9 key.

These questions will be made for every face that is shown on the screen. Most of the faces will be of unfamiliar people. You can have as much time as you need for answering each question.

You will have a practice block of 20 photographs, so that you can become familiar with the questions and answering keys. After that you will see 3 blocks of 200 photographs each. If you feel tired, you can take a break between each block.

PRESS ANY KEY TO START.

Appendix II

Interrater Correlations for Attractiveness

Male Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.62	1				
Rater 3	0.51	0.65	1			
Rater 4	0.55	0.62	0.66	1		
Rater 5	0.51	0.67	0.62	0.59	1	
Rater 6	0.57	0.62	0.51	0.57	0.58	1

Female Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.66	1				
Rater 3	0.46	0.59	1			
Rater 4	0.70	0.71	0.53	1		
Rater 5	0.69	0.72	0.53	0.70	1	
Rater 6	0.58	0.51	0.31	0.55	0.53	1

Interrater Correlations for Intelligence

Male Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.49	1				
Rater 3	0.49	0.42	1			
Rater 4	0.61	0.54	0.52	1		
Rater 5	0.30	0.38	0.37	0.44	1	
Rater 6	0.30	0.32	0.23	0.39	0.20	1

Female Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.37	1				
Rater 3	0.44	0.34	1			
Rater 4	0.45	0.27	0.35	1		
Rater 5	0.29	0.35	0.39	0.29	1	
Rater 6	0.21	0.21	0.19	0.28	0.11	1

Appendix II (continued)

Interrater Correlations for Trustworthiness

Male Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.51	1				
Rater 3	0.32	0.47	1			
Rater 4	0.41	0.39	0.33	1		
Rater 5	0.29	0.39	0.46	0.29	1	
Rater 6	0.38	0.36	0.35	0.30	0.28	1

Female Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.48	1				
Rater 3	0.48	0.52	1			
Rater 4	0.33	0.27	0.25	1		
Rater 5	0.34	0.39	0.42	0.24	1	
Rater 6	0.27	0.35	0.40	0.16	0.23	1

Interrater Correlations for Kindness

Male Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.51	1				
Rater 3	0.61	0.60	1			
Rater 4	0.52	0.44	0.57	1		
Rater 5	0.58	0.58	0.68	0.44	1	
Rater 6	0.34	0.34	0.39	0.26	0.39	1

Female Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.63	1				
Rater 3	0.60	0.56	1			
Rater 4	0.36	0.35	0.41	1		
Rater 5	0.46	0.57	0.52	0.52	1	
Rater 6	0.43	0.39	0.42	0.24	0.38	1

Appendix II (continued)

Interrater Correlations for Age

Male Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.89	1				
Rater 3	0.89	0.92	1			
Rater 4	0.88	0.89	0.88	1		
Rater 5	0.87	0.90	0.89	0.87	1	
Rater 6	0.84	0.85	0.86	0.85	0.84	1

Female Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.86	1				
Rater 3	0.87	0.90	1			
Rater 4	0.85	0.87	0.88	1		
Rater 5	0.85	0.89	0.87	0.86	1	
Rater 6	0.81	0.86	0.85	0.83	0.84	1

Interrater Correlations for Distinctiveness

Male Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.40	1				
Rater 3	0.64	0.29	1			
Rater 4	0.64	0.45	0.65	1		
Rater 5	0.57	0.38	0.61	0.57	1	
Rater 6	0.33	0.31	0.29	0.36	0.32	1

Female Faces (n=300)

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6
Rater 1	1					
Rater 2	0.32	1				
Rater 3	0.53	0.30	1			
Rater 4	0.52	0.34	0.40	1		
Rater 5	0.44	0.12	0.30	0.42	1	
Rater 6	0.22	0.24	0.14	0.27	0.08	1

Appendix III

Mean ratings for the 600 stimuli database - FEMALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
f001	4,5	0,8	4,2	0,8	5,2	1,2	3,2	0,8	2,7	1,0	4,2	1,2
f002	3,3	0,8	3,7	1,4	3,3	1,5	3,8	0,8	4,0	1,8	3,8	1,7
f003	5,2	1,2	3,8	1,5	5,5	0,5	2,8	0,8	4,3	0,8	4,8	0,4
f004	3,8	1,0	3,7	1,0	3,8	0,8	3,7	0,8	1,8	1,0	3,5	1,6
f005	2,5	1,2	2,8	1,2	4,2	1,3	2,2	1,0	4,7	2,0	4,2	1,5
f006	4,0	0,9	4,7	0,8	6,3	1,2	5,8	0,8	2,8	1,3	5,7	1,4
f007	6,0	0,9	3,5	1,6	4,0	1,3	3,0	0,6	5,2	0,4	3,0	0,9
f008	5,3	1,4	3,0	1,7	4,3	1,8	3,0	1,1	5,7	1,0	4,8	1,6
f009	5,0	1,1	5,3	1,4	6,2	0,8	2,8	0,8	2,5	1,0	5,3	1,4
f010	5,5	0,8	5,0	1,3	5,5	1,0	5,5	0,5	5,0	1,4	5,8	1,2
f011	4,3	0,8	3,0	0,6	5,0	0,6	3,3	0,8	3,2	2,0	3,8	1,0
f012	4,8	1,0	5,3	0,8	5,5	0,5	5,7	0,8	4,3	1,2	4,8	1,2
f013	4,3	0,8	4,0	1,3	4,5	0,8	3,3	0,5	3,3	1,4	4,7	1,4
f014	3,5	0,8	2,7	1,2	4,0	0,9	2,8	0,8	3,3	1,5	4,8	1,0
f015	3,2	0,4	3,3	0,8	2,8	1,2	2,8	1,5	2,3	1,0	3,0	1,4
f016	6,7	0,5	4,0	1,5	3,8	2,1	2,2	0,4	4,8	1,3	4,2	1,3
f017	4,0	0,6	4,8	0,8	4,8	1,2	4,5	0,5	4,0	2,0	4,7	0,8
f018	5,5	0,8	5,3	0,8	3,8	1,6	3,7	0,5	5,0	1,4	3,5	1,4
f019	4,8	1,0	4,5	0,8	5,8	1,2	5,5	0,5	3,5	1,8	5,7	0,5
f020	2,3	1,0	3,0	1,4	2,3	1,0	3,7	0,8	2,5	1,2	2,2	0,8
f021	4,2	1,2	3,3	1,5	1,8	1,0	3,0	1,1	5,3	1,8	1,5	0,8
f022	4,3	0,8	4,2	1,2	4,8	0,8	4,8	0,4	3,2	1,2	4,7	1,0
f023	1,7	0,8	2,8	1,7	2,7	0,8	1,8	0,8	4,2	2,2	2,8	1,0
f024	2,3	1,0	3,2	0,8	2,7	0,8	4,8	0,8	3,5	1,5	2,7	0,5
f025	4,2	1,2	4,2	0,4	5,0	0,6	3,2	0,8	3,3	1,0	4,5	0,8
f026	3,2	1,0	4,2	1,2	4,0	1,9	4,0	0,6	2,5	1,0	4,3	0,8
f027	5,5	1,0	4,3	0,8	5,2	0,8	3,0	1,1	3,2	1,2	5,3	0,8
f028	4,5	0,5	4,2	1,2	5,7	0,8	5,8	0,8	3,3	1,2	5,8	0,8
f029	5,8	1,2	3,2	1,5	3,0	1,4	2,7	0,8	5,0	1,5	3,5	1,0
f030	3,3	1,0	4,0	1,3	5,2	1,2	6,7	0,5	5,0	1,1	5,5	0,8
f031	4,7	1,2	4,2	0,8	4,3	1,9	1,8	0,8	2,7	0,8	3,5	1,2
f032	4,0	0,6	4,7	0,8	4,7	0,5	4,0	0,6	2,7	1,0	5,0	1,1
f033	4,8	1,3	5,2	1,0	5,3	0,8	2,3	1,0	4,0	0,9	5,7	1,0
f034	5,2	1,2	3,8	0,8	4,0	0,9	2,5	0,8	3,5	1,8	4,5	1,4
f035	2,3	1,0	3,0	1,3	3,7	1,2	5,0	0,6	2,7	1,0	3,5	0,8
f036	2,8	0,8	3,2	1,5	4,3	2,2	1,8	0,8	3,0	1,3	4,3	1,8
f037	3,5	0,5	3,5	0,8	3,5	0,8	4,8	0,4	5,2	0,4	4,0	1,4
f038	5,0	1,1	4,3	1,4	5,2	0,8	3,0	0,6	3,3	1,4	4,8	1,2
f039	5,7	0,5	5,3	0,8	5,8	0,8	3,7	0,8	3,2	1,2	5,8	1,3
f040	4,7	1,0	4,3	0,8	5,3	1,2	4,2	0,4	2,7	1,2	4,3	1,2
f041	5,5	0,5	4,7	1,2	4,5	0,8	3,2	0,4	4,3	1,4	4,2	1,2
f042	4,3	0,8	5,0	0,6	4,3	1,0	5,5	0,5	2,7	1,2	3,7	1,0
f043	4,0	1,4	4,7	1,2	5,0	0,9	2,2	1,2	4,2	1,5	4,7	0,8
f044	4,3	1,8	4,7	1,2	4,7	1,2	2,0	0,9	4,3	1,2	4,3	1,0
f045	3,5	1,0	4,7	1,0	5,8	1,5	6,7	0,5	4,7	1,8	6,5	0,5
f046	3,8	0,8	5,3	0,8	3,7	1,4	3,8	0,8	3,5	1,4	3,5	1,2
f047	4,7	1,2	3,5	1,4	3,3	0,8	3,0	0,6	5,0	0,9	3,0	0,6
f048	3,5	0,5	3,3	0,8	4,8	1,0	6,7	0,5	3,7	1,4	4,0	1,3
f049	5,7	1,0	4,5	1,0	5,8	0,8	2,5	0,8	4,5	1,5	5,7	1,0
f050	6,3	0,8	2,7	0,8	2,7	1,8	2,3	0,8	5,0	1,3	2,8	1,3

Appendix III

Mean ratings for the 600 stimuli database - FEMALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
f051	4,3	1,2	4,8	1,2	5,5	1,5	4,0	0,9	4,5	1,8	5,5	1,5
f052	3,3	0,8	4,3	1,4	5,3	1,2	6,8	0,4	4,0	1,3	5,0	0,9
f053	6,0	0,6	4,0	0,9	5,3	0,8	2,3	0,5	3,7	1,2	5,2	1,2
f054	4,3	0,8	4,2	1,5	6,2	1,0	6,5	0,5	2,7	0,8	6,5	0,5
f055	4,7	0,8	3,7	1,2	3,5	0,8	3,2	1,0	4,5	1,4	4,0	1,1
f056	3,8	0,8	3,7	1,2	4,2	1,2	3,3	1,2	3,3	0,8	4,7	1,4
f057	3,3	1,2	4,8	1,5	5,7	1,0	5,7	0,8	3,3	1,9	5,2	0,4
f058	3,0	0,9	3,5	1,4	3,3	1,5	3,3	1,0	1,8	0,8	2,7	0,5
f059	5,2	0,8	4,2	1,0	3,3	1,2	3,5	0,8	4,0	1,1	3,7	0,8
f060	4,7	1,0	4,8	1,2	4,8	1,5	4,7	0,5	4,0	1,1	5,3	1,4
f061	3,3	0,8	3,2	1,2	3,0	0,9	2,3	0,8	1,7	0,5	2,8	0,8
f062	4,7	1,0	3,5	1,4	3,3	1,0	2,3	1,0	4,0	1,5	4,0	0,9
f063	5,5	0,8	4,3	1,2	5,7	0,8	2,7	0,8	3,3	1,6	5,8	0,4
f064	3,0	0,6	4,0	0,6	3,5	1,0	2,8	1,2	2,0	0,6	3,0	0,9
f065	4,3	1,2	4,3	1,4	4,3	0,8	2,7	1,0	3,0	1,5	3,5	0,5
f066	6,8	0,4	3,7	1,0	5,3	1,6	1,8	1,2	4,5	1,9	6,0	1,1
f067	3,8	0,8	4,2	0,8	4,8	1,3	4,7	0,5	2,8	1,0	4,8	1,2
f068	5,0	0,6	5,0	0,9	5,8	0,8	4,0	0,9	3,0	1,7	6,2	0,4
f069	4,0	0,9	5,0	0,6	4,2	0,8	4,8	0,4	4,0	0,9	4,2	1,2
f070	6,3	0,8	5,0	0,9	4,7	1,2	2,3	0,8	4,8	0,8	5,2	1,0
f071	2,8	0,8	3,5	1,2	3,3	0,8	5,0	0,0	4,3	1,2	3,5	1,2
f072	6,5	0,5	4,8	1,2	6,0	0,9	2,3	0,8	4,8	1,3	4,5	1,2
f073	2,8	1,0	3,2	1,0	2,5	1,0	2,8	0,8	3,7	1,9	2,8	0,8
f074	6,0	0,9	3,7	1,0	5,0	1,1	2,2	1,0	5,0	0,9	5,7	1,0
f075	3,2	1,5	3,7	1,9	4,2	1,9	6,3	0,5	5,2	1,9	5,2	0,8
f076	4,7	0,8	4,5	1,0	5,2	0,8	2,2	0,4	3,7	0,8	4,7	1,0
f077	2,8	0,8	4,7	1,0	3,5	1,2	5,8	0,4	4,5	0,8	2,7	0,5
f078	5,2	0,8	4,3	2,0	2,8	1,0	2,2	1,0	4,7	1,2	2,3	0,8
f079	5,7	1,0	4,2	1,2	4,2	1,7	1,8	0,8	3,3	1,2	3,2	1,3
f080	4,0	0,6	4,3	0,8	4,3	1,9	2,5	0,5	4,3	1,6	5,2	1,2
f081	4,0	0,9	3,7	1,4	4,7	1,8	3,7	0,8	4,5	0,5	4,8	1,5
f082	3,3	0,8	4,7	1,0	5,5	0,5	6,3	0,5	2,7	1,2	4,3	1,0
f083	2,3	0,8	3,0	1,7	5,8	1,3	6,8	0,4	6,0	0,9	6,2	0,4
f084	4,7	0,5	5,2	1,0	5,5	1,0	4,3	0,8	3,2	1,0	5,3	0,5
f085	4,2	1,6	3,8	1,0	2,8	1,7	3,2	1,0	4,0	1,1	2,0	0,9
f086	4,3	1,4	4,8	1,2	6,0	0,6	6,8	0,4	4,5	1,8	6,5	0,5
f087	5,2	1,5	4,8	1,2	5,2	1,0	3,0	0,6	3,3	1,5	3,7	1,2
f088	4,7	1,0	5,8	0,8	5,8	0,4	5,5	0,5	3,3	1,2	4,8	1,2
f089	6,0	1,1	5,3	1,0	5,3	1,4	2,2	1,0	3,8	1,9	5,7	1,2
f090	2,7	0,8	3,5	1,4	3,2	1,2	4,0	0,6	2,3	0,5	2,3	0,8
f091	3,2	0,8	4,3	0,8	4,0	1,1	4,3	0,5	4,3	1,0	3,8	0,4
f092	2,3	1,0	2,7	1,0	3,5	1,0	5,0	0,6	2,7	1,5	3,5	0,8
f093	5,8	1,0	4,5	0,5	5,7	1,0	2,3	0,8	4,2	1,6	4,7	1,0
f094	3,0	0,9	2,8	1,0	2,3	1,0	3,0	0,6	3,7	1,4	2,5	1,2
f095	6,7	0,5	5,8	0,8	6,0	1,1	2,7	0,8	5,5	0,8	5,5	0,8
f096	5,0	1,3	3,0	0,9	3,7	0,8	2,5	0,8	3,7	1,4	3,3	0,8
f097	4,5	0,5	5,7	0,8	5,2	1,2	4,5	0,5	4,0	0,6	3,5	0,8
f098	4,0	1,4	4,7	1,2	5,3	1,6	5,7	0,5	4,5	1,4	4,8	1,6
f099	5,3	0,8	4,0	0,9	4,5	1,0	1,7	0,8	2,7	0,5	4,5	1,0
f100	2,8	0,8	4,2	1,0	3,5	1,0	4,7	0,8	2,8	1,2	3,3	0,5

Appendix III

Mean ratings for the 600 stimuli database - FEMALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
f101	6,0	0,9	3,7	1,6	4,8	1,7	2,2	0,8	5,2	1,7	3,8	1,0
f102	3,3	0,5	4,2	0,8	4,0	0,6	3,8	0,8	2,2	1,0	3,3	0,5
f103	5,7	0,8	5,8	1,0	5,7	0,8	2,7	0,8	4,3	2,0	5,3	1,5
f104	4,8	0,8	3,0	1,3	3,8	1,5	3,2	1,0	5,3	1,2	5,0	1,3
f105	6,3	0,8	5,2	0,8	6,0	0,9	2,7	0,8	4,2	1,7	5,2	1,0
f106	3,7	1,2	4,0	1,3	5,2	1,0	4,0	0,6	3,7	1,2	5,0	0,6
f107	2,8	1,0	4,2	1,3	5,3	1,4	6,0	0,6	5,0	1,1	5,3	1,2
f108	5,8	0,8	5,2	1,0	3,8	1,7	3,2	1,2	4,0	1,8	2,8	1,0
f109	4,7	1,0	3,7	1,0	4,0	1,3	1,8	1,2	2,7	1,4	4,0	0,9
f110	5,0	0,6	4,8	1,0	5,5	1,0	6,2	0,4	4,2	1,7	5,8	0,4
f111	3,7	1,2	3,5	0,8	4,5	0,8	3,2	1,2	1,7	0,5	4,0	1,1
f112	5,0	0,0	3,8	0,4	4,5	0,8	3,3	1,0	2,8	1,3	4,7	0,5
f113	6,5	0,5	3,5	2,3	3,3	1,2	2,7	0,8	4,8	1,5	3,7	0,5
f114	5,3	1,2	4,5	1,0	5,8	1,2	2,2	1,0	3,0	0,9	5,7	0,5
f115	3,7	0,5	3,7	0,8	3,7	1,2	5,8	0,4	3,8	1,5	3,5	1,0
f116	3,0	0,9	3,0	1,1	5,2	1,5	6,8	0,4	3,7	2,1	5,2	0,8
f117	6,0	1,1	3,3	1,5	4,5	1,9	2,5	0,8	4,3	1,6	4,5	1,5
f118	4,2	0,8	5,3	0,8	3,3	1,2	5,3	0,5	5,7	1,2	2,7	1,2
f119	3,8	0,8	4,0	1,3	5,3	1,4	2,5	1,5	2,8	1,3	5,0	0,6
f120	4,0	0,9	3,5	0,5	5,2	1,3	3,2	1,2	2,8	1,0	4,7	1,0
f121	5,2	1,0	5,0	1,4	5,5	1,0	5,0	0,0	4,7	1,5	5,2	0,8
f122	3,5	1,0	3,2	0,8	4,2	1,0	1,7	1,0	2,0	0,9	2,3	0,8
f123	2,2	1,0	3,8	1,2	3,3	0,8	2,8	1,0	3,2	2,0	3,5	1,5
f124	4,7	0,8	5,2	0,8	4,7	0,8	4,8	0,8	4,7	1,0	3,3	1,4
f125	3,3	1,2	3,8	0,8	4,7	1,2	1,8	1,2	2,0	0,6	4,3	0,8
f126	3,0	0,9	4,2	1,6	5,8	1,2	5,8	0,4	3,0	1,1	5,5	1,0
f127	4,0	1,4	4,8	0,8	5,2	1,2	3,5	1,0	2,8	1,2	4,7	1,0
f128	3,8	0,8	4,7	0,8	5,5	1,2	6,3	0,5	4,5	1,5	5,0	0,9
f129	4,7	1,8	3,3	1,6	4,2	1,6	2,3	0,8	4,5	1,2	3,5	0,5
f130	4,2	1,2	4,3	1,4	5,2	1,3	2,8	1,2	5,0	0,9	5,2	0,8
f131	2,0	0,9	2,3	0,8	3,3	1,0	4,7	0,5	3,2	1,9	3,5	0,8
f132	3,7	0,5	4,5	1,0	5,7	0,8	4,7	0,5	3,2	0,8	5,2	0,8
f133	3,3	0,5	3,7	1,2	6,3	0,8	6,0	0,6	4,2	2,0	6,0	0,9
f134	2,8	1,0	3,0	0,9	4,2	1,7	4,3	0,5	4,2	1,5	4,0	1,3
f135	6,0	0,6	2,3	1,0	4,3	1,4	2,8	0,8	5,3	1,8	3,5	1,5
f136	5,3	0,5	3,7	1,0	4,8	1,2	1,7	1,0	2,8	1,2	4,0	0,6
f137	3,5	1,0	3,7	1,2	5,0	1,7	3,2	0,8	3,0	1,8	5,2	1,2
f138	2,2	1,2	4,5	1,6	3,5	1,0	4,3	0,5	4,0	2,1	2,2	0,8
f139	6,3	0,8	3,3	2,1	3,2	1,2	2,8	1,2	5,8	1,9	1,8	1,0
f140	3,2	0,4	3,3	0,8	3,5	1,4	5,2	0,8	2,8	0,8	3,3	1,4
f141	4,5	1,8	4,2	1,5	5,0	1,1	3,8	0,8	4,7	1,0	4,3	1,2
f142	5,5	1,2	2,2	1,2	3,7	1,4	2,2	1,0	4,0	1,8	2,3	1,0
f143	4,2	0,8	3,7	0,8	5,2	1,2	3,0	1,1	1,7	0,8	4,7	1,0
f144	4,0	1,8	4,7	1,5	5,3	0,5	5,8	0,4	5,7	0,8	3,8	1,2
f145	2,3	0,8	2,8	0,8	3,5	1,0	4,5	0,5	1,7	0,8	3,7	1,5
f146	3,5	0,5	4,0	0,9	5,7	1,0	4,3	0,5	2,8	1,2	5,5	1,0
f147	3,3	0,5	3,5	0,8	4,0	1,4	2,8	0,8	2,2	0,4	3,8	1,0
f148	6,3	0,8	4,7	1,0	5,7	0,8	3,2	0,8	4,3	1,5	4,7	1,5
f149	4,8	1,2	4,8	0,8	4,8	1,0	3,0	1,1	3,0	1,4	4,5	1,5
f150	4,3	0,8	3,3	1,0	4,3	0,8	1,5	0,8	2,0	0,6	4,2	1,2

Appendix III

Mean ratings for the 600 stimuli database - FEMALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
f151	2,5	0,8	2,7	0,5	3,0	0,6	3,8	0,8	2,3	1,5	2,8	1,0
f152	5,2	0,8	4,7	1,0	5,5	1,0	3,5	0,8	3,5	1,4	5,0	1,1
f153	5,0	0,9	4,3	0,8	5,2	1,0	3,8	1,0	3,8	0,8	4,7	0,8
f154	5,5	0,5	5,5	0,8	4,5	1,5	5,0	0,6	4,8	1,0	4,3	0,8
f155	4,3	0,5	4,7	1,0	3,7	0,5	4,2	0,8	2,8	1,0	2,7	0,5
f156	3,3	0,8	4,0	0,6	2,3	0,8	4,0	0,6	3,0	0,9	2,2	0,8
f157	3,7	0,8	3,5	1,0	3,5	0,8	3,0	1,3	2,7	0,8	3,8	1,2
f158	3,8	0,4	3,8	1,0	3,7	0,5	3,5	0,8	3,3	1,2	4,2	1,0
f159	5,2	0,8	5,0	0,9	5,3	1,2	4,0	0,6	2,7	1,0	4,0	0,9
f160	4,2	1,0	3,3	1,2	4,3	1,4	2,2	1,0	4,0	1,4	5,0	1,4
f161	2,3	1,0	3,5	1,0	3,2	1,2	2,7	0,8	2,7	1,5	3,8	0,8
f162	4,2	1,0	4,3	0,5	6,0	1,3	5,7	0,5	2,8	1,3	5,2	1,2
f163	2,7	1,2	3,2	1,3	4,2	1,2	4,3	1,0	4,7	1,5	3,0	1,3
f164	3,8	0,8	4,0	0,6	5,2	1,0	3,7	1,2	2,2	0,4	4,2	0,8
f165	5,0	0,9	4,2	1,2	5,8	0,8	3,0	1,7	2,8	1,3	5,5	0,5
f166	2,0	1,1	2,5	1,0	4,0	1,7	5,8	1,2	5,5	1,4	3,8	1,0
f167	2,7	0,8	4,3	1,0	4,8	1,6	6,5	0,5	5,0	2,0	5,0	1,3
f168	6,5	0,8	5,2	1,0	5,7	1,2	2,2	0,4	4,3	1,8	5,3	1,4
f169	3,0	0,6	3,8	1,2	5,2	1,0	5,7	0,8	2,8	0,8	4,8	1,3
f170	4,7	0,5	5,7	0,5	5,0	1,3	2,2	1,6	4,0	1,4	5,3	1,2
f171	4,3	1,0	5,0	0,6	5,8	1,2	5,8	0,4	3,5	1,0	5,3	1,8
f172	4,7	1,0	4,3	1,4	4,8	1,5	5,7	0,8	4,8	1,0	4,5	1,5
f173	6,2	0,8	3,2	1,5	4,5	2,1	1,8	0,8	3,8	1,6	5,3	0,8
f174	3,2	0,8	4,2	0,8	5,0	1,1	4,8	0,8	2,3	0,5	3,8	1,0
f175	2,7	1,2	2,7	1,0	3,0	1,3	2,5	1,0	3,3	1,5	3,3	0,8
f176	6,3	0,8	3,2	1,0	3,8	0,8	2,7	0,8	4,7	1,5	3,5	1,2
f177	6,0	1,1	3,3	1,6	2,7	1,2	3,3	1,0	6,2	2,0	2,0	0,9
f178	4,7	1,0	3,7	1,0	4,7	0,8	3,0	0,6	3,2	0,8	4,7	1,2
f179	5,3	0,5	4,7	1,0	4,7	0,8	2,3	0,5	3,2	1,0	3,3	0,5
f180	4,8	0,8	3,2	1,2	4,5	1,0	2,5	0,8	3,7	1,2	5,0	0,6
f181	6,0	0,9	3,2	1,6	3,0	1,3	2,5	0,8	5,7	1,6	2,2	0,8
f182	3,5	0,5	4,2	0,8	4,5	1,4	3,2	1,2	3,8	1,5	4,8	1,0
f183	5,7	1,2	5,3	1,2	5,0	1,3	2,3	1,0	3,7	2,0	3,3	0,5
f184	6,3	0,5	4,5	1,0	5,0	1,1	2,3	0,8	4,2	1,8	4,8	0,8
f185	2,3	1,2	3,0	1,3	4,0	1,3	1,3	0,8	2,3	1,9	3,0	1,1
f186	5,3	0,5	4,8	1,2	5,5	1,0	3,7	0,8	3,3	0,8	5,0	0,9
f187	3,0	1,1	3,5	1,0	3,5	0,8	6,0	0,6	3,3	0,5	2,3	0,5
f188	5,0	0,6	3,3	1,5	3,0	1,3	3,5	1,0	3,7	1,4	2,3	1,0
f189	4,0	1,4	5,7	0,8	5,3	0,8	4,3	0,8	4,5	0,8	5,8	1,2
f190	5,0	0,6	4,3	1,0	3,8	1,0	1,7	0,8	2,5	0,8	3,3	0,8
f191	5,0	0,6	5,3	0,5	5,5	1,4	4,3	0,5	3,8	1,2	4,5	1,9
f192	4,2	1,3	4,8	1,3	6,5	0,5	6,8	0,4	5,2	1,3	6,2	0,8
f193	4,7	1,0	4,5	1,0	4,7	1,5	1,5	0,8	5,0	1,3	5,2	0,8
f194	3,2	1,0	4,0	1,1	5,0	1,1	5,8	0,4	4,7	1,9	4,2	1,2
f195	3,2	1,3	3,8	1,2	5,3	1,0	3,5	1,5	5,3	1,2	4,7	1,2
f196	3,8	1,2	4,7	1,2	3,5	0,8	5,8	0,4	5,0	1,3	2,5	1,5
f197	5,5	1,0	4,7	0,8	4,5	1,0	3,0	0,6	3,8	0,8	3,7	0,8
f198	6,2	0,4	4,2	1,0	5,2	1,5	2,2	1,0	4,0	1,5	4,7	0,8
f199	2,8	0,8	2,8	0,8	3,8	1,3	5,0	0,6	3,2	1,9	3,7	1,0
f200	4,3	0,8	3,8	1,2	5,2	1,5	3,0	1,8	2,5	0,5	4,3	1,2

Appendix III

Mean ratings for the 600 stimuli database - FEMALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
f201	3,7	0,8	4,7	0,5	4,2	1,0	4,8	0,8	3,3	1,2	4,2	0,8
f202	3,8	0,8	4,0	0,6	5,0	0,9	4,7	0,5	2,8	0,8	4,3	0,8
f203	3,2	1,5	3,5	0,8	4,8	1,8	4,8	0,8	4,7	1,4	4,3	1,2
f204	3,2	0,4	3,7	1,4	3,5	1,0	5,7	0,8	4,8	1,2	2,3	0,5
f205	4,7	0,8	4,5	0,5	4,3	1,2	4,5	0,8	5,0	1,1	4,0	1,3
f206	6,2	0,8	4,7	1,0	4,3	2,0	2,5	0,8	4,7	1,6	4,2	1,7
f207	5,0	1,4	4,5	1,4	4,0	0,9	3,0	0,9	3,8	1,5	4,7	1,0
f208	2,8	0,8	3,7	1,2	4,0	0,9	3,5	0,8	2,2	1,5	4,2	2,1
f209	4,5	0,8	4,3	1,2	4,3	1,4	3,5	0,8	3,0	1,1	4,7	1,5
f210	4,8	0,8	4,3	1,2	2,5	0,5	2,7	1,0	4,3	0,8	3,5	1,0
f211	5,3	1,4	4,8	1,0	5,2	1,3	2,0	0,9	4,7	0,5	5,2	1,5
f212	2,8	1,9	4,2	1,0	3,8	1,3	3,3	1,0	5,0	1,5	2,5	0,8
f213	5,2	1,2	2,7	1,2	3,8	1,2	2,2	1,0	3,7	1,4	4,7	1,0
f214	4,3	0,8	4,5	1,0	5,7	1,0	6,0	0,9	2,7	1,0	5,5	1,0
f215	5,3	0,8	4,2	1,2	5,0	1,3	4,8	1,2	3,5	1,6	4,5	1,8
f216	5,8	1,9	3,5	1,2	4,0	1,1	2,0	0,6	6,0	0,9	3,5	1,8
f217	5,3	0,8	4,0	1,3	4,3	1,6	2,5	0,8	4,5	1,0	4,3	1,9
f218	3,5	1,0	4,3	0,8	4,0	1,4	6,3	0,5	5,2	1,3	3,7	1,2
f219	4,0	0,6	3,5	1,0	4,8	1,2	3,7	0,5	4,7	1,8	4,5	2,0
f220	5,0	0,9	4,8	0,8	5,2	1,5	2,2	0,8	3,3	1,5	5,5	1,2
f221	3,0	0,9	3,8	1,0	4,0	1,3	5,8	0,8	3,0	1,8	4,2	1,0
f222	6,0	0,9	4,8	1,2	5,8	0,8	2,0	1,1	4,7	1,4	5,3	1,2
f223	6,2	0,8	4,5	1,5	5,5	1,4	1,3	0,8	3,3	2,2	4,2	1,8
f224	3,5	1,4	4,0	1,4	5,0	1,3	6,3	0,8	4,7	1,9	5,2	1,5
f225	4,2	1,3	3,2	1,5	2,7	0,5	3,0	0,6	4,2	1,2	2,3	0,8
f226	4,7	0,8	4,5	0,8	4,8	1,0	2,5	0,8	3,2	0,8	4,7	0,5
f227	4,2	1,0	5,0	0,9	4,3	1,0	3,5	0,8	3,0	1,3	3,0	0,9
f228	2,8	1,0	3,7	0,5	3,2	0,8	2,7	0,8	2,3	1,5	2,0	0,6
f229	5,3	0,5	4,5	1,0	5,0	1,1	2,3	0,5	3,5	1,2	5,3	1,4
f230	2,8	1,3	3,5	1,4	4,8	1,6	6,5	0,5	5,2	1,7	4,7	1,5
f231	5,5	1,2	4,3	1,0	4,3	1,0	2,7	0,8	4,2	1,2	3,8	1,3
f232	5,8	0,8	4,3	1,0	5,3	0,8	2,7	0,8	4,2	1,0	4,2	0,8
f233	4,5	0,5	3,5	1,2	4,3	0,8	3,0	1,1	3,3	1,0	3,8	1,3
f234	5,5	0,8	4,2	1,6	4,7	1,9	1,7	0,8	4,3	0,5	4,5	0,5
f235	4,0	0,6	5,0	1,3	5,2	0,4	5,7	0,5	4,0	0,6	3,5	1,0
f236	4,3	0,8	4,2	1,2	5,3	1,9	4,5	0,5	3,8	1,2	4,8	1,2
f237	6,0	0,9	2,7	0,8	3,2	1,7	1,8	1,2	3,7	1,4	3,5	1,8
f238	4,3	1,2	4,7	0,5	5,5	1,4	5,2	0,8	5,0	1,4	5,5	1,5
f239	4,2	1,0	4,7	1,0	4,3	1,2	3,7	0,8	3,2	1,3	4,2	0,8
f240	5,7	1,0	3,0	1,4	3,8	1,5	1,8	0,8	5,0	1,4	4,0	0,9
f241	5,2	0,8	5,0	0,6	4,5	0,5	3,8	1,0	3,3	0,8	4,2	0,8
f242	6,2	0,4	3,7	0,8	4,5	0,8	1,7	0,8	3,7	1,2	4,7	1,0
f243	4,0	0,9	4,2	0,8	4,0	0,9	3,8	0,4	3,0	1,3	3,8	1,0
f244	4,7	0,8	5,2	0,8	4,7	0,5	4,3	0,5	2,8	0,8	3,5	0,5
f245	3,8	1,0	4,5	1,0	5,0	1,5	2,0	1,1	2,2	1,5	5,0	0,9
f246	5,7	0,8	3,5	1,6	3,5	1,4	2,0	1,1	5,8	0,8	2,8	0,8
f247	3,0	1,3	4,5	1,8	3,7	0,8	3,3	0,8	2,8	1,5	3,7	0,8
f248	4,2	1,2	4,0	0,9	4,8	1,2	1,8	1,0	3,3	1,0	4,3	1,0
f249	3,0	1,7	3,8	0,8	4,8	1,2	6,7	0,5	5,8	1,5	4,8	1,0
f250	3,7	1,0	4,0	1,4	3,7	1,0	3,2	1,0	4,0	1,4	4,0	0,9

Appendix III

Mean ratings for the 600 stimuli database - FEMALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
f251	5,8	0,8	3,8	1,5	5,2	0,8	2,2	1,0	4,8	1,5	4,0	1,7
f252	4,5	0,8	5,2	1,3	5,0	1,3	4,3	0,8	4,7	1,9	3,8	1,2
f253	4,7	0,8	5,0	0,9	2,7	1,2	4,8	0,4	4,2	1,5	1,7	0,8
f254	4,2	0,4	4,8	1,2	4,7	0,5	4,5	0,8	3,3	1,2	5,3	0,5
f255	3,7	1,6	3,2	1,2	4,0	1,8	1,8	1,2	4,7	0,8	5,3	1,0
f256	3,3	0,8	3,8	1,3	4,2	1,5	4,7	0,8	3,5	1,6	2,3	0,8
f257	2,5	1,0	2,5	1,0	3,2	1,5	4,8	0,4	3,5	2,6	2,7	1,0
f258	4,3	1,5	4,5	1,0	5,5	0,5	3,7	0,8	3,3	1,0	5,7	1,0
f259	5,3	1,0	3,5	1,4	3,8	1,5	3,2	0,4	4,5	1,0	3,2	0,4
f260	4,3	0,8	3,5	0,5	4,7	0,5	1,5	0,8	2,7	1,2	4,5	1,0
f261	6,2	0,8	4,3	0,8	4,0	0,9	2,3	0,8	4,7	1,9	3,8	1,7
f262	5,7	0,8	4,7	0,5	5,5	0,8	2,7	0,8	4,0	0,6	5,3	0,8
f263	4,5	0,8	5,7	1,2	5,2	1,0	3,2	0,4	4,7	0,8	4,7	1,4
f264	5,0	1,1	4,3	0,5	5,5	0,8	3,5	0,8	4,2	0,4	5,3	1,4
f265	5,7	0,8	3,8	1,2	4,8	1,6	2,3	0,8	4,0	1,5	3,8	0,8
f266	3,7	0,5	4,8	1,2	3,5	1,5	4,3	0,8	3,8	1,2	3,3	0,8
f267	4,8	1,5	5,0	1,4	3,0	1,4	2,8	0,8	5,2	1,7	2,7	0,8
f268	2,5	0,5	2,7	0,8	4,2	1,2	4,5	0,8	2,8	1,6	4,0	0,9
f269	4,8	1,0	4,0	0,9	4,8	0,8	3,0	0,6	2,7	1,5	4,5	0,8
f270	4,7	0,8	5,3	0,5	5,8	1,0	5,5	0,5	4,0	1,1	5,8	1,0
f271	6,0	0,6	3,3	1,6	3,8	1,2	2,2	1,0	3,8	1,5	3,2	0,8
f272	4,0	0,9	4,5	0,8	6,3	0,8	6,8	0,4	5,3	1,2	6,5	0,5
f273	4,2	0,8	3,5	1,4	4,8	1,3	3,2	0,8	3,3	1,2	5,7	0,8
f274	4,8	0,4	3,8	1,0	5,2	0,4	3,2	0,8	3,7	0,8	4,7	1,8
f275	5,5	0,8	5,2	1,2	5,7	1,0	2,0	1,1	3,7	1,4	6,0	0,6
f276	4,0	1,1	3,7	0,5	3,2	1,5	3,7	0,5	2,8	1,0	3,0	0,6
f277	3,5	0,5	4,2	1,2	4,3	1,2	4,0	0,6	2,8	0,8	4,0	0,9
f278	4,5	1,0	3,2	1,0	3,8	0,4	3,3	0,8	2,8	0,8	3,7	0,8
f279	4,0	1,1	4,2	1,0	5,2	1,0	3,8	0,4	4,7	1,0	5,3	1,5
f280	5,3	0,5	4,0	1,4	5,5	0,5	2,8	0,8	3,8	1,2	5,2	0,8
f281	4,8	1,2	3,7	0,5	3,5	1,4	2,5	0,8	4,7	0,5	4,0	1,4
f282	5,2	0,8	3,2	1,8	3,8	1,5	2,0	0,6	3,7	1,2	3,2	1,2
f283	5,3	1,2	4,2	1,5	4,7	0,8	2,3	0,8	4,2	1,5	4,3	1,5
f284	4,5	0,8	4,5	1,0	5,5	0,5	4,3	0,5	3,5	0,5	4,2	1,2
f285	2,7	0,8	4,5	1,4	5,5	1,4	3,7	1,0	3,5	2,2	5,3	1,6
f286	5,0	1,4	3,8	1,2	5,2	0,8	1,7	0,8	3,5	1,4	4,3	1,2
f287	5,7	1,0	3,5	1,4	5,0	0,9	2,3	1,0	4,7	0,8	5,2	1,5
f288	5,2	1,2	3,7	1,4	4,2	1,3	2,8	1,0	4,5	1,8	4,5	1,0
f289	5,5	0,5	4,5	0,8	4,7	0,8	2,8	0,8	3,8	1,3	4,7	0,8
f290	5,7	0,8	4,0	1,4	5,3	0,8	2,3	0,8	5,0	0,6	4,5	1,4
f291	4,8	0,8	4,7	1,0	5,2	1,2	1,8	0,8	3,3	1,5	5,5	0,8
f292	6,0	1,1	4,0	1,4	5,8	0,8	2,7	0,8	4,0	1,1	4,8	1,2
f293	3,7	0,5	3,8	1,2	4,2	1,5	2,2	1,0	2,5	1,4	5,2	1,0
f294	5,3	1,0	3,7	0,8	4,7	1,5	2,7	0,8	3,5	1,0	5,0	0,6
f295	3,5	0,5	3,2	0,8	3,7	1,2	3,3	0,8	3,5	1,4	3,7	0,8
f296	2,8	1,6	2,7	1,4	2,2	1,2	1,5	1,2	6,3	0,8	2,7	1,0
f297	4,5	0,8	5,2	0,8	5,0	0,9	3,5	0,8	3,7	1,6	4,2	0,8
f298	4,0	1,1	3,5	1,2	4,0	1,3	1,5	0,8	4,8	0,8	4,0	1,1
f299	5,2	1,0	4,7	0,8	4,5	1,0	3,2	0,8	3,7	1,5	4,5	0,5
f300	5,0	0,9	3,3	1,2	5,3	1,2	1,8	0,8	3,3	1,2	5,3	1,0

Appendix III

Mean ratings for the 600 stimuli database - MALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
m001	2,2	1,2	3,0	1,5	4,8	1,2	5,8	0,8	6,5	0,8	5,3	0,8
m002	3,3	0,5	2,7	0,8	3,5	1,0	3,0	1,1	4,7	1,8	4,5	0,8
m003	5,5	1,2	4,7	1,0	5,0	1,1	3,8	0,8	4,3	1,4	4,7	0,8
m004	5,8	1,2	4,8	1,2	3,8	1,5	3,7	0,8	5,0	0,6	3,7	1,6
m005	4,2	1,0	5,3	1,4	4,2	2,3	4,0	0,6	4,5	1,8	3,8	1,0
m006	5,5	1,0	2,8	1,2	3,2	1,3	3,2	0,8	4,3	1,4	4,0	0,9
m007	3,8	0,8	3,5	1,4	4,7	1,2	4,2	0,4	3,8	1,2	4,7	1,4
m008	4,7	1,0	5,5	0,5	6,2	0,8	5,2	0,4	3,5	1,9	5,7	1,4
m009	4,8	1,3	5,3	0,5	5,0	1,4	3,7	0,8	4,8	1,2	5,0	1,4
m010	2,3	0,8	3,8	1,3	3,7	0,8	2,8	1,2	3,0	1,7	3,7	1,2
m011	4,8	1,0	5,0	0,6	4,7	1,2	6,3	0,5	3,8	1,3	4,3	1,2
m012	3,2	1,0	4,8	0,8	5,2	0,8	3,5	0,8	2,5	1,2	5,3	1,0
m013	2,8	0,8	3,3	1,4	3,5	0,8	2,8	1,2	2,0	0,9	3,2	0,4
m014	4,0	1,1	2,8	1,0	4,3	1,5	3,7	0,8	3,8	1,5	4,2	1,2
m015	5,0	1,1	3,2	1,2	3,5	1,0	2,8	1,0	3,7	1,0	4,2	0,8
m016	3,7	0,5	4,3	1,2	5,3	1,0	5,3	0,5	3,5	1,0	4,5	1,5
m017	3,5	1,2	4,0	0,6	2,5	1,0	2,8	1,2	4,3	1,4	2,2	0,8
m018	3,5	1,0	3,7	1,8	3,8	1,2	3,5	1,0	2,2	0,8	3,0	0,6
m019	4,2	1,0	5,3	0,8	3,3	2,0	3,7	0,8	3,8	1,5	3,0	1,3
m020	5,8	0,8	2,7	0,8	3,8	1,5	1,8	0,8	5,2	1,2	3,8	1,7
m021	4,0	1,4	5,2	0,8	5,2	1,2	7,0	0,0	5,2	1,5	4,5	1,9
m022	1,7	0,5	3,0	1,7	3,3	1,2	6,0	0,9	4,5	1,5	3,7	1,0
m023	1,7	0,8	2,2	1,5	2,7	1,2	2,5	0,8	3,7	2,3	2,8	0,8
m024	4,7	1,0	4,7	1,0	2,2	1,5	3,0	0,6	4,3	0,5	2,2	0,8
m025	1,7	0,5	4,2	1,6	4,3	1,6	4,5	0,8	5,7	1,5	3,3	0,8
m026	5,5	0,8	4,3	0,5	3,8	0,8	3,0	0,6	3,3	0,8	4,8	1,3
m027	2,2	1,2	3,2	1,3	2,7	1,2	3,0	0,6	2,2	1,2	3,2	1,3
m028	5,2	1,0	4,0	0,9	3,3	1,2	2,8	0,8	3,5	1,4	3,2	1,5
m029	3,0	1,1	4,8	1,5	2,2	1,2	4,5	0,5	5,8	0,4	2,8	1,5
m030	4,7	1,0	6,2	0,4	6,5	0,8	6,2	0,4	4,8	1,0	5,7	1,0
m031	4,5	0,8	3,8	1,3	4,8	1,3	3,2	0,4	5,0	0,6	5,3	1,4
m032	2,3	0,5	6,2	0,4	4,5	1,9	5,8	0,4	5,3	1,4	1,8	1,2
m033	2,3	1,2	3,5	0,8	4,7	2,3	5,0	0,6	6,5	0,8	5,2	1,2
m034	4,2	0,8	5,3	1,0	4,2	1,3	4,0	0,9	3,5	1,0	4,0	1,4
m035	3,0	0,9	2,2	1,2	3,0	1,4	4,3	1,2	2,0	0,6	2,7	0,8
m036	3,3	0,5	4,8	1,0	3,5	2,0	5,8	0,8	5,2	0,8	3,2	1,2
m037	5,5	1,0	5,2	1,2	5,0	1,1	4,0	0,6	3,5	0,8	3,7	0,8
m038	2,7	1,5	4,5	1,6	1,7	0,8	4,8	0,8	5,7	1,9	1,5	0,8
m039	2,7	0,8	3,7	1,2	3,8	0,4	1,8	1,0	2,2	0,8	3,3	0,5
m040	4,0	0,9	5,2	1,3	3,8	1,8	5,7	0,5	4,7	1,6	3,3	1,0
m041	3,7	0,5	4,5	1,4	5,0	0,6	4,8	0,4	2,5	1,0	5,0	1,4
m042	4,3	0,8	5,3	0,8	4,2	1,2	4,8	0,4	3,2	1,0	4,5	0,8
m043	5,3	1,0	5,2	0,8	4,5	1,0	3,5	0,8	3,7	1,5	4,3	1,4
m044	2,8	0,8	4,5	1,0	4,2	1,3	5,5	0,5	3,0	1,7	5,2	0,4
m045	3,7	1,0	3,0	0,6	3,0	1,1	1,5	0,8	3,3	1,2	4,7	1,5
m046	4,8	1,2	4,7	0,8	4,0	1,9	3,8	0,8	4,8	0,8	5,2	1,2
m047	2,2	0,8	2,5	1,4	3,3	1,0	2,2	1,2	2,2	1,5	3,7	1,4
m048	2,7	1,0	5,5	0,8	3,0	0,9	2,7	1,0	2,8	1,7	3,0	1,1
m049	3,5	1,0	4,5	1,2	3,0	1,1	4,3	0,5	3,3	1,2	2,7	0,5
m050	5,0	1,5	5,2	1,2	4,0	1,7	4,7	0,5	4,2	0,8	5,0	1,7

Appendix III

Mean ratings for the 600 stimuli database - MALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
m051	3,5	0,5	4,5	1,0	4,7	0,8	5,2	0,4	4,5	1,2	4,5	0,8
m052	4,8	1,0	3,5	1,2	3,7	0,8	2,7	0,8	3,2	0,8	4,7	0,8
m053	3,5	0,8	4,3	1,2	4,0	0,9	5,2	0,8	3,8	1,2	3,3	1,2
m054	3,2	1,0	3,3	1,0	3,0	1,3	3,7	0,8	1,5	0,5	3,0	0,6
m055	5,0	1,1	3,8	1,5	3,8	1,7	2,8	1,2	3,3	1,0	3,3	1,0
m056	4,5	0,8	5,7	1,0	4,5	1,0	5,0	0,9	2,8	1,0	3,8	1,0
m057	2,3	0,8	3,0	1,4	2,3	1,0	3,2	1,0	2,2	1,6	2,7	0,8
m058	4,0	0,6	5,0	0,6	5,0	1,3	6,2	0,4	5,2	0,8	4,5	1,2
m059	2,5	1,0	4,3	0,8	2,8	1,5	2,0	0,6	4,7	1,8	3,0	0,6
m060	4,5	0,5	4,3	0,5	4,2	1,0	1,8	0,8	2,8	1,8	4,7	0,8
m061	1,7	0,8	3,3	2,2	2,7	1,9	4,5	0,5	6,5	0,8	2,8	1,5
m062	2,8	0,8	4,0	0,6	4,5	1,0	4,3	0,5	3,0	0,9	4,3	1,0
m063	3,8	0,8	4,8	0,8	3,8	1,8	5,2	0,4	3,7	1,5	3,5	1,2
m064	3,3	1,2	2,8	1,3	2,2	0,8	2,7	0,8	3,8	1,7	2,0	0,9
m065	4,0	0,6	6,2	0,8	5,3	0,8	4,8	0,8	4,8	0,4	4,0	1,1
m066	5,2	0,8	4,3	1,2	4,7	1,2	3,3	0,8	2,8	1,2	4,5	1,0
m067	3,8	0,8	5,5	0,8	4,3	1,6	5,7	0,8	3,5	0,5	4,7	0,8
m068	5,0	0,9	5,0	0,6	5,3	1,2	4,5	0,5	3,8	0,4	5,0	1,3
m069	2,0	0,9	4,8	0,4	2,3	1,4	5,8	0,4	5,2	1,7	1,8	0,4
m070	5,5	0,8	5,2	0,8	5,7	0,5	4,3	0,5	3,8	1,2	5,2	1,2
m071	4,3	0,5	5,0	0,6	4,7	0,8	4,5	0,5	3,7	0,8	3,3	1,0
m072	5,3	1,0	5,5	1,0	4,2	1,2	2,7	0,8	3,5	1,9	4,7	1,2
m073	5,2	0,4	4,5	1,2	4,8	1,0	4,3	0,5	3,2	1,2	4,3	0,8
m074	5,3	1,0	6,0	0,9	5,7	1,4	5,3	0,8	4,0	1,7	5,7	1,2
m075	4,3	0,5	4,2	1,3	5,0	0,9	3,7	0,8	2,8	1,0	4,8	0,8
m076	2,5	0,8	3,3	1,2	3,3	0,8	2,5	0,8	1,8	0,8	2,8	0,8
m077	3,8	0,8	4,2	0,8	4,5	0,8	3,8	0,8	3,7	1,2	4,8	0,4
m078	3,8	0,8	3,7	0,5	3,2	1,3	2,3	1,0	5,2	0,8	3,8	1,0
m079	3,0	0,6	3,3	0,5	5,0	0,9	6,2	0,8	3,5	1,2	4,2	0,8
m080	1,3	0,5	1,7	0,8	1,8	0,8	5,3	1,0	6,3	1,2	2,3	1,0
m081	3,8	1,2	4,5	0,8	3,0	0,6	3,2	0,4	2,3	0,5	2,8	1,2
m082	3,0	0,9	5,7	0,5	3,8	0,8	4,3	0,5	2,5	1,0	3,0	0,6
m083	2,7	1,0	2,7	1,4	3,2	1,2	2,7	0,8	2,7	1,4	2,3	0,8
m084	4,8	1,5	5,3	0,5	4,5	1,9	5,0	0,6	3,0	0,9	5,2	1,5
m085	3,7	1,0	4,2	0,8	4,2	1,0	4,7	0,8	3,7	1,5	4,3	0,8
m086	4,8	1,0	5,3	0,8	5,8	1,2	6,3	0,5	3,5	1,2	6,0	0,9
m087	2,5	0,5	2,5	1,0	3,0	0,9	3,2	1,0	2,3	1,9	3,7	1,2
m088	3,5	0,8	5,3	0,5	3,8	1,0	5,0	0,6	3,0	1,4	3,7	1,6
m089	6,5	0,5	3,2	1,2	3,8	1,5	3,2	1,0	4,3	1,0	4,5	0,8
m090	3,5	1,2	4,2	1,3	4,0	1,3	5,0	0,6	4,2	1,0	3,7	1,6
m091	3,2	1,2	5,3	0,5	3,0	1,3	4,0	0,6	3,0	0,6	2,7	1,0
m092	1,7	0,5	3,2	2,4	4,3	2,0	6,3	0,5	7,0	0,0	4,3	1,0
m093	5,8	1,0	5,5	1,2	5,3	0,8	3,0	0,6	4,0	1,3	5,2	1,3
m094	4,3	0,8	5,0	1,1	4,3	1,2	4,0	0,6	4,7	1,0	3,3	0,5
m095	5,2	0,8	3,8	1,2	5,5	1,0	5,5	0,5	2,8	1,0	5,8	0,4
m096	2,3	0,8	2,2	0,8	3,2	0,4	2,2	1,0	2,0	1,1	3,3	0,5
m097	4,0	1,4	5,0	1,3	3,8	1,5	3,0	0,6	6,2	0,8	3,5	1,0
m098	4,7	0,8	5,0	1,1	5,8	0,8	4,8	0,4	4,5	1,4	4,8	1,0
m099	3,0	0,6	3,7	1,0	4,8	0,8	2,0	1,1	4,3	1,5	5,0	0,6
m100	5,5	1,0	4,3	2,0	4,2	1,8	3,0	0,6	4,8	1,5	3,2	1,2

Appendix III

Mean ratings for the 600 stimuli database - MALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
m101	2,8	1,0	5,2	0,8	2,7	1,4	5,2	0,8	3,2	0,4	2,3	0,8
m102	3,7	1,0	5,2	1,3	3,2	1,2	5,0	0,6	3,7	1,2	3,5	0,8
m103	4,2	1,3	4,0	1,7	3,2	1,7	2,0	0,6	6,2	1,6	3,5	1,6
m104	4,5	0,5	4,5	1,0	5,2	0,8	5,8	0,4	3,8	1,0	5,0	1,4
m105	3,7	0,8	4,0	0,9	2,2	1,2	1,7	0,8	1,7	0,5	2,5	1,0
m106	3,7	1,0	4,8	1,0	3,5	0,8	3,7	0,8	4,3	1,9	3,0	1,3
m107	3,8	0,8	5,5	0,8	5,3	0,5	6,2	0,8	3,7	1,0	4,8	1,7
m108	4,7	0,5	5,5	0,8	5,0	1,3	5,2	0,4	3,0	1,3	5,0	0,6
m109	4,7	0,8	5,5	1,0	5,3	0,8	5,8	0,8	3,3	0,5	4,8	0,8
m110	5,2	0,4	3,8	0,8	4,2	1,2	2,7	0,8	4,5	0,8	4,2	1,0
m111	2,2	0,8	2,8	1,2	3,2	0,8	2,7	0,8	1,7	0,8	2,7	0,8
m112	2,5	1,0	4,2	1,5	3,3	1,2	5,3	0,5	3,2	1,2	3,8	0,8
m113	2,3	1,0	3,2	1,0	3,5	1,4	2,5	0,5	2,7	2,3	2,7	1,0
m114	4,0	0,6	3,3	1,0	3,8	1,5	2,7	0,8	3,8	0,8	4,3	0,8
m115	4,7	0,8	5,5	0,8	6,3	0,8	6,8	0,4	4,7	1,4	6,5	0,8
m116	3,3	1,2	4,7	1,0	3,8	1,7	1,7	0,8	6,0	0,6	3,2	1,2
m117	4,0	1,3	4,5	1,0	4,0	1,1	4,5	0,5	3,7	1,4	3,0	0,9
m118	4,5	0,8	5,5	0,8	5,0	1,1	6,8	0,4	3,8	1,2	3,2	1,2
m119	3,2	0,8	4,8	1,3	3,3	1,8	6,2	0,4	3,8	1,2	3,0	0,6
m120	5,5	0,8	5,3	1,2	5,5	0,5	2,2	0,4	4,0	0,9	5,3	0,5
m121	2,7	1,0	3,8	0,8	2,5	1,4	1,8	0,8	2,0	0,6	2,8	0,8
m122	3,5	1,0	4,8	0,8	4,3	1,5	5,3	0,5	2,8	0,8	4,3	1,8
m123	5,3	1,4	3,7	1,5	4,0	0,9	3,3	1,0	4,8	1,0	4,7	0,8
m124	3,3	1,5	3,7	0,8	6,0	1,1	7,0	0,0	6,0	0,9	5,7	1,9
m125	5,0	1,5	4,3	2,0	3,2	1,8	3,2	0,8	4,2	1,2	2,5	1,6
m126	3,0	0,6	5,8	0,8	4,3	1,0	5,8	0,4	4,5	1,6	2,7	0,5
m127	2,8	1,2	3,7	1,0	4,5	0,5	4,7	0,5	2,5	1,0	3,5	0,8
m128	2,7	1,0	4,7	0,8	3,2	1,5	5,7	0,8	3,7	1,2	3,2	1,2
m129	2,0	0,9	3,5	0,8	2,5	0,8	6,5	0,5	6,3	0,8	2,2	1,2
m130	4,8	1,2	4,3	0,8	5,0	0,6	3,5	0,8	3,7	1,4	4,8	0,4
m131	3,7	1,0	4,0	1,3	6,0	0,6	6,2	0,4	3,8	1,5	5,5	1,2
m132	5,2	1,2	5,5	0,8	5,7	0,8	3,0	0,6	4,2	1,5	5,5	0,8
m133	4,3	0,5	4,0	1,4	3,7	1,2	3,7	0,8	2,8	1,2	3,3	0,5
m134	4,0	0,9	3,3	1,0	4,0	0,9	1,7	0,8	3,0	1,3	4,3	0,5
m135	3,0	1,1	4,3	0,8	3,8	1,0	2,3	0,8	1,8	0,8	2,8	0,8
m136	5,3	1,0	5,5	1,2	5,0	0,6	4,7	0,8	5,3	1,2	4,2	0,8
m137	6,0	0,9	4,0	1,9	4,0	1,4	3,2	0,8	4,0	1,3	4,0	1,4
m138	3,8	1,2	5,7	1,0	4,3	2,0	5,3	0,5	4,5	1,0	2,8	1,2
m139	2,7	1,0	4,7	0,8	4,5	0,5	5,2	0,4	2,3	0,5	3,5	1,0
m140	4,3	1,0	5,7	0,5	5,2	0,4	3,8	0,8	4,3	1,2	4,3	0,8
m141	5,2	0,8	3,5	1,0	4,7	1,5	2,5	0,8	3,7	1,0	5,2	0,8
m142	2,7	1,2	3,7	1,5	3,2	1,2	5,7	0,5	6,2	0,8	2,8	1,0
m143	5,5	0,8	2,8	0,8	4,5	1,4	2,7	0,8	4,3	1,2	4,2	1,2
m144	3,3	0,8	4,8	0,8	5,2	0,4	5,8	0,4	6,5	0,8	3,8	1,3
m145	3,3	1,5	2,8	1,7	3,2	1,5	1,3	0,8	5,3	1,2	4,7	1,0
m146	5,2	1,2	4,0	1,1	4,3	1,2	2,8	0,8	3,3	1,0	4,8	1,0
m147	5,2	1,2	4,2	0,8	4,8	1,0	3,0	0,6	4,3	0,5	5,3	1,0
m148	5,2	1,0	4,0	2,2	3,3	1,6	3,0	1,1	5,2	1,0	3,5	1,2
m149	2,5	1,0	3,7	0,5	3,0	1,4	2,5	0,5	2,0	1,3	3,3	0,8
m150	4,5	0,8	6,3	0,5	5,7	0,8	4,5	0,5	4,3	1,0	5,3	0,8

Appendix III

Mean ratings for the 600 stimuli database - MALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
m151	2,8	1,2	3,2	1,5	3,2	1,5	2,3	1,0	1,8	1,2	3,3	0,5
m152	3,0	1,8	3,2	1,7	3,5	2,1	2,3	0,8	6,5	0,8	4,2	1,5
m153	4,7	1,0	4,8	1,0	6,0	0,9	6,2	0,4	4,8	1,7	6,2	0,8
m154	3,0	1,1	5,3	0,8	3,3	1,5	5,2	0,4	2,5	0,5	2,3	1,2
m155	5,5	0,5	4,0	0,9	4,3	1,6	3,2	0,8	3,8	1,2	4,5	1,0
m156	3,0	0,6	4,7	0,5	3,0	1,1	4,5	0,5	3,3	1,2	3,8	1,2
m157	3,2	0,8	3,8	1,5	1,8	0,8	4,0	0,9	4,7	1,6	1,8	0,8
m158	4,2	0,4	6,2	1,0	5,0	0,9	3,3	0,8	3,8	1,0	3,5	1,5
m159	2,2	0,8	2,3	0,8	2,0	1,3	2,8	0,8	3,2	1,9	3,0	1,3
m160	4,8	1,3	6,2	0,8	4,8	0,4	3,7	0,8	5,0	1,7	5,3	1,2
m161	4,0	0,6	5,2	0,8	5,8	0,4	6,0	0,6	3,7	1,5	5,5	0,5
m162	2,7	1,2	2,8	1,0	2,5	1,4	2,7	0,8	2,0	0,6	2,8	1,0
m163	4,5	1,2	5,5	0,5	4,2	1,3	4,0	1,3	4,7	1,4	3,5	1,0
m164	3,5	1,0	4,8	0,8	5,0	1,3	4,8	1,3	3,7	1,8	4,2	1,0
m165	6,3	0,5	3,7	1,0	4,7	1,0	3,2	0,4	3,8	1,2	4,7	1,0
m166	4,7	1,4	3,5	0,8	3,5	0,8	3,0	1,1	4,3	0,8	2,8	0,8
m167	3,0	1,1	3,0	1,3	3,7	1,8	5,0	1,3	1,5	0,5	3,2	1,5
m168	4,2	1,9	4,5	1,0	4,3	1,0	2,2	1,0	4,5	0,8	5,0	0,9
m169	2,8	1,2	4,7	1,0	2,8	0,8	3,2	0,4	2,3	0,8	2,3	0,8
m170	1,7	0,8	2,7	0,8	3,0	1,4	2,3	1,4	3,0	2,0	4,0	0,9
m171	3,8	1,2	5,2	1,0	4,8	0,4	4,2	0,8	4,5	0,5	5,2	1,0
m172	2,8	0,8	5,0	0,6	4,2	1,3	4,8	0,8	3,7	0,8	4,5	0,8
m173	5,3	1,4	3,3	1,2	3,7	2,0	4,0	0,6	5,5	0,5	3,5	0,8
m174	3,7	0,8	5,2	1,0	3,3	1,2	5,3	0,8	3,7	1,4	4,0	0,0
m175	3,7	1,2	4,2	1,5	3,5	0,5	4,5	0,8	5,7	1,0	4,8	1,2
m176	4,0	0,6	4,7	1,6	4,5	1,0	4,0	0,6	3,7	1,2	3,7	1,0
m177	2,8	1,2	3,5	1,2	5,5	1,4	5,2	0,4	5,2	1,6	5,5	0,8
m178	4,2	0,8	4,8	1,0	5,5	1,0	4,8	0,4	3,5	1,6	5,3	1,2
m179	3,2	1,3	3,5	1,2	3,7	0,8	2,8	0,8	3,0	0,9	3,7	1,0
m180	4,7	0,8	5,3	0,8	5,0	0,9	5,5	0,5	3,3	0,8	5,2	0,8
m181	5,2	1,2	3,3	1,4	4,0	1,8	3,0	0,9	3,0	1,4	4,0	1,1
m182	4,3	0,8	5,3	0,5	5,5	0,5	6,2	0,4	3,2	1,2	5,2	1,0
m183	3,0	0,6	4,3	0,8	3,3	0,8	5,2	0,8	4,5	1,0	2,2	1,0
m184	6,0	0,9	4,0	1,4	4,5	1,4	2,3	1,0	4,7	1,5	3,7	0,8
m185	5,3	0,5	4,2	1,2	4,8	1,2	3,3	1,0	4,0	1,1	4,2	1,0
m186	3,3	1,2	4,8	0,8	4,7	0,8	6,0	0,0	4,0	1,3	4,2	1,3
m187	2,0	0,6	4,0	1,1	5,2	1,0	4,5	1,0	5,8	1,5	5,2	1,7
m188	2,3	0,8	3,3	1,0	2,7	2,1	3,7	0,5	6,5	0,8	3,2	1,5
m189	3,0	0,6	4,8	0,8	4,3	1,4	5,0	0,6	2,8	0,8	4,8	0,8
m190	3,7	0,5	4,3	0,5	3,0	1,3	4,0	0,6	3,2	1,0	2,7	0,5
m191	2,3	1,2	2,8	1,2	2,5	1,4	3,2	1,0	2,8	2,2	2,8	0,8
m192	3,7	0,5	4,0	0,6	2,7	1,2	3,8	0,8	6,0	0,9	2,5	1,0
m193	3,0	0,9	3,5	0,5	3,0	1,1	4,5	0,5	4,0	1,4	2,8	0,4
m194	3,3	0,5	3,7	0,5	5,5	0,5	3,8	0,8	2,8	1,5	5,3	0,5
m195	5,3	0,8	5,2	1,2	4,3	0,5	2,7	0,8	4,8	0,8	3,7	0,8
m196	5,7	0,5	4,5	1,9	3,3	0,8	2,5	0,8	5,2	0,8	3,8	1,2
m197	2,8	0,8	4,2	1,0	4,8	1,2	5,0	0,0	2,2	1,5	4,3	0,8
m198	4,2	1,0	4,8	1,5	3,2	2,0	2,8	0,8	5,8	0,8	3,2	1,5
m199	4,0	1,3	4,5	0,8	5,5	0,5	5,2	0,8	4,0	0,9	5,5	1,4
m200	2,5	0,8	2,5	1,0	3,3	1,8	2,8	0,8	2,8	1,8	4,0	0,6

Appendix III

Mean ratings for the 600 stimuli database - MALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
m201	2,7	1,2	4,2	1,3	3,8	1,2	3,7	1,0	4,0	0,9	3,3	0,5
m202	3,8	1,9	4,0	0,0	4,2	1,3	4,5	0,5	6,3	0,8	5,3	0,8
m203	3,3	1,0	5,0	0,6	4,8	1,2	4,3	0,8	3,7	1,4	4,2	1,7
m204	2,5	1,4	5,7	1,5	2,5	0,8	6,2	0,4	5,8	1,2	1,8	0,4
m205	2,0	0,6	2,5	1,0	2,2	0,8	3,2	0,8	4,0	1,9	2,5	0,5
m206	5,2	1,2	5,3	0,5	5,5	0,5	3,2	0,4	3,3	1,0	5,2	1,2
m207	6,0	0,6	4,2	0,8	5,0	0,0	3,2	0,8	5,0	1,1	5,5	0,8
m208	3,0	0,6	4,0	1,4	4,3	1,0	2,5	1,0	2,3	1,0	3,2	1,0
m209	3,5	1,4	4,8	1,2	6,2	1,0	5,3	0,5	6,0	0,9	6,0	1,5
m210	4,7	1,0	4,3	1,0	3,7	1,0	1,8	0,8	4,3	0,5	4,3	0,8
m211	5,0	0,9	5,8	0,8	6,2	1,0	6,8	0,4	4,8	1,3	6,2	0,8
m212	4,0	0,9	4,7	0,8	5,8	0,4	6,5	0,5	3,0	1,1	5,5	1,2
m213	3,2	1,3	4,7	1,0	2,5	1,6	3,7	0,8	5,7	0,8	3,7	1,6
m214	2,2	0,8	3,2	1,5	3,7	1,6	5,2	0,8	2,5	1,6	3,8	0,8
m215	4,0	1,1	4,5	1,0	5,2	1,5	3,7	0,8	3,5	1,6	5,0	1,1
m216	2,3	0,8	3,5	1,0	3,5	1,9	4,0	0,6	4,2	1,7	2,8	1,3
m217	2,3	1,0	4,2	1,6	3,5	1,0	2,5	1,0	2,2	1,2	3,2	1,2
m218	3,0	0,9	5,5	1,2	2,5	0,5	4,3	0,5	3,7	1,0	3,8	1,2
m219	2,5	0,5	5,0	1,3	3,7	1,0	5,5	0,5	1,7	0,8	4,2	0,4
m220	2,2	1,2	3,0	0,9	3,3	2,3	5,3	0,8	5,8	1,2	3,5	0,8
m221	3,5	1,0	5,0	1,1	5,0	0,6	4,7	0,5	3,5	1,0	4,3	0,8
m222	2,3	1,0	3,3	1,9	3,7	0,5	1,8	0,8	3,3	2,3	3,2	0,4
m223	5,3	1,0	5,3	1,0	5,5	0,5	3,5	0,5	4,3	1,0	5,2	1,0
m224	2,5	0,5	3,0	0,6	4,5	1,2	6,3	0,8	3,5	1,4	4,5	1,0
m225	3,0	0,9	4,3	1,2	3,7	1,0	4,8	0,8	4,2	1,6	4,8	0,8
m226	2,2	0,8	3,8	1,0	2,8	1,7	4,3	0,8	4,2	1,8	2,0	0,6
m227	2,2	0,8	3,8	1,3	3,8	0,8	1,5	0,8	2,3	1,2	3,3	1,0
m228	2,8	1,2	6,0	1,1	4,2	1,5	6,5	0,5	5,3	1,9	2,2	1,2
m229	4,0	0,9	5,5	1,0	5,3	0,8	5,2	1,0	4,3	1,4	5,7	0,5
m230	2,8	1,7	4,3	1,4	4,2	1,5	5,2	0,8	6,0	0,9	5,3	1,0
m231	3,2	1,0	4,2	1,5	4,3	1,0	6,5	0,5	4,0	2,0	3,2	1,5
m232	2,5	0,8	3,0	1,1	2,7	0,8	2,0	1,3	2,3	1,0	2,5	0,5
m233	3,0	1,4	3,7	1,2	3,8	1,9	3,8	0,8	6,5	0,8	4,3	2,0
m234	4,5	0,5	4,3	1,5	2,5	0,5	3,7	0,8	5,0	0,9	2,2	0,8
m235	4,2	1,2	4,5	1,0	5,2	0,8	3,0	1,1	3,7	1,2	4,7	0,8
m236	2,5	1,0	4,0	0,6	3,0	1,3	2,0	1,1	2,5	2,1	2,5	0,8
m237	4,2	1,2	5,3	1,0	6,0	1,1	6,5	0,5	4,0	1,4	5,7	1,0
m238	1,8	1,2	2,7	0,8	3,0	0,6	2,3	1,5	4,5	1,9	2,8	0,8
m239	5,0	1,3	4,7	0,5	5,5	0,8	2,8	0,8	4,5	1,4	5,8	1,2
m240	4,2	1,0	5,7	1,0	4,0	1,3	5,7	0,8	3,2	1,5	2,7	0,8
m241	3,0	0,6	3,2	1,2	4,0	1,7	2,8	0,8	2,2	1,0	3,8	1,3
m242	4,7	1,4	4,8	1,0	5,0	1,1	5,0	0,6	4,3	0,8	5,3	1,0
m243	2,8	1,0	4,7	1,4	3,8	1,5	6,0	0,9	3,5	1,4	3,5	1,6
m244	6,2	0,8	4,2	0,8	3,7	1,6	3,7	0,8	4,2	1,6	3,2	1,3
m245	2,2	0,8	3,7	2,0	3,0	1,1	1,7	0,8	4,0	2,3	2,7	0,5
m246	2,0	0,6	2,8	1,3	3,3	1,2	6,8	0,4	5,3	1,8	3,0	2,1
m247	5,5	1,4	4,8	1,0	4,7	1,0	2,2	1,0	4,2	1,2	4,5	0,8
m248	4,8	1,2	5,3	0,5	5,8	0,8	5,0	0,9	3,2	1,2	5,3	0,8
m249	2,5	0,5	3,7	1,0	4,3	1,5	5,0	0,9	3,3	2,1	3,0	0,6
m250	4,3	1,0	5,2	0,4	4,7	1,4	3,8	0,4	4,3	1,6	4,3	0,8

Appendix III

Mean ratings for the 600 stimuli database - MALE FACES

	ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS		AGE		DISTINCTIVENESS		KINDNESS	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
m251	2,7	0,5	3,5	0,8	4,0	1,4	7,0	0,0	5,2	1,7	4,8	1,0
m252	4,2	0,8	5,3	1,4	4,3	1,2	4,8	0,8	3,2	1,0	4,3	0,5
m253	2,7	1,2	4,5	1,0	2,3	1,0	6,0	0,6	6,7	0,5	3,2	1,5
m254	3,0	1,3	3,8	0,4	1,8	0,8	3,7	0,8	2,8	1,7	2,5	0,5
m255	4,7	0,5	4,7	0,8	6,0	0,6	6,2	0,8	3,8	1,3	6,2	0,8
m256	2,5	1,0	2,8	1,0	2,3	1,0	1,8	0,8	2,7	1,5	2,5	0,5
m257	5,3	1,2	4,7	0,8	3,7	1,2	3,0	0,6	3,3	1,0	4,0	0,9
m258	3,8	0,8	5,7	0,5	4,0	1,7	4,7	0,5	4,5	0,8	3,7	0,8
m259	3,0	0,6	2,8	0,8	3,5	1,0	4,2	1,0	4,7	0,8	4,5	1,2
m260	2,7	0,8	4,5	1,0	4,0	0,6	5,7	0,5	3,5	1,8	4,3	1,0
m261	3,7	1,0	4,8	0,8	4,3	1,2	4,8	0,4	3,7	1,2	4,0	1,1
m262	2,5	0,5	4,3	0,8	3,0	1,3	5,0	0,6	2,7	0,5	3,7	1,0
m263	2,8	0,8	3,3	1,5	3,8	1,5	2,7	0,5	2,8	1,2	4,3	0,8
m264	4,5	0,8	5,0	0,6	3,2	1,5	3,8	0,8	4,8	1,2	3,3	1,0
m265	3,2	1,0	5,0	1,4	3,5	1,0	5,7	0,5	5,5	1,4	3,7	1,0
m266	3,8	1,0	4,2	1,0	4,2	1,2	2,2	0,8	3,2	1,2	4,8	1,0
m267	3,5	1,2	3,7	1,0	4,5	1,5	2,3	0,8	1,8	0,4	4,2	1,2
m268	4,3	1,2	4,0	0,6	5,8	0,8	6,3	0,5	3,0	1,3	6,2	0,8
m269	6,3	0,5	4,0	1,4	4,8	1,6	4,0	0,9	5,0	1,1	4,8	0,8
m270	2,2	0,8	3,0	1,3	2,5	1,0	5,2	0,8	5,7	0,5	3,0	0,9
m271	5,2	0,4	4,3	0,8	4,5	1,4	2,5	0,8	4,2	1,5	4,7	1,0
m272	4,5	0,8	4,7	0,8	5,7	1,8	6,7	0,5	5,2	1,2	6,7	0,5
m273	4,7	1,0	3,3	1,4	3,8	1,3	3,0	0,6	2,8	0,4	4,3	0,5
m274	5,7	1,0	6,3	0,8	6,5	0,8	5,7	0,5	5,8	0,8	5,8	0,8
m275	2,3	0,5	2,3	1,0	2,8	1,0	2,5	0,8	2,2	1,5	2,7	0,5
m276	3,3	1,2	4,0	1,7	2,7	1,4	4,2	0,4	4,2	0,8	3,2	0,8
m277	5,3	1,4	4,7	1,0	4,8	0,8	3,2	0,8	3,8	1,0	4,3	1,4
m278	3,2	1,7	4,5	1,2	2,8	1,5	4,7	0,5	4,0	1,1	2,7	0,8
m279	3,0	0,9	2,5	1,0	3,0	1,3	3,3	0,5	2,5	1,9	2,7	0,8
m280	3,8	0,8	4,5	0,5	4,8	0,8	4,2	0,8	2,2	1,0	5,0	0,6
m281	3,2	1,0	4,7	1,0	4,8	1,2	6,2	0,4	6,2	0,8	4,3	1,4
m282	2,0	0,9	2,7	1,2	3,5	1,4	3,3	1,0	3,0	2,0	2,3	0,8
m283	6,2	0,4	4,0	1,4	4,0	1,8	2,5	0,5	4,8	1,6	4,8	0,4
m284	3,0	1,4	4,2	1,2	4,2	0,8	5,0	0,6	3,8	1,5	4,2	0,8
m285	2,3	0,5	2,7	1,5	2,8	1,3	4,2	0,8	2,5	1,9	2,8	1,2
m286	2,5	1,0	3,0	0,9	2,7	0,8	2,3	0,8	1,8	1,2	2,2	0,4
m287	4,0	1,1	4,5	0,5	3,3	1,2	3,2	0,8	5,3	1,2	3,5	1,2
m288	2,8	1,3	3,8	1,2	5,0	1,5	5,7	0,5	4,5	0,5	5,0	0,6
m289	2,5	0,5	3,0	1,7	2,7	1,5	3,5	0,8	2,2	1,2	2,3	0,5
m290	2,8	0,8	5,3	1,0	4,7	1,2	7,0	0,0	4,2	1,5	4,2	1,2
m291	5,5	1,4	3,8	0,8	4,2	1,5	2,3	0,8	3,0	1,3	4,5	0,5
m292	2,7	1,0	3,7	1,4	3,3	1,5	2,8	0,8	2,5	1,5	2,7	1,2
m293	4,5	0,8	4,5	0,5	4,7	1,0	5,0	0,6	3,5	1,0	4,7	0,8
m294	4,7	1,4	5,2	0,8	5,5	0,8	6,0	0,6	4,7	0,5	4,7	1,5
m295	2,0	0,6	1,8	0,8	2,3	1,0	1,7	0,8	2,3	1,9	2,0	0,0
m296	2,7	1,2	5,7	1,0	2,3	1,2	5,8	0,4	3,8	1,5	2,3	1,2
m297	4,7	0,5	4,5	1,0	2,8	1,0	3,2	0,8	5,0	0,6	3,3	1,0
m298	3,0	0,9	4,8	0,8	4,0	0,6	2,8	0,8	1,7	0,8	4,0	1,1
m299	4,2	0,8	5,0	0,6	3,8	0,8	4,5	0,5	3,2	0,8	4,0	1,1
m300	3,7	1,6	4,8	1,2	4,7	1,2	5,3	0,5	3,5	1,2	3,8	0,8

Appendix IV

Selected Faces *(experiment 1 & experiment 2)*

Low Attractiveness - Males

m022

m025

m069

m187

m216

Low Attractiveness - Females

f005

f138

f166

f167

f285

Appendix IV (continued)

High Attractiveness - Males

m165

m196

m244

m269

m283

High Attractiveness - Females

f016

f066

f113

f184

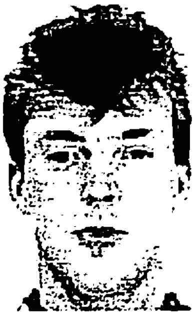
f261

Appendix IV (continued)

Low Intelligence - Males

m014

m020



m096

m143

m259

Low Intelligence - Females

f014

f096

f135

f237

f268

Appendix IV (continued)

High Intelligence - Males


m048


m082


m160


m163


m258

High Intelligence - Females


f018


f046

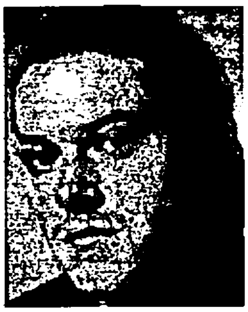

f159


f241


f253

Appendix IV (continued)

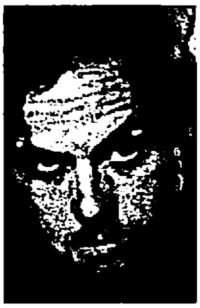
Low Trustworthiness - Males


m017


m024


m218


m234


m297

Low Trustworthiness - Females


f021


f078


f156


f210


f225

Appendix IV (continued)

High Trustworthiness - Males


m095


m131


m194


m255


m268

High Trustworthiness - Females


f086


f133


f192


f270


f272

Appendix V

Mean ratings for each stimulus selected for Experiment 1 and Experiment 2

ATTRACTIVENESS

Low Attractiveness

Photos	Attract.	Distinct.	Kind.	Intel.	Trust.	Age
f167	2,7	5,0	5,0	4,3	4,8	6,5
f285	2,7	3,5	5,3	4,5	5,5	3,7
f166	2,0	5,5	3,8	2,5	4,0	5,8
f005	2,5	4,7	4,2	2,8	4,2	2,2
f138	2,2	4,0	2,2	4,5	3,5	4,3
Mean	**2,4**	**4,5**	**4,1**	**3,7**	**4,4**	**4,5**
SD	0,3	0,8	1,2	1,0	0,8	1,7
m187	2,0	5,8	5,2	4,0	5,2	4,5
m216	2,3	4,2	2,8	3,5	3,5	4,0
m069	2,0	5,2	1,8	4,8	2,3	5,8
m025	1,7	5,7	3,3	4,2	4,3	4,5
m022	1,7	4,5	3,7	3,0	3,3	6,0
Mean	**1,9**	**5,1**	**3,4**	**3,9**	**3,7**	**5,0**
SD	0,3	0,7	1,2	0,7	1,1	0,9
Overall Mean	2,2	4,8	3,7	3,8	4,1	4,7
Overall SD	0,4	0,8	1,2	0,8	0,9	1,3

High Attractiveness

Photos	Attract.	Distinct.	Kind.	Intel.	Trust.	Age
f113	6,5	4,8	3,7	3,5	3,3	2,7
f261	6,2	4,7	3,8	4,3	4,0	2,3
f016	6,7	4,8	4,2	4,0	3,8	2,2
f184	6,3	4,2	4,8	4,5	5,0	2,3
f066	6,8	4,5	6,0	3,7	5,3	1,8
Mean	**6,5**	**4,6**	**4,5**	**4,0**	**4,3**	**2,3**
SD	0,3	0,3	1,0	0,4	0,8	0,3
m244	6,2	4,2	3,2	4,2	3,7	3,7
m283	6,2	4,8	4,8	4,0	4,0	2,5
m165	6,3	3,8	4,7	3,7	4,7	3,2
m269	6,3	5,0	4,8	4,0	4,8	4,0
m196	5,7	5,2	3,8	4,5	3,3	2,5
Mean	**6,1**	**4,6**	**4,3**	**4,1**	**4,1**	**3,2**
SD	0,3	0,6	0,7	0,3	0,6	0,7
Overall Mean	6,3	4,6	4,4	4,0	4,2	2,7
Overall SD	0,3	0,4	0,8	0,3	0,7	0,7

Appendix V (continued)

INTELLIGENCE

Low Intelligence

Photos	Intel.	Trust.	Age	Attract.	Distinct.	Kind.
f268	2,7	4,2	4,5	2,5	2,8	4,0
f237	2,7	3,2	1,8	6,0	3,7	3,5
f135	2,3	4,3	2,8	6,0	5,3	3,5
f014	2,7	4,0	2,8	3,5	3,3	4,8
f096	3,0	3,7	2,5	5,0	3,7	3,3
Mean	**2,7**	**3,9**	**2,9**	**4,6**	**3,8**	**3,8**
SD	0,2	0,5	1,0	1,6	0,9	0,6
m020	2,7	3,8	1,8	5,8	5,2	3,8
m259	2,8	3,5	4,2	3,0	4,7	4,5
m014	2,8	4,3	3,7	4,0	3,8	4,2
m143	2,8	4,5	2,7	5,5	4,3	4,2
m096	2,2	3,2	2,2	2,3	2,0	3,3
Mean	**2,7**	**3,9**	**2,9**	**4,1**	**4,0**	**4,0**
SD	0,3	0,6	1,0	1,5	1,2	0,4
Overall Mean	2,7	3,9	2,9	4,4	3,9	3,9
Overall SD	0,2	0,5	0,9	1,5	1,0	0,5

High Intelligence

Photos	Intel.	Trust.	Age	Attract.	Distinct.	Kind.
f253	5,0	2,7	4,8	4,7	4,2	1,7
f241	5,0	4,5	3,8	5,2	3,3	4,2
f046	5,3	3,7	3,8	3,8	3,5	3,5
f018	5,3	3,8	3,7	5,5	5,0	3,5
f159	5,0	5,3	4,0	5,2	2,7	4,0
Mean	**5,1**	**4,0**	**4,0**	**4,9**	**3,7**	**3,4**
SD	0,2	1,0	0,5	0,6	0,9	1,0
m163	5,5	4,2	4,0	4,5	4,7	3,5
m048	5,5	3,0	2,7	2,7	2,8	3,0
m160	6,2	4,8	3,7	4,8	5,0	5,3
m082	5,7	3,8	4,3	3,0	2,5	3,0
m258	5,7	4,0	4,7	3,8	4,5	3,7
Mean	**5,7**	**4,0**	**3,9**	**3,8**	**3,9**	**3,7**
SD	0,3	0,7	0,8	0,9	1,1	1,0
Overall Mean	5,4	4,0	4,0	4,3	3,8	3,5
Overall SD	0,4	0,8	0,6	1,0	1,0	0,9

TRUSTWORTHINESS

Low Trustworthiness

Photos	Trust.	Age	Attract.	Distinct.	Kind.	Intel.
f021	1,8	3,0	4,2	5,3	1,5	3,3
f078	2,8	2,2	5,2	4,7	2,3	4,3
f210	2,5	2,7	4,8	4,3	3,5	4,3
f225	2,7	3,0	4,2	4,2	2,3	3,2
f156	2,3	4,0	3,3	3,0	2,2	4,0
Mean	**2,4**	**3,0**	**4,3**	**4,3**	**2,4**	**3,8**
SD	0,4	0,7	0,7	0,9	0,7	0,6
m024	2,2	3,0	4,7	4,3	2,2	4,7
m017	2,5	2,8	3,5	4,3	2,2	4,0
m297	2,8	3,2	4,7	5,0	3,3	4,5
m218	2,5	4,3	3,0	3,7	3,8	5,5
m234	2,5	3,7	4,5	5,0	2,2	4,3
Mean	**2,5**	**3,4**	**4,1**	**4,5**	**2,7**	**4,6**
SD	0,2	0,6	0,8	0,6	0,8	0,6
Overall Mean	2,5	3,2	4,2	4,4	2,6	4,2
Overall SD	0,3	0,6	0,7	0,7	0,7	0,7

High Trustworthiness

Photos	Trust.	Age	Attract.	Distinct.	Kind.	Intel.
f086	6,0	6,8	4,3	4,5	6,5	4,8
f270	5,8	5,5	4,7	4,0	5,8	5,3
f133	6,3	6,0	3,3	4,2	6,0	3,7
f272	6,3	6,8	4,0	5,3	6,5	4,5
f192	6,5	6,8	4,2	5,2	6,2	4,8
Mean	**6,2**	**6,4**	**4,1**	**4,6**	**6,2**	**4,6**
SD	0,3	0,6	0,5	0,6	0,3	0,6
m095	5,5	5,5	5,2	2,8	5,8	3,8
m255	6,0	6,2	4,7	3,8	6,2	4,7
m268	5,8	6,3	4,3	3,0	6,2	4,0
m194	5,5	3,8	3,3	2,8	5,3	3,7
m131	6,0	6,2	3,7	3,8	5,5	4,0
Mean	**5,8**	**5,6**	**4,2**	**3,3**	**5,8**	**4,0**
SD	0,3	1,0	0,7	0,5	0,4	0,4
Overall Mean	6,0	6,0	4,2	4,0	6,0	4,3
Overall SD	0,3	0,9	0,6	0,9	0,4	0,6

Appendix VI (a)
Instructions for Experiment 1

INSTRUCTIONS

In this experiment you are going to learn some labels that have been randomly attributed to faces of male and female adults. The face and label pairings will be presented in blocks of 10 faces, and each face will be presented only once. The labels are related to different traits, namely Attractiveness, Intelligence and Trustworthiness.

After you have learnt the labels attached to each face, you will be presented again the same faces and you will be asked to press different keys, according to the labels that you have previously learnt for each face. You will be told if you are correct or incorrect after each trial.

Please try to be as fast and as accurate as possible.

Appendix VI (b)

First Set of Instructions

You have completed the learning phase of these 10 faces.

You are now going to be presented the same faces again, and asked to press different keys, according to the labels that you have previously learnt for each face.

You will be told if you were correct or incorrect after each trial.

PRESS THE LEFT KEY TO CONTINUE

Appendix VI (b) (continued)

Second Set of Instructions

A.

Please press:

the Attractive Key - for
"ATTRACTIVE"
the Unattractive Key - for "UNATTRACTIVE"

(according to the labels that you have previously learnt)

PLEASE TRY TO BE AS FAST AND AS ACCURATE AS POSSIBLE

NOW, Press the LEFT KEY to continue.

B.

Please press:

the Intelligent Key - for
"INTELLIGENT"
the Unintelligent Key - for "UNINTELLIGENT"

(according to the labels that you have previously learnt)

PLEASE TRY TO BE AS FAST AND AS ACCURATE AS POSSIBLE

NOW, Press the LEFT KEY to continue.

C.

Please press:

the Trustworthy Key - for
"TRUSTWORTHY"
the Untrustworthy Key - for "UNTRUSTWORTHY"

(according to the labels that you have previously learnt)

PLEASE TRY TO BE AS FAST AND AS ACCURATE AS POSSIBLE

NOW, Press the LEFT KEY to continue.

Appendix VII

Absolute number of errors for each participant in the congruent and incongruent trials, for Attractiveness, Intelligence and Trustworthiness (Experiment 1)

	S.Gend	ATTRACTIVENESS CONG	ATTRACTIVENESS INCONG	INTELLIGENCE CONG	INTELLIGENCE INCONG	TRUSTWORTHINESS CONG	TRUSTWORTHINESS INCONG
sub 3	1	5	8	2	4	1	4
sub 4	1	4	11	5	11	2	13
sub 5	1	3	1	1	2	3	2
sub 6	1	2	10	4	6	2	3
sub 7	1	1	1	4	8	0	0
sub 9	1	2	2	8	4	11	8
sub 12	1	11	4	2	5	10	2
sub 14	1	6	14	6	13	11	3
sub 16	1	3	3	1	1	2	2
sub 18	1	0	18	10	8	10	11
sub 19	1	3	1	4	6	4	5
sub 24	1	7	2	9	2	3	8
SUM		**47**	**75**	**56**	**70**	**59**	**61**
MEAN		**3,92**	**6,25**	**4,67**	**5,83**	**4,92**	**5,08**
SD		**3,00**	**5,82**	**3,06**	**3,66**	**4,25**	**4,03**
sub 1	2	4	1	1	4	4	1
sub 2	2	5	4	2	8	7	5
sub 8	2	1	5	4	0	6	15
sub 10	2	15	7	8	6	5	1
sub 11	2	3	6	5	3	7	5
sub 13	2	3	3	1	11	1	6
sub 15	2	1	0	0	1	1	2
sub 17	2	3	5	3	2	6	7
sub 20	2	3	2	5	13	5	10
sub 21	2	4	5	7	4	6	7
sub 22	2	10	11	8	6	9	7
sub 23	2	4	8	5	3	8	9
SUM		**56**	**57**	**49**	**61**	**65**	**75**
MEAN		4,67	4,75	4,08	5,08	5,42	6,25
SD		3,98	3,08	2,75	3,94	2,47	4,00

OVERALL

		ATTRACTIVENESS CONG	ATTRACTIVENESS INCONG	INTELLIGENCE CONG	INTELLIGENCE INCONG	TRUSTWORTHINESS CONG	TRUSTWORTHINESS INCONG
SUM		103	132	105	131	124	136
MEAN		4,29	5,50	4,38	5,46	5,17	5,67
SD		3,47	4,62	2,86	3,74	3,41	3,97

Appendix VIII

Individual mean reaction times for each participant in all experimental conditions (Experiment 1)

		ATTRACTIVENESS								INTELLIGENCE								TRUSTWORTHINESS							
		HIGH				LOW				HIGH				LOW				HIGH				LOW			
		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE	
		cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc
Sub 3	1	1284	2017	1315	1234	1295	1089	1145	1129	996	829	1319	1122	811	799	963	1412	976	1073	913	1112	1006	1198	950	1159
Sub 4	1	784	745	670	810	905	735	821	806	921	884	720	975	851	835	776	799	622	704	626	877	728	770	782	993
Sub 5	1	612	514	608	777	550	550	795	733	507	564	645	592	577	646	595	507	683	650	1017	664	622	616	668	755
Sub 6	1	501	498	511	605	535	516	563	558	569	607	527	562	627	571	598	573	516	545	515	545	518	590	495	519
Sub 7	1	812	777	639	684	935	730	682	574	1505	2011	772	764	1365	1607	745	1086	686	600	652	762	717	715	607	622
Sub 9	1	798	1396	855	941	870	815	900	793	1125	935	800	1064	1680	830	1056	1018	1276	985	1268	980	1026	1354	710	944
Sub 12	1	878	1223	804	1019	986	1321	1312	938	553	822	637	817	630	692	671	624	727	814	925	826	942	837	770	786
Sub 14	1	794	1179	875	880	1059	1047	695	656	966	1384	1010	1057	1703	1143	1263	1234	1005	1303	1439	1530	1551	1263	965	1488
Sub 16	1	704	713	1050	858	874	873	582	709	618	662	759	927	681	622	613	856	859	855	765	660	666	597	612	603
Sub 18	1	717	839	584	795	677	914	544	932	695	842	687	595	1540	892	657	460	621	829	548	569	744	791	623	486
Sub 19	1	689	834	613	766	1306	986	701	744	1013	1288	759	1243	1104	1277	1021	917	956	910	829	872	912	961	747	742
Sub 24	1	567	534	757	721	512	595	677	630	592	675	600	534	700	551	600	511	630	683	603	576	538	540	634	572
mean		762	939	773	841	875	831	785	767	838	959	769	854	1022	872	797	833	796	829	842	831	831	852	713	806
sd		198	446	228	167	271	250	235	167	301	416	211	245	436	320	224	311	220	217	289	281	285	281	140	298
Sub 1	2	651	876	943	1066	883	830	918	822	1122	1276	1287	1977	1004	794	1248	1609	681	872	885	716	1121	872	694	848
Sub 2	2	969	915	822	899	916	754	669	647	909	917	797	777	874	1015	861	758	858	764	727	975	800	859	702	883
Sub 8	2	784	1051	812	864	651	777	737	718	645	607	702	962	908	680	715	821	900	849	867	897	700	1050	1310	1475
Sub 10	2	994	1549	809	867	1203	999	1296	915	681	1149	714	853	864	838	865	698	691	701	783	831	864	869	885	723
Sub 11	2	1227	1153	1198	993	1122	1087	1171	1681	1364	1162	1025	1305	2017	1248	1412	1614	1681	1594	1054	1502	1316	1162	1228	909
Sub 13	2	1098	1002	823	855	722	852	803	950	957	983	803	1008	841	966	850	954	741	904	904	796	761	759	705	861
Sub 15	2	740	618	637	618	666	602	693	685	737	683	676	596	732	688	759	611	927	767	750	632	1030	925	761	717
Sub 17	2	1257	2235	1268	1485	1635	1867	1858	1910	1039	1181	881	1067	1536	1502	1120	1405	1211	1265	1630	1864	1296	1196	1685	2120
Sub 20	2	809	793	743	791	687	1072	1130	923	532	633	1124	1483	794	1137	1026	965	765	822	1836	1394	832	826	972	1497
Sub 21	2	931	1228	1150	1181	1084	1051	1026	817	1152	938	1145	1179	848	1407	1360	968	1293	1059	1234	1051	960	843	901	1123
Sub 22	2	735	863	888	748	784	882	924	973	684	975	907	807	787	889	800	661	836	844	824	950	1030	788	813	909
Sub 23	2	738	629	559	692	917	746	705	638	725	538	673	538	677	661	587	561	901	990	873	943	1143	1041	800	930
mean		911	1076	888	922	939	960	994	973	879	920	895	1046	990	985	967	969	957	953	1031	1046	988	933	955	1083
sd		202	448	218	238	287	323	341	404	252	251	207	402	390	285	265	375	296	253	359	361	204	145	304	415
overall		836	1008	830	881	907	895	889	870	858	939	832	950	1,006	929	882	901	877	891	936	938	909	892	834	944
sd		210	442	226	204	275	290	308	320	272	338	214	340	405	302	255	344	268	239	333	335	255	222	262	380

Appendix IX

REPEATED MEASURES ANOVA SOURCE TABLE - EXPERIMENT 1

5-way ANOVA with 4 within-subjects factors (trait, level, face gender and congruency) and 1 between-subjects factor (subject gender)

Source of Variation	*SS*	*DF*	*MS*	*F*	*Sig of F*
Between Subjects					
Within cells + residual	23256721,09	22	1057123,70		
Sub_Gender	2623710,20	1	2623710,20	2,48	0,129
Within Subjects					
Within cells + residual (1)	7418728,35	44	168607,46		
Trait	49051,29	2	24525,65	0,15	0,865
Sub_Gender by Trait	204110,71	2	102055,36	0,61	0,550
Within cells + residual (2)	718486,60	22	32658,48		
Level	6686,67	1	6686,67	0,20	0,655
Sub_Gender by Level	17254,25	1	17254,25	0,53	0,475
Within cells + residual (3)	2301994,61	22	104636,12		
Face Gender	67645,29	1	67645,29	0,65	0,430
Sub_Gender by Face Gender	287154,42	1	287154,42	2,74	0,112
Within cells + residual (4)	576141,60	22	26188,25		
Congruency	194654,13	1	194654,13	7,43	0,012 **
Sub_Gender by Congruency	961,18	1	961,18	0,04	0,850
Within cells + residual (5)	1631986,18	44	37090,59		
Trait by Level	61836,01	2	30918,01	0,83	0,441
Sub_Gend by Trait by Level	1785,54	2	892,77	0,02	0,976
Within cells + residual (6)	2989670,05	44	67947,05		
Trait by Face Gender	130230,20	2	65115,10	0,96	0,391
Sub_Gend by Trait by Face Gend	64607,76	2	32303,88	0,48	0,625
Within cells + residual (7)	882714,06	44	20061,68		
Trait by Congruency	9874,95	2	4937,48	0,25	0,783
Sub_Gend by Trait by Congruency	8456,42	2	4228,21	0,21	0,811
Within cells + residual (8)	584661,06	22	26575,50		
Level by Face Gender	31511,72	1	31511,72	1,19	0,288
Sub_Gend by Level by Face Gend	37239,83	1	37239,83	1,40	0,249
Within cells + residual (9)	508519,46	22	23114,52		
Level by Congruency	187922,61	1	187922,61	8,13	0,009 ***
Sub_Gend by Level by Congruency	10221,13	1	10221,13	0,44	0,513
Within cells + residual (10)	525519,96	22	23887,27		
Face Gender by Congruency	14654,41	1	14654,41	0,61	0,442
Sub_Gend by FaceGend by Congruency	686,81	1	686,81	0,03	0,867
Within cells + residual (11)	1106244,06	44	25141,91		
Trait by Level by FaceGend	99138,49	2	49569,24	1,97	0,151
Sub_Gend by Trait by Level by FaceGend	62456,66	2	31228,33	1,24	0,299
Within cells + residual (12)	1195405,27	44	27168,30		
Trait by Level by Congruency	220669,07	2	110334,53	4,06	0,024 **
Sub_Gend by Trait by Level by Congruency	10607,58	2	5303,79	0,20	0,823
Within cells + residual (13)	1042848,98	44	23701,11		
Trait by FaceGend by Congruency	128069,44	2	64034,72	2,70	0,078 *
Sub_Gend by Trait by FaceGend by Congruency	29409,54	2	14704,77	0,62	0,542
Within cells + residual (14)	432863,42	22	19675,61		
Level by FaceGend by Congruency	96877,86	1	96877,86	4,92	0,037 **
Sub_Gend by Level by FaceGend by Congruency	26211,48	1	26211,48	1,33	0,261
Within cells + residual (15)	960451,48	44	21828,44		
Trait by Level by FaceGend by Congruency	9868,17	2	4934,08	0,23	0,799
Sub_Gend by Trait by Level by FaceGend by Congruency	57207,12	2	28603,56	1,31	0,280

*** $p<0.01$
** $p<0.05$
* $p<0.1$

Appendix X
Instructions for Experiment 2

INSTRUCTIONS

In this experiment, some photographs of male and female adult faces will be presented. You will be asked to label these faces with traits related to Attractiveness, Intelligence and Trustworthiness.

This trait labelling will have nothing to do neither with objectively classifying the stimulus nor with personal opinions about them, that is, this labelling is in no way based on some gender related prejudice.

In each part of the experiment you will be presented 26 faces, from which the first 6 ones will serve as practice trials. Between each photograph you will see a white cross, and you should direct your attention to the stimulus that is coming right after it. After each block of 26 photos you will have a short break.

Before each part starts you will be told which words you should say after the presentation of each photograph. You should try to respond as quickly and as accurately as possible. Your response times will be measured using a voice key, and in order for the voice key to register the responses correctly, you should try to respond clearly and to avoid making any other sounds besides your answers.

Appendix XI

Absolute number of errors for each participant in the congruent and incongruent trials of each experimental condition for attractiveness, intelligence and trustworthiness (Experiment 2)

		ATTRACTIVENESS		INTELLIGENCE		TRUSTWORTHINESS	
		cong	incong	cong	incong	cong	incong
Sub 5	1	0	0	0	0	1	0
Sub 6	1	0	1	0	0	2	2
Sub 7	1	1	1	1	0	0	0
Sub 8	1	1	3	0	0	1	0
Sub 10	1	1	1	0	0	1	0
Sub 12	1	0	0	0	0	0	0
Sub 13	1	2	0	1	1	0	2
Sub 16	1	0	0	1	0	1	2
mean		0,63	0,75	0,38	0,13	0,75	0,75
sd		0,74	1,04	0,52	0,35	0,71	1,04
sum		5	6	3	1	6	6
Sub 1	2	1	0	1	0	1	3
Sub 2	2	0	2	1	0	0	0
Sub 3	2	0	1	2	3	2	2
Sub 4	2	5	2	2	2	1	1
Sub 9	2	0	1	0	3	1	1
Sub 11	2	0	1	2	1	0	1
Sub 14	2	0	1	2	1	2	0
Sub 15	2	0	1	0	0	1	0
mean		0,75	1,13	1,25	1,25	1,00	1,00
sd		1,75	0,64	0,89	1,28	0,76	1,07
sum		6	9	10	10	8	8
overall		0,69	0,94	0,81	0,69	0,88	0,88
sd		1,30	0,85	0,83	1,08	0,72	1,02
sum		11	15	13	11	14	14

Appendix XII

Individual mean reaction times for each participant in all experimental conditions (Experiment 2)

		ATTRACTIVENESS								INTELLIGENCE								TRUSTWORTHINESS							
		HIGH				LOW				HIGH				LOW				HIGH				LOW			
		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE	
		cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc	cong	inc
Sub 5	1	564	570	523	600	522	547	577	620	578	563	525	587	570	582	628	586	550	546	621	575	553	567	596	655
Sub 6	1	557	587	524	581	590	600	658	616	568	648	546	620	588	629	579	596	615	667	679	631	600	642	583	652
Sub 7	1	816	684	719	718	762	818	733	899	692	592	680	604	706	727	625	702	629	554	637	592	606	663	620	634
Sub 8	1	601	589	564	507	585	602	545	674	652	755	671	591	743	684	590	633	592	618	575	655	607	596	609	601
Sub 10	1	635	586	587	616	543	645	675	637	774	630	764	652	623	820	680	785	593	616	633	641	645	581	665	638
Sub 12	1	658	680	666	722	745	686	742	717	595	775	767	722	821	702	723	738	635	778	658	763	760	672	784	724
Sub 13	1	694	520	629	587	580	697	639	680	552	581	613	558	586	570	556	582	552	586	688	498	577	613	540	716
Sub 16	1	753	614	667	677	587	735	643	781	777	715	724	721	636	825	666	715	753	821	699	752	880	678	769	653
mean		660	604	610	626	614	666	652	703	649	657	661	632	659	692	631	667	615	649	649	638	654	627	646	659
sd		91	55	72	74	89	86	68	96	91	82	93	62	89	97	56	78	64	101	41	88	111	43	88	41
Sub 1	2	808	605	612	727	614	753	685	660	741	648	749	664	631	734	621	758	677	608	644	685	594	673	625	589
Sub 2	2	680	820	689	600	822	790	727	802	691	519	637	529	542	671	520	665	674	669	688	777	591	735	639	622
Sub 3	2	887	713	716	713	664	866	781	899	801	619	713	789	690	797	772	761	769	646	717	612	658	652	643	679
Sub 4	2	624	663	507	553	601	723	737	672	749	553	644	626	580	586	624	566	660	566	612	591	567	945	653	593
Sub 9	2	902	834	755	833	823	827	880	924	797	677	779	815	801	839	796	757	922	748	771	843	736	901	784	787
Sub 11	2	764	730	746	908	890	772	749	881	876	744	773	986	831	930	963	873	722	807	796	928	879	790	1048	781
Sub 14	2	695	546	679	577	635	715	576	732	577	626	617	560	616	579	609	665	667	693	646	667	653	623	660	674
Sub 15	2	685	598	710	612	548	709	656	732	621	541	613	571	647	636	621	607	708	609	790	679	613	725	859	674
mean		756	689	677	690	700	769	724	788	732	616	691	693	667	722	691	707	725	668	708	723	661	756	739	675
sd		102	105	82	129	126	56	90	104	99	76	71	158	102	126	142	99	87	80	72	117	103	116	150	76
overall		708	646	643	658	657	718	688	745	690	637	676	662	663	707	661	687	670	658	678	681	657	691	692	667
sd		106	92	82	107	115	88	88	106	101	79	81	120	93	110	109	89	93	89	64	109	103	108	128	60

Appendix XIII

REPEATED MEASURES ANOVA SOURCE TABLE - EXPERIMENT 2

5-way ANOVA with 4 within-subjects factors (trait, level, face gender and congruency) and 1 between-subjects factor (subject gender)

Source of Variation	*SS*	*DF*	*MS*	*F*	*Sig of F*
Between Subjects					
Within cells + residual	1599310,85	14	114236,49		
Sub_Gender	347943,96	1	347943,96	3,05	0,103
Within Subjects					
Within cells + residual (1)	408115,35	28	14575,55		
Trait	7541,06	2	3770,53	0,26	0,774
Sub_Gender by Trait	38982,25	2	19491,12	1,34	0,279
Within cells + residual (2)	30831,91	14	2202,28		
Level	34031,84	1	34031,84	15,45	0,002 ****
Sub_Gender by Level	19,71	1	19,71	0,01	0,926
Within cells + residual (3)	65530,10	14	4680,72		
Face Gender	885,13	1	885,13	0,19	0,670
Sub_Gender by Face Gender	39,40	1	39,40	0,01	0,928
Within cells + residual (4)	16149,97	14	1153,57		
Congruency	3595,38	1	3595,38	3,12	0,099 *
Sub_Gender by Congruency	1588,44	1	1588,44	1,38	0,260
Within cells + residual (5)	58375,17	28	2084,83		
Trait by Level	18892,94	2	9446,47	4,53	0,020 ***
Sub_Gend by Trait by Level	939,06	2	469,53	0,23	0,800
Within cells + residual (6)	41810,92	28	1493,25		
Trait by Face Gender	2885,02	2	1442,51	0,97	0,393
Sub_Gend by Trait by Face Gend	9422,06	2	4711,03	3,15	0,058 *
Within cells + residual (7)	50252,73	28	1794,74		
Trait by Congruency	6770,02	2	3385,01	1,89	0,170
Sub_Gend by Trait by Congruency	3091,08	2	1545,54	0,86	0,434
Within cells + residual (8)	15495,62	14	1106,83		
Level by Face Gender	2161,25	1	2161,25	1,95	0,184
Sub_Gend by Level by Face Gend	17,09	1	17,09	0,02	0,903
Within cells + residual (9)	159196,62	14	11371,19		
Level by Congruency	68133,40	1	68133,40	5,99	0,028 **
Sub_Gend by Level by Congruency	10116,77	1	10116,77	0,89	0,362
Within cells + residual (10)	38915,18	14	2779,66		
Face Gender by Congruency	1662,50	1	1662,50	0,60	0,452
Sub_Gend by FaceGend by Congruency	196,94	1	196,94	0,07	0,794
Within cells + residual (11)	47660,65	28	1702,17		
Trait by Level by FaceGend	25430,77	2	12715,39	7,47	0,003 ****
Sub_Gend by Trait by Level by FaceGend	1116,75	2	558,37	0,33	0,723
Within cells + residual (12)	191643,33	28	6844,40		
Trait by Level by Congruency	24561,06	2	12280,53	1,79	0,185
Sub_Gend by Trait by Level by Congruency	1167,94	2	583,97	0,09	0,918
Within cells + residual (13)	39038,21	28	1394,22		
Trait by FaceGend by Congruency	14096,65	2	7048,32	5,06	0,013 ***
Sub_Gend by Trait by FaceGend by Congruency	9803,65	2	4901,82	3,52	0,043 **
Within cells + residual (14)	74681,62	14	5334,40		
Level by FaceGend by Congruency	29277,63	1	29277,63	5,49	0,034 **
Sub_Gend by Level by FaceGend by Congruency	45959,38	1	45959,38	8,62	0,011 ***
Within cells + residual (15)	121862,40	28	4352,23		
Trait by Level by FaceGend by Congruency	511,52	2	255,76	0,06	0,943
Sub_Gend by Trait by Level by FaceGend by Congruency	22874,08	2	11437,04	2,63	0,090 *

**** $p<0.005$
*** $p<0.02$
** $p<0.05$
* $p<0.1$

Appendix XIV

Selected faces for Experiment 3

LOW ATTRACTIVENESS – LOW INTELLIGENCE

MALES


m152


m162


m162


m083


m289

FEMALES


f140


f175


f199


f257


f296

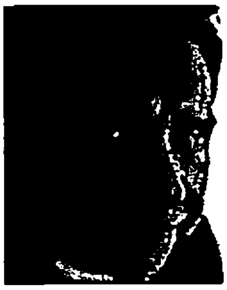
Appendix XIV (continued)

<u>*LOW ATTRACTIVENESS - HIGH INTELLIGENCE*</u>

MALES

m032

m048



m204

m219

m296

FEMALES

f046

f077

f082

f138

f266

Appendix XIV (continued)

HIGH ATTRACTIVENESS – LOW INTELLIGENCE

MALES


m006


m015


m020


m143


m273

FEMALES


f096


f104


f142


f213


f240

Appendix XIV (continued)

HIGH ATTRACTIVENESS – HIGH INTELLIGENCE

MALES


m043


m068


m072


m206


m223

FEMALES


f009


f018


f103


f121


f191

Appendix XV

Mean ratings for each individual stimulus selected for Experiment 3

low attractiveness- low intelligence

	ATTRACT.	INTEL.	AGE
f140	3,2	3,3	5,2
f296	2,8	2,7	1,5
f199	2,8	2,8	5,0
f175	2,7	2,7	2,5
f257	2,5	2,5	4,8
MEAN	**2,8**	**2,8**	**3,8**
SD	0,2	0,3	1,8
m162	2,7	2,8	2,7
m152	3,0	3,2	2,3
m289	2,5	3,0	3,5
m167	3,0	3,0	5,0
m083	2,7	2,7	2,7
MEAN	**2,8**	**2,9**	**3,2**
SD	0,2	0,2	1,1
OVERALL MEAN	2,8	2,9	3,5
SD	0,2	0,3	1,4

low attractiveness - high intelligence

	ATTRACT.	INTEL.	AGE
f138	2,2	4,5	4,3
f077	2,8	4,7	5,8
f082	3,3	4,7	6,3
f266	3,7	4,8	4,3
f046	3,8	5,3	3,8
MEAN	**3,2**	**4,8**	**4,9**
SD	0,7	0,3	1,1
m032	2,3	6,2	5,8
m204	2,5	5,7	6,2
m219	2,5	5,0	5,5
m048	2,7	5,5	2,7
m296	2,7	5,7	5,8
MEAN	**2,5**	**5,6**	**5,2**
SD	0,1	0,4	1,4
OVERALL MEAN	2,9	5,2	5,1
SD	0,6	0,5	1,2

high attractiveness - low intelligence

	ATTRACT.	INTEL.	AGE
f104	4,8	3,0	3,2
f096	5,0	3,0	2,5
f213	5,2	2,7	2,2
f142	5,5	2,2	2,2
f240	5,7	3,0	1,8
MEAN	**5,2**	**2,8**	**2,4**
SD	0,3	0,4	0,5
m273	4,7	3,3	3,0
m015	5,0	3,2	2,8
m006	5,5	2,8	3,2
m143	5,5	2,8	2,7
m020	5,8	2,7	1,8
MEAN	**5,3**	**3,0**	**2,7**
SD	0,5	0,3	0,5
OVERALL MEAN	5,3	2,9	2,5
SD	0,4	0,3	0,5

high attractiveness - high intelligence

	ATTRACT.	INTEL.	AGE
f018	5,5	5,3	3,7
f009	5,0	5,3	2,8
f191	5,0	5,3	4,3
f121	5,2	5,0	5,0
f103	5,7	5,8	2,7
MEAN	**5,3**	**5,4**	**3,7**
SD	0,3	0,3	1,0
m068	5,0	5,0	4,5
m043	5,3	5,2	3,5
m206	5,2	5,3	3,2
m072	5,3	5,5	2,7
m223	5,3	5,3	3,5
MEAN	**5,2**	**5,3**	**3,5**
SD	0,1	0,2	0,7
OVERALL MEAN	5,3	5,3	3,6
SD	0,2	0,2	0,8

Appendix XVI

Instructions for Experiment 3

INSTRUCTIONS

In this experiment, some photographs of male and female adult faces will be presented. You will be asked to label these faces with traits related to Attractiveness and Intelligence.

This trait labelling will have nothing to do neither with objectively classifying the stimulus nor with personal opinions about them, that is, this labelling is in no way based on some gender-related prejudice.

In each part of the experiment you will be presented 40 faces. Between each photograph you will see a white cross, and you should direct your attention to the stimulus that is coming right after it. After each block of 40 photos you will have a short break.

Before each part starts you will be told which words you should say after the presentation of each photograph. You should try to respond as quickly and as accurately as possible. Your response times will be measured using a voice key, and in order for the voice key to register the responses correctly, you should try to respond clearly and to avoid making any other sounds besides your answers.

Appendix XVII

Absolute number of errors for each participant in the congruent and incongruent trials in each experimental condition for attractiveness and intelligence (Experiment 3)

		ATTRACTIVENESS		INTELLIGENCE	
	sub gender	Cong	Incong	Cong	Incong
sub 7	1	5	2	7	0
sub 8	1	2	2	0	1
sub 9	1	2	3	9	9
sub 10	1	1	1	1	1
sub 11	1	2	3	2	5
sub 12	1	2	0	1	2
sub 13	1	1	1	2	1
sub 14	1	0	2	2	0
sub 15	1	0	1	1	0
sub 16	1	2	1	2	3
sub 17	1	6	5	4	6
sub 18	1	4	0	0	5
	sum	27	21	31	33
	mean	2,25	1,75	2,58	2,75
	sd	1,86	1,42	2,78	2,90
sub 1	2	1	0	1	0
sub 2	2	1	4	2	1
sub 3	2	1	2	1	0
sub 4	2	2	2	2	1
sub 5	2	0	1	1	2
sub 6	2	2	2	0	0
sub 19	2	0	0	0	0
sub 20	2	4	4	3	2
sub 21	2	1	0	2	3
sub 22	2	0	0	2	1
sub 23	2	3	2	1	0
sub 24	2	0	0	3	1
	sum	15	17	18	11
	mean	1,25	1,42	1,50	0,92
	sd	1,29	1,51	1,00	1,00
OVERALL	sum	42	38	49	44
	mean	1,8	1,6	2,0	1,8
	sd	1,6	1,4	2,1	2,3

Appendix XVIII

Individual mean reaction times for each participant in all experimental conditions (Experiment 3)

ATTRACTIVENESS CONDITION

		HIGH ATTRACTIVENESS								LOW ATTRACTIVENESS							
		HIGH INTELLIGENCE				LOW INTELLIGENCE				HIGH INTELLIGENCE				LOW INTELLIGENCE			
	sub	MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE	
	gend	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong
sub 7	1	605	637	624	606	548	608	601	666	580	597	575	625	627	615	680	631
sub 8	1	594	477	504	491	576	495	509	551	487	547	559	598	489	609	710	511
sub 9	1	670	642	589	664	662	657	533	713	626	626	665	591	632	635	606	649
sub 10	1	673	480	609	468	639	583	577	596	532	647	595	585	514	695	546	599
sub 11	1	575	560	517	502	602	509	494	520	529	582	491	525	513	590	501	583
sub 12	1	946	678	689	839	987	673	629	758	688	870	726	846	620	883	892	664
sub 13	1	764	622	688	623	716	648	669	630	603	767	665	661	637	796	641	693
sub 14	1	592	641	629	596	604	589	633	646	596	650	641	598	574	644	590	636
sub 15	1	789	605	680	624	697	665	737	620	586	734	609	696	629	682	662	675
sub 16	1	481	507	552	470	529	507	490	497	608	549	538	532	515	486	521	557
sub 17	1	639	706	690	933	745	954	832	627	803	706	584	767	752	845	576	793
sub 18	1	633	571	643	666	681	550	636	638	563	665	644	684	637	616	617	687
	mean	**663**	**594**	**618**	**624**	**666**	**620**	**612**	**622**	**600**	**662**	**608**	**642**	**595**	**675**	**629**	**640**
	sd	121	76	66	144	122	123	103	75	82	95	64	94	76	114	104	73
sub 1	2	640	596	653	642	678	553	644	659	556	732	652	713	652	754	722	645
sub 2	2	643	598	645	627	605	633	612	678	587	714	660	717	687	770	626	635
sub 3	2	722	634	698	661	655	617	668	690	591	642	707	775	647	655	657	660
sub 4	2	849	680	716	830	740	683	694	800	664	810	788	737	688	779	759	839
sub 5	2	661	615	777	632	755	583	648	610	625	667	630	675	666	723	645	689
sub 6	2	706	569	730	606	785	586	710	598	617	667	653	710	650	779	647	768
sub 19	2	654	578	671	657	692	620	617	615	589	728	640	590	602	715	614	666
sub 20	2	708	605	758	603	764	644	660	669	636	680	659	805	575	721	766	659
sub 21	2	529	510	565	543	636	484	541	514	476	584	499	541	507	562	496	600
sub 22	2	889	658	777	748	729	622	694	748	714	757	703	749	660	854	692	707
sub 23	2	621	615	657	543	698	560	575	550	502	592	596	735	582	696	670	599
sub 24	2	577	508	576	499	551	500	568	483	492	601	509	602	528	597	543	607
	mean	**683**	**597**	**685**	**633**	**691**	**590**	**636**	**635**	**587**	**681**	**641**	**696**	**620**	**717**	**653**	**673**
	sd	103	52	71	90	70	59	54	92	72	70	80	80	61	82	80	71
OVERALL																	
	mean	**673**	**596**	**652**	**628**	**678**	**605**	**624**	**628**	**594**	**671**	**625**	**669**	**608**	**696**	**641**	**656**
	sd	110	63	75	117	98	95	81	82	76	82	73	90	69	100	92	73

Appendix XVIII (continued)

Individual mean reaction times for each participant in all experimental conditions (Experiment 3)

INTELLIGENCE CONDITION

		HIGH ATTRACTIVENESS								LOW ATTRACTIVENESS							
		HIGH INTELLIGENCE				LOW INTELLIGENCE				HIGH INTELLIGENCE				LOW INTELLIGENCE			
	sub	MALE		FEMALE		MALE		FEMALE		MALE		FEMALE		MALE		FEMALE	
	gend	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong	Cong	Incong
sub 7	1	597	596	622	627	600	619	605	615	610	572	636	616	575	643	595	639
sub 8	1	463	492	532	481	505	511	491	465	601	503	575	498	482	505	513	479
sub 9	1	612	641	578	688	625	565	575	539	638	662	661	813	607	704	623	539
sub 10	1	651	567	560	533	555	671	520	629	676	518	658	541	548	619	510	563
sub 11	1	643	491	536	547	516	767	510	535	604	495	540	547	492	645	513	559
sub 12	1	646	547	601	608	525	674	619	595	635	590	677	764	570	708	552	551
sub 13	1	667	595	648	588	596	601	550	687	645	626	622	583	582	675	617	599
sub 14	1	617	562	656	644	631	581	578	619	614	623	627	578	592	635	604	623
sub 15	1	665	699	700	678	680	734	735	666	659	689	702	728	739	797	788	759
sub 16	1	555	588	512	522	508	566	524	490	562	479	557	550	510	598	540	510
sub 17	1	691	912	752	652	739	653	885	775	741	878	980	691	772	738	649	810
sub 18	1	662	586	564	707	629	717	689	581	730	566	611	649	590	713	658	583
	mean	**622**	**606**	**605**	**606**	**592**	**638**	**607**	**600**	**643**	**600**	**654**	**630**	**588**	**665**	**597**	**601**
	sd	62	112	73	73	74	78	114	87	53	110	114	99	88	75	80	97
sub 1	2	797	563	737	710	553	782	701	704	869	553	767	665	622	810	645	725
sub 2	2	817	731	722	739	683	796	655	763	691	774	760	675	589	770	715	752
sub 3	2	735	676	663	621	600	706	684	652	804	576	664	782	583	720	669	637
sub 4	2	762	684	695	727	694	800	733	755	796	687	778	720	668	808	687	717
sub 5	2	644	703	620	641	614	615	622	584	616	633	702	732	566	607	641	629
sub 6	2	540	504	578	496	504	609	519	514	536	489	602	498	521	587	543	525
sub 19	2	647	663	613	631	637	592	645	606	618	630	575	633	645	686	642	619
sub 20	2	697	723	694	606	695	584	602	912	669	634	698	720	747	693	675	778
sub 21	2	535	535	587	532	520	516	598	555	484	553	558	559	510	576	576	581
sub 22	2	772	737	708	786	662	824	827	613	785	719	655	782	731	740	817	659
sub 23	2	748	524	640	633	568	668	639	648	707	605	706	606	547	818	634	627
sub 24	2	622	555	536	562	512	536	561	505	572	523	548	604	533	580	555	539
	mean	**693**	**633**	**649**	**640**	**604**	**669**	**649**	**651**	**679**	**615**	**668**	**665**	**605**	**700**	**650**	**649**
	sd	95	89	64	87	72	110	81	117	119	83	82	88	79	93	74	81
OVERALL																	
	mean	**658**	**620**	**627**	**623**	**598**	**654**	**628**	**625**	**661**	**607**	**661**	**647**	**597**	**682**	**623**	**625**
	sd	87	100	71	80	71	94	99	104	92	96	97	94	82	85	80	91

Appendix XIX

REPEATED MEASURES ANOVA SOURCE TABLE - EXPERIMENT 3

6-way ANOVA with 5 within-subjects factors (condition, attractiveness level, intelligence level, face gender and congruency) and 1 between-subjects factor (subject gender)

Source of Variation	*SS*	*DF*	*MS*	*F*	*Sig of F*
Between Subjects					
Within cells + residual	3181886,52	22	144631,21		
Sub_Gender	156779,60	1	156779,60	1,08	0,309
Within Subjects					
Within cells + residual (1)	485596,84	22	22072,58		
Condition	8500,03	1	8500,03	0,39	0,541
Sub_Gender by Condition	8354,28	1	8354,28	0,38	0,545
Within cells + residual (2)	20470,07	22	930,46		
At_Level	16179,20	1	16179,20	17,39	0,000 ****
Sub_Gender by At_Level	144,39	1	144,39	0,16	0,697
Within cells + residual (3)	45466,97	22	2066,68		
Int_Level	1421,91	1	1421,91	0,69	0,416
Sub_Gender by Int_Level	99,91	1	99,91	0,05	0,828
Within cells + residual (4)	49068,22	22	2230,37		
Face Gender	162,25	1	162,25	0,07	0,790
Sub_Gender by Face Gender	11216,44	1	11216,44	5,03	0,035 **
Within cells + residual (5)	47525,84	22	2160,27		
Congruency	5747,66	1	5747,66	2,66	0,117
Sub_Gender by Congruency	1109,28	1	1109,28	0,51	0,481
Within cells + residual (6)	38201,16	22	1736,42		
Condition by At_Level	16,04	1	16,04	0,01	0,924
Sub_Gender by Condition by At_Level	4010,45	1	4010,45	2,31	0,143
Within cells + residual (7)	39448,71	22	1793,12		
Condition by Int_Level	7631,82	1	7631,82	4,26	0,051 **
Sub_Gender by Condition by Int_Level	430,50	1	430,50	0,24	0,629
Within cells + residual (8)	32426,06	22	1473,91		
Condition by Face Gender	235,19	1	235,19	0,16	0,693
Sub_Gend by Condition by Face Gender	1336,16	1	1336,16	0,91	0,351
Within cells + residual (9)	35113,89	22	1596,09		
Condition by Congruency	454,79	1	454,79	0,28	0,599
Sub_Gend by Condition by Congruency	476,60	1	476,60	0,30	0,590
Within cells + residual (10)	24240,29	22	1101,83		
At_Level by Int_Level	658,23	1	658,23	0,60	0,448
Sub_Gend by At_Level by Int_Level	6930,01	1	6930,01	6,29	0,020 ***
Within cells + residual (11)	40415,08	22	1837,05		
At_Level by Face Gender	4461,20	1	4461,20	2,43	0,133
Sub_Gend by At_Level by Face Gender	16,63	1	16,63	0,01	0,925
Within cells + residual (12)	54361,64	22	2470,98		
At_Level by Congruency	122942,82	1	122942,82	49,75	0,000 ****
Sub_Gend by At_Level by Congruency	12232,06	1	12232,06	4,95	0,037 **
Within cells + residual (13)	24943,83	22	1133,81		
Int_Level by Face Gender	10553,92	1	10553,92	9,31	0,006 ***
Sub_Gend by Int_Level by Face Gender	68,28	1	68,28	0,06	0,808
Within cells + residual (14)	102190,31	22	4645,01		
Int_Level by Congruency	52189,53	1	52189,53	11,24	0,003 ****
Sub_Gend by Int_Level by Congruency	1138,31	1	1138,31	0,25	0,625
Within cells + residual (15)	34500,00	22	1568,18		
FaceGend by Congruency	1336,16	1	1336,16	0,85	0,366
Sub_Gend by FaceGend by Congruency	95,63	1	95,63	0,06	0,807
Within cells + residual (16)	24677,17	22	1121,69		
Condition by At_level by Int_level	4885,38	1	4885,38	4,36	0,049 **
Sub_Gend by Condition by At_level by Int_level	4,23	1	4,23	0,00	0,952
Within cells + residual (17)	43211,11	22	1964,14		
Condition by At_Level by Face Gender	46,51	1	46,51	0,02	0,879
Sub_Gend by Condition by At_Level by Face Gender	293,78	1	293,78	0,15	0,703

Appendix XIX

(continued)

Source of Variation	SS	DF	MS	F	Sig of F
Within cells + residual (18)	71398,80	22	3245,40		
Condition by At_Level by Congruency	112302,56	1	112302,56	34,60	0,000 ****
Sub_Gend by Condition by At_Level by Congruency	6159,67	1	6159,67	1,90	0,182
Within cells + residual (19)	55405,55	22	2518,43		
Condition by Int_Level by Face Gender	912,20	1	912,20	0,36	0,553
Sub_Gend by Condition by Int_Level by Face Gender	9443,03	1	9443,03	3,75	0,066 *
Within cells + residual (20)	143540,61	22	6524,57		
Condition by Int_Level by Congruency	41462,82	1	41462,82	6,35	0,019 ***
Sub_Gend by Condition by Int_Level by Congruency	2418,97	1	2418,97	0,37	0,549
Within cells + residual (21)	55324,82	22	2514,76		
Condition by Face Gender by Congruency	6609,39	1	6609,39	2,63	0,119
Sub_Gend by Condition by Face Gender by Congruency	726,57	1	726,57	0,29	0,596
Within cells + residual (22)	19696,34	22	895,29		
At_Level by Int_Level by Face Gender	6273,47	1	6273,47	7,01	0,015 ***
Sub_Gend by At_Level by Int_Level by Face Gender	1785,47	1	1785,47	1,99	0,172
Within cells + residual (23)	65766,17	22	2989,37		
At_Level by Int_Level by Congruency	49,51	1	49,51	0,02	0,899
Sub_Gend by At_Level by Int_Level by Congruency	2070,47	1	2070,47	0,69	0,414
Within cells + residual (24)	119940,11	22	5451,82		
At_Level by Face Gender by Congruency	49617,10	1	49617,10	9,10	0,006 ***
Sub_Gend by At_Level by Face Gender by Congruency	124,32	1	124,32	0,02	0,881
Within cells + residual (25)	112037,42	22	5092,61		
Int_Level by Face Gender by Congruency	40585,79	1	40585,79	7,97	0,010 ***
Sub_Gend by Int_Level by Face Gender by Congruency	79,44	1	79,44	0,02	0,902
Within cells + residual (26)	74592,12	22	3390,55		
Condition by At_Level by Int_Level by Face Gender	8420,38	1	8420,38	2,48	0,129
Sub_Gend by Condition by At_Level by Int_Level by Face Gender	654,53	1	654,53	0,19	0,665
Within cells + residual (27)	23324,21	22	1060,19		
Condition by At_Level by Int_Level by Congruency	9150,78	1	9150,78	8,63	0,008 ***
Sub_Gend by Condition by At_Level by Int_Level by Congruency	226,42	1	223,42	0,21	0,649
Within cells + residual (28)	120418,87	22	5473,59		
Condition by At_Level by Face Gender by Congruency	35574,91	1	35574,91	6,50	0,018 ***
Sub_Gend by Condition by At_Level by Face Gender by Congruency	64,75	1	64,75	0,01	0,914
Within cells + residual (29)	210376,12	22	9562,55		
Condition by Int_Level by Face Gender by Congruency	29837,72	1	29837,72	3,12	0,091 *
Sub_Gend by Condition by Int_Level by Face Gender by Congruency	7344,56	1	7344,56	0,77	0,390
Within cells + residual (30)	75688,14	22	3440,37		
At_Level by Int_Level by Face Gender by Congruency	6668,19	1	6668,19	1,94	0,178
Sub_Gend by At_Level by Int_Level by Face Gender by Congruency	1960,32	1	1960,32	0,57	0,458
Within cells + residual (31)	39263,07	22	1784,69		
Condition by At_Level by Int_Level by Face Gender by Congruency	714,95	1	714,95	0,40	0,533
Sub_Gend by Condition by At_Level by Int_Level by Face Gender by Congruency	669,39	1	669,39	0,38	0,547

**** $p<0.005$
*** $p<0.02$
** $p<0.05$
* $p<0.1$