Increasing Ecological Validity in Studies of Facial Attractiveness: Effects of Motion and Expression on Attractiveness Judgements

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Abstract

While our understanding of what makes a face attractive has been greatly furthered in recent decades, the stimuli used in much of the foregoing research (static images with neutral expressions) bear little resemblance to the faces with which we normally interact. In our social interactions, we frequently evaluate faces that move and are expressive, and thus, it is important to evaluate whether motion and expression influence ratings of attractiveness; this was the central aim of the experiments in this dissertation. Using static and dynamic stimuli with neutral or positive expression, the effects of motion and expression were also tested in combination with other factors known to be relevant to attractiveness judgements: personality attributions, sex-typicality and cultural influence.

In general, the results from this set of experiments show that judgements of moving, expressive stimuli do differ, sometimes radically, from judgements made of more traditional types of stimuli. Motion and positive expression were both found to increase ratings of attractiveness reliably in most experiments, as well as across cultures, and in some instances, showed strong sex-specific effects. Intriguing sex differences were also found in personality trait ratings of the stimuli, particularly for male faces; while criteria for female faces remained relatively constant across all conditions, trait ratings associated with attractiveness for male faces were dependent on particular combinations of motion and expression. Finally, in line with previous research, cross-cultural experiments showed general agreement between Japanese and Caucasian raters, but also suggested slight, culture-specific differences in preferences for expression and motion.

This set of experiments has integrated the factors of motion, expression, sex-typicality, personality and cultural influence together in order to bring a greater degree of ecological validity into attractiveness studies. These findings offer major implications for researchers studying attractiveness, particularly that of males, and suggest that motion and expression are important dimensions that should be considered in future research while simultaneously placing a caution on the interpretation of findings made with static stimuli. Suggestions are also made for further research in light of the present findings.

Chapter 1: Attractiveness Research – The Influence of Structural and Non-Structural Factors

Beautiful faces are captivating. The effects of facial attractiveness are not limited to our aesthetic sensibilities however and extend into many aspects of our lives. Research has shown that attractive people are judged to be more socially and academically competent (Langlois et al., 2000), fare better in employment opportunities (Hosoda et al., 2003) and may even be more likely to be acquitted of a crime than less attractive people (McCoun, 1990). Given its far-reaching effects, understanding attractiveness preferences is not of little consequence.

In recent decades, psychological research has revealed that facial beauty results from the interplay of many, varied factors and on the whole, has focused on the structural aspects of a face. This research has identified symmetry, averageness, sex-typicality and personality attributions made from facial features as contributors to attractiveness. It should be noted that the majority of these studies have used static stimuli to test their hypotheses. While using photographs of faces (usually with neutral expressions) facilitates experimental work, such stimuli fail to represent faces in their natural context. That is, when we judge faces in real life, we are used to dealing with faces that are moving and being expressive. Despite this, most studies of attractiveness have focused on the static structure of a face and relatively little attention has been paid to non-structural aspects of the face, such as facial motion and expression, which may influence attractiveness under more realistic conditions. It is therefore the central aim of this dissertation to evaluate how facial expression and motion influence attractiveness judgements and interact with the influence of structural factors.

This chapter will begin by reviewing some of the research demonstrating the speed and consistency of attractiveness judgements. Following this is a discussion of the basic principles of evolutionary, perceptual and social theories, which all make contributions to understanding the attractiveness of certain features. The major factors influencing ratings of attractiveness studied in recent years will then be discussed, first addressing the research concerning aspects of facial structure. This section will cover the influence of facial symmetry, averageness, sex-typicality and personality attributions on judgements of attractiveness. Comparatively, the non-structural factors of facial expression and motion have received less attention and the research involving these factors will be reviewed next. Finally, the chapter will close with a description and outline of the content of subsequent chapters in this dissertation.

Speed and Consistency in Attractiveness Judgements

Attractiveness is one of the first things we perceive about an unfamiliar person, as it takes only a fraction of a second to make a judgement about the attractiveness of a face. Attractiveness ratings of participants viewing faces for a mere 150 milliseconds have been shown to correlate with those previously made by independent judges, who had ample time to make their judgements (Goldstein & Papageorge, 1980). A recent study asking participants to classify faces on various social dimensions with limited exposure time showed that classification of faces as attractive or unattractive matched those from independent judges at well above chance levels when viewed for only 50 milliseconds (Santos & Young, 2004).

Not only are attractiveness judgements made very quickly, but they have been found to have high reliability across different raters within and across cultures,

genders and ages. Across different cultures and racial groups, there is general agreement on what faces and which facial features are considered attractive (Cunningham, Roberts, Barbee, Druen & Wu, 1995; Perrett et al., 1998; Rhodes et al., 2001). Although differences in the degree of consensus exist for same- and opposite-sex judgements, men and women also tend to rate faces similarly for attractiveness (Marcus & Miller, 2003). Even infants as young as 5 months old show preferences for faces that adults rate as attractive (e.g., Langlois et al., 1987).

In most studies of attractiveness, judgements are ascertained by asking participants to provide ratings to faces one at a time. Some studies also use ranking and forced choice paradigms in which participants are presented with multiple faces simultaneously and asked to judge relative attractiveness. Given the subjective measures used to assess attractiveness, it is remarkable then that attractiveness is rated with such consistency.

This inter-rater consistency suggests that beauty is not completely in the eye of the beholder. That said, it should be noted that some individual differences in attractiveness preferences do occur. Attractiveness ratings for faces may vary based on how attractive you perceive yourself to be (Little, Burt, Penton-Voak, & Perrett, 2001), what your parents look like (Perrett et al., 2002) and for women, what phase of the menstrual cycle you are in (Penton-Voak et al., 1999). By and large however, people tend to agree on which faces are beautiful.

There has been debate to what is actually meant by attractiveness. Again, most studies and those found in this dissertation, ask raters to make judgements based on whether a face is attractive or unattractive to them. This could be taken to mean a number of different things. Attractiveness may be interpreted by the

participant to mean "how sexually attracted are you to this person based on their facial appearance?", or could be construed as a more objective measure of how attractive the face would be to members of the opposite sex. Other studies show that attractiveness criteria may differ based on whether judgements are made for short- or long-term relationships (Penton-Voak et al., 1999) and thus, relationship context may also be a factor that should be taken into consideration. Again however, although the term may seem vague, attractiveness is nonetheless evaluated with striking reliability across raters when they are given no other instruction than to judge how "attractive" someone is.

Theoretical Approaches to the Study of Facial Attractiveness

Research attempting to explain the bases for attractiveness preferences has been driven by a number of different theoretical perspectives, including those with evolutionary, perceptual and social bases. In recent years, evolutionary theories have driven the greatest amount of research and gained the most support. Perceptual explanations for attractiveness have also been proposed as alternatives, though they have not been able to account for the observed attractiveness phenomena to the degree that evolutionary theories do. Social learning mechanisms have also been proposed to explain certain universal preferences, and may also lend insight into individual differences. It should be noted however that these theories are not mutually exclusive and attractiveness preferences may in fact result from a combination of evolutionary, perceptual and social influence processes. A brief review of the principles of each theoretical perspective is described below.

Evolutionary theories

The evolutionary approach to understanding attractiveness presumes that our preferences are related to the processes of natural and sexual selection first proposed by Darwin (1859,1871) in his observation of animal behaviour. As a result, this approach is closely related to biological principles and often involves comparisons to other species to help explain human behaviour.

Evolution not only requires the survival of the fittest but also the reproduction of the fittest. Thus, behaviours which increase reproductive success and offspring viability are essential to the propagation of genes. Where such behaviours have a degree of heritability, their benefits may be transmitted to subsequent generations. Attractiveness preferences are suggested to be psychological adaptations which evolved under these principles. Indeed, the agreement in attractiveness preferences between infants and adults (Langlois, Ritter, Roggman & Vaughan, 1991; Langlois, Roggman & Riese-Danner, 1990; Samuels, Butterworth, Roberts, Graupner & Hole, 1994) and across different cultures (Cunningham, et al., 1995; Rhodes et al., 2001) have been used to support the contention that attractiveness preferences are somewhat predisposed.

Attractiveness preferences are thought to have evolved as a means of detecting a person's fitness as a mate. Many of the features found to be attractive have also been linked to health (e.g., Møller, 1999; Rhodes, Chang, Zebrowitz, & Simmons, 2003; for counterevidence, see Kalick, Zebrowitz, Langlois, & Johnson, 1989). This adaptive hypothesis of mate choice may explain the particular salience and immediacy of attractiveness judgements in our encounters with new people. This mate value is based on criteria that will maximize reproductive success, such as health, fertility and the ability to acquire and share resources. Some debate

surrounds how the evaluation of mate value from attractiveness occurs and this will be discussed later in specific reference to certain features.

It should also be noted that the evolutionary approach focuses on how preferences may have been advantageous in ancestral environments. Consequently, the utility of certain preferences may not apply in modern environments. For example, clear skin may be attractive because early in our evolutionary history, it was a good indication of a person's health. Today however the modern use of make up can now create the impression of clear skin and good health, rendering such preferences less effective. Thus, evolutionary psychologists consider how the potential for reproductive success in ancestral environments might help explain the attractiveness preferences we possess today.

Perceptual theories

Perceptual theories suggest that we find certain features attractive in faces because they exploit more general processes of perception and have been proposed as an alternative to the evolutionary approach (Enquist & Arak, 1994; Enquist, Ghirlanda, Lundqvist, & Wachtmeister, 2002; Enquist & Johnstone, 1997). According to perceptual theories, common perceptual learning across cultures and in the very early stages of life may account for the agreement in attractiveness preferences across ages and cultures. As a result, this approach contends that attractiveness preferences are no more than by-products of other perceptual affinities. For instance, prototype extraction, which applies not only to recognition and preference of faces but to all objects, may explain the attractiveness of average faces; this process will be discussed in greater detail below. Thus, perceptual

explanations suggest that attractive features themselves are not related to mate value or reproductive success as evolutionary psychology does.

It must be noted that the suggestion that attractive features exploit perceptual biases is not at complete odds with the evolutionary approach. Both approaches presume that preferences are evolved and important to survival. It has also been suggested that the perceptual biases used to explain attractiveness preferences may have first originated to identify traits important for reproductive success, and then were generalized to non-human stimuli (Little & Jones, 2003).

Social learning

While both evolutionary and perceptual theories offer explanations for the bases for attractiveness preferences, social learning mechanisms help explain the differences that arise across individuals and cultures. Grammer, Fink, Møller, and Thornhill (2003) suggested that evolutionary psychology implies that different cultures will share the same rules in deciding what is attractive. This does not mean, however, that they will share the exact same criteria for attractiveness. Although there is agreement across cultures on what makes an attractive face (e.g., Cunningham et al., 1995), cultural differences also exist, which likely result from the challenges to survival and reproduction in individual cultures. For instance, Symons (1979) suggests there is no innate ideal for body weight, but that this is learned, as we associate weight with health and status. In Western cultures, ideal body weight has declined over the last century and the current preference for thinness may be attributable to links between obesity, the wide availability of inexpensive, unhealthy food and lower socioeconomic status. Yet, in contrast, cultures in which food is scarce tend to show preferences for a more plump body

shape. In areas where parasite prevalence is particularly high, attractive facial features that indicate health, tend to be more distinctly preferred (Gangestad & Buss, 1992; Penton-Voak, Jacobson & Trivers, 2004). In such harsh environments, selection pressures are especially great and only those who can acquire high quality mates can prosper.

Commonalities in social learning across cultures have also been proposed to explain preferences for features that are similar across cultures. For instance, the importance of infant care in all cultures might explain the aesthetic preference for youthful facial qualities (Zebrowitz & Rhodes, 2003). Differences between human males and females can also be observed in all cultures, though the differences themselves may occur to different degrees. Learning these distinctions may thus account for preferences for masculine/feminine appearance.

Finally, there may also be more arbitrary preferences for attractiveness that are culturally defined. Extreme examples of this include preferences shown for tattoos or body piercings that have emerged in recent subcultures. Such preferences do not ostensibly provide any purpose in advertising mate quality or health, nor do they appear to exploit any visual perceptual processes. Instead, their appeal is based on some other quality that is valued within that specific culture.

Structural Factors Influencing Facial Attractiveness

Much of the existing research on facial attractiveness has focused on factors related to the basic physical structure of the face. Some of these factors, such as symmetry and averageness, focus on the configuration of the face (i.e., the spatial relationship between different facial features; Tanaka & Farah, 1993). Other factors, such as sex-typicality and personality attributions, are based both on the

presence of specific facial features as well as particular configurational aspects of these features. While the experiments in this dissertation will deal more with sex-typicality and personality attributions, a brief review of all the aforementioned factors follows to provide a comprehensive account of the research conducted on attractiveness so far.

Symmetry

Research investigating the attractiveness of symmetry has produced mixed results. A study of monozygotic twins demonstrated that the more symmetrical twin was rated as more attractive even when symmetry and attractiveness were rated by independent judges (Mealey, Bridgstock, & Townsend, 1999). Other studies measuring the symmetry on real faces have produced similar results (Rhodes, Sumich, & Byatt, 1999; Scheib, Gangestad, & Thornhilll, 1999). Conversely, preferences for asymmetry have been yielded by studies in which the symmetry of faces is manipulated. These findings may have been caused by artefacts of manipulation that create unnatural-looking faces. For instance, symmetrical faces that were made by reflecting half of a face along its vertical midline may create unnaturally wide or narrow faces and symmetrical blemishes (e.g., Langlois, Roggman, & Musselman, 1994; Samuels et al., 1994). The latter could also be caused when morphing an original image with its mirror image (Swaddle & Cuthill, 1994). Later methodologies corrected these artefacts by using an average of the original face and its mirror image and subsequent retouching to eliminate symmetrical blemishes (Rhodes, Proffitt, Grady, & Sumich, 1998) or by remapping features to create symmetrical facial configurations (Perrett et al., 1999) and found that symmetry is related to attractiveness.

The evolutionary explanation for symmetry suggests that a symmetrical face advertises developmental stability. Fluctuating asymmetry, defined as "a departure from symmetry in traits that are symmetrical at the population level [resulting from the] inability to perfectly express developmental design" (Thornhill & Gangestad, 1999a, p. 454). Facial asymmetry may be caused by mutation, pathogens and toxins and thus, symmetry may be an indication of healthiness (Thornhill & Gangestad, 1993). A meta-analytic study by Møller (1999) found that asymmetry was reliably and inversely related to measures of growth, fecundity and survival across various species. Thus, a symmetrical face is thought to be attractive because it signals developmental stability and therefore, high phenotypic and hence, probable genetic quality.

It has been suggested that it may not be symmetry per se, but some correlate of symmetry that is attractive. Scheib et al. (1999) compared the attractiveness of the left or right half of male faces (in order to eliminate symmetry cues) with that of full face images. The attractiveness of half faces correlated with that of full faces, suggesting that symmetry itself is not attractive, but that some co-variant of symmetry present in half faces accounts for attractiveness. Scheib et al. suggested this co-variant might be facial masculinity, as it was found that the attractive half faces in their study tended to have larger lower faces and jaws which are typical of male as opposed to female faces. It has been suggested however that even half faces may include some cues to symmetry, as asymmetrical faces will have more or less of the features visible and mental reflection of these half faces would show these features to be abnormally large or small (Penton-Voak et al., 2001).

Penton-Voak et al. (2001) tested Scheib et al's hypothesis that the attractiveness of symmetry could be explained by masculinity and found no link

between them. They did show however that some other element, independent of symmetry, influenced attractiveness. Low- and high-symmetry averages were created by averaging together the most and least symmetrical 15 faces from a sample of male faces. As averaged composites tend towards symmetry, regardless of asymmetries in the individual faces, the averaging process eliminates differences in symmetry between composites while preserving other co-variants of low- and high-symmetry faces. The high-symmetry composite was judged to be higher in attractiveness, athletic fitness and medical health than the low-symmetry composite. Also, a trend was observed for the high-symmetry composite to be considered more masculine than the low-symmetry composite. This suggests that some co-variant of symmetry might underlie male attractiveness. This possibility is consistent with findings that show women have been found to prefer the scent of symmetrical men (Thornhill & Gangestad, 1999b), suggesting that symmetry and scent might be linked through some cross-modal expression of quality.

A perceptual explanation for the attractiveness of symmetry suggests this preference originates from a visual bias for symmetrical things, not just faces. Enquist and Johnstone (1997) suggest that this preference arises as a result of generalization in stimulus recognition, necessary for the recognition of objects across different positions and orientations that project varied images on the retina. They used bell shaped, generalization gradients (with greatest response to training stimulus) along some stimulus dimension to illustrate theoretical responses to stimuli. They summed the generalization gradients of two mirror-reflected asymmetrical stimuli and showed that the maximal response occurred for a stimulus at the intermediate point between the two stimuli, which correspond to a novel symmetrical stimulus. Thus, preferences for unseen symmetrical stimuli may occur

after exposure to multiple exemplars of asymmetric stimuli. Under this view, preferences for symmetry in faces do not exist *per se*, but arise from a response generalized over many similar exemplars. Thus, this perceptual theory attributes no value to symmetry as an indicator of health and suggests its attractiveness is merely a product of our visual bias.

Little and Jones (2003) suggested that preferences for symmetry may be better accounted for by evolutionary than perceptual explanations. In their study, they collected attractiveness ratings of faces that were either upright or inverted and symmetrical or asymmetrical. When inverted, faces visually become more like other non-face objects because we are not used to perceiving them in that orientation and normal face processing is disrupted. Little and Jones argued that if symmetry is attractive due to reasons associated with perceptual biases, then preferences for symmetry should hold when faces are inverted, as the symmetrical, inverted face should be perceived as any other symmetrical object. Evolutionary theories hold that symmetry is attractive because it is linked to better mate quality and that it is specific to faces. Consequently, this theoretical view would predict symmetry to be attractive only when faces are upright. Little and Jones' study showed a greater preference for symmetry in upright than in inverted faces, which the authors argued to be consistent with an adaptive mate choice hypothesis.

To summarize, despite early methodological issues producing mixed results, research from naturalistic studies and more recent studies using improved stimulus construction methods suggest that symmetry is related to attractiveness. Both evolutionary and perceptual explanations have been proposed for this preference. A study evaluating both explanations has yielded evidence in favour of the evolutionary approach (Little & Jones, 2003). That said, it has been suggested that

symmetry itself may be only a co-variate of another factor (Penton-Voak et al., 2001; Scheib et al., 1999). Certainly, symmetry alone cannot account fully for the attractiveness of faces. Another configurational factor found to affect attractiveness is averageness, which is reviewed in the next section.

Averageness

The first indication that averageness might be attractive came in Galton's attempts in 1878 to identify the features that characterize the face of a criminal. He did this by superimposing images of criminals together and noticed that the resulting composite image unexpectedly looked more attractive than any of the individual images. Over a century later, researchers have investigated the attractiveness of averaging by using computer techniques to create composite faces. Langlois and Roggman (1990) created an average face by averaging the grey colour value of pixels in several black and white computer face images. Another technique involves using landmark points to delineate facial features and averaging the position of these features for a set of faces, which uses the average colour and intensity of pixels over the face set (Perrett, May & Yoshikawa, 1994). Using these modern methods to average the shape, colour and texture of faces, studies have corroborated Galton's initial observations – that average faces are generally more attractive than individual exemplars (e.g., Langlois & Roggman, 1990; Perrett et al., 1994; Rhodes et al., 1999).

A cognitive-perceptual explanation suggests that we find averageness attractive because of the way we process and recognize objects and faces. Prototype extraction theory suggests that our visual system processes all the exemplars of a particular object we encounter and constructs a prototype in perhaps an analogous

way to which the averaged composites are made. By creating an average of many exemplars of one class, the commonalties (presumably the qualities that classify the object) are preserved and eliminate the more variable qualities, creating a prototype. Langlois & Roggman (1990) suggest that averageness in faces is attractive because averaging together a large number of faces creates a face that is close to the population average and is also close to our prototype. Since prototypical items are more likely to be classed as familiar when previously unseen, the preference for average faces may be a result of the mere exposure effect (i.e., what is familiar is attractive). Indeed, support for this hypothesis comes from a study by Halberstadt and Rhodes (2000) in which preferences for averageness were tested with non-face objects and found for watches.

The evolutionary approach offers two possible explanations for the attractiveness of averageness. Symons (1979, 1994) suggested that stabilizing selection may be used to explain why average facial features are attractive: "for any given phenotypic feature the local population's central tendency often approximates the naturally selected optimal design, hence selection is expected to have favored the ability to detect and prefer the central tendency," (Symons, 1994, p. 97). Thus, average characteristics are likely to be selected due to their optimal functionality and this may account for their appeal and the evolution of an averageness-detecting mechanism may have evolved.

Thornhill and Gangestad (1993) speculate that averageness may be attractive because it reflects genetic heterozygosity and better parasite resistance. Parasites are able to adapt quickly to the most common proteins in a host population During sexual reproduction however, new and unique genotypes are created, which in turn create uncommon proteins to which the contemporary pathogens are maladapted.

Thornhill and Gangestad suggest that "the more heterozygous an individual is, the more uncommon alleles it may possess, and hence, everything else being equal, the better its defense against pathogens, because of the greater likelihood that it can produce proteins to which pathogens are poorly adapted," (Thornhill & Gangestad, 1993). They refer to evidence showing individual protein heterozygosity to be related to the average expression of continuously distributed, heritable traits (Mitton & Grant, 1984, as cited in Thornhill & Gangestad, 1993). Thus, averageness may be attractive as a possible reflection of superior parasite resistance and genetic fitness.

Some doubt has been raised about whether it is averageness per se that is attractive in averaged faces. Alley and Cunningham (1991) pointed out that average faces tend to be more symmetrical and that symmetry in faces may account for the attractiveness of averageness. They also suggested that the averaging process, which blends several faces together, tends to produce faces that have very smooth complexions, which may account for their attractiveness. Rhodes et al. (1999) looked at partial correlations for a set of faces varying on averageness, symmetry and positive expression. They found that averageness influenced attractiveness independent of symmetry and expression. In regards to the possibility that smooth complexions might account for the attractiveness of averageness, it should be noted that averageness has also been found to be attractive in natural, undistorted faces (Rhodes et al., 1999).

While the research above shows that average faces are generally more attractive than the component faces, research also shows that the most attractive faces are more than just average. Average faces have been found to differ from exceptionally attractive faces (Johnston & Franklin, 1993; Perrett et al., 1994).

Specifically, research suggests that very attractive female faces and perhaps male faces also are characterized by the presence of exaggerated sex-typical features, which are reviewed next.

Sex-typicality

Humans are characterized by a moderate degree of sexual dimorphism. Certain facial characteristics generally differentiate human male from female faces and are thus, sex-typical. Before puberty, the faces of male and female children do not differ much and both have smooth skin, large eyes, and small, rounded faces. During puberty however, the increase in sex hormones initiate and guide the development of secondary sex characteristics that make adult male and female faces look distinct. In males, an increase in testosterone causes the jaw and chin to lengthen and widen while the cheekbones and brow ridge grow more prominent in male faces (Merow & Broadbent, 1990). Conversely, an increase in oestrogen causes lips to become fuller and limits the growth of the lower face, which also cause cheekbones to look more prominent (Enlow, 1990). The net effect of sex hormones during puberty is that adult male faces have larger, bonier faces, while adult female faces look relatively youthful, with smaller, smoother faces.

Research involving measurements of facial features has corroborated that these sex-typical features help identify faces as male or female. For example, Burton, Bruce & Dench (1993) found that accurate gender identification of faces was based on nose size and width, mouth width, eyebrow thickness, and cheek size and protuberance. That is, faces correctly identified as female tended to have smaller noses, wider mouths, thinner eyebrows and shorter faces with more prominent cheeks while male faces had the opposite characteristics. Fellous (1997)

found that female faces were characterized by large eyes and eye-to-eyebrow distance, smaller noses and shorter, narrower faces while male faces tended to have smaller eyes and eye-to-eyebrow distance, wider noses and longer, wider faces. Thus, male and female faces generally differ in predictable ways.

Sexually dimorphic features have been associated with the attractiveness of female faces. Cunningham (1986) measured the size of 24 features on facial photographs of 50 smiling females, including beauty queens and college students. It was found that the most attractive female faces had large eyes, small nose, small chin, prominent cheekbones and narrow cheeks, as well as high eyebrows and large smile. Note that the majority of these features are those that characterize female faces in comparison to male faces and are found to be more exaggerated in attractive female faces.

Accordingly, female faces that possess more exaggerated female-typical features appear more feminine. The attractiveness of sex-typicality has therefore also been assessed by correlating ratings of attractiveness with those of the perceived femininity/masculinity of a face. Similar to Cunningham (1986), Brown, Cash and Noles (1986) investigated the attractiveness of faces naturally varying in sex-typicality. They asked separate groups of raters to judge the attractiveness and the masculinity/femininity of female faces and found a positive relationship between these scores.

Recent studies have employed a more experimental approach in testing the relationship between sex-typicality and attractiveness. Caricaturing techniques allow researchers to manipulate a face's perceived femininity/masculinity by graphically exaggerating the configural and textural differences between typical male and female faces. In a study of face shape, Perrett et al. (1994) found that a

face representing the average of the top 15 most attractive faces in a sample ("high shape") was preferred to a face representing that of the whole sample ("average shape"). Furthermore, attractiveness preferences of male and female raters favoured a face representing the caricature of the high shape away from the average shape by 50% past the high shape (high shape + 50%). The high shape was noted to have the female-typical features of "higher cheek bones, thinner jaw and larger eyes relative to the size of the face" (Perrett et al., 1994, p. 241). This pattern of preferences (average shape < high shape < high shape + 50%) was also replicated with a Japanese sample, showing cross-cultural consistency. Other studies, which use similar caricaturing techniques (Perrett et al., 1998; Rhodes et al., 2000, Experiment 2) or use genetic algorithms to create faces (Johnston & Franklin, 1993), have yielded comparable results, suggesting sex-typicality in female faces is considered attractive.

For male faces, the attractiveness of sex-typicality is less straightforward. On the one hand, some studies have found facial masculinity to be attractive for male faces (Brown et al., 1986; Johnston, Hagel, Franklin, Fink & Grammer, 2001) Analogous with what was found for female faces, Brown et al. (1986) used faces naturally varying in sex-typicality and found those faces rated high in masculinity were also rated high in attractiveness. Johnston et al.'s (2001) study used an experimental approach, using a continuum of faces ranging from feminine to masculine in appearance. They asked female raters to choose from this continuum: 1) the male face that they considered most attractive and 2) the male face that looked most like an average male. It was found that the most attractive male was more masculine than the average male, suggesting sex-typicality in male faces to be attractive.

On the contrary, studies have also demonstrated that female raters may prefer more feminine male faces. Perrett et al. (1998) used a similar technique to Johnston et al. (2001) in which they provided raters with a continuum of faces between the average male and the average female face and asked them to choose the most attractive face. On average, the Caucasian raters chose a Caucasian male face that was 15% feminized (or 15% caricatured towards the average female face) to be most attractive. Rhodes et al. (2000) found that participants preferred the male average when compared to a masculine, "supermale" face, which was created by caricaturing faces 50% past the male average. In a second experiment using faces that had been caricatured in 25% increments towards and away from the male average, participants seemed to prefer more feminized male faces (average distortion was 33% feminized). These studies suggest that masculine male faces may not always be attractive.

Adding to the complexity of facial masculinity and attractiveness, research has also shown that female preferences for male facial sex-typicality shift over the menstrual cycle and with risk of conception. Penton-Voak et al. (1999) determined the menstrual status of female raters not taking oral contraception and categorized their risk of conception as low (after ovulation and during menses) or high (after end of menses and before ovulation). These raters were then asked to choose the most attractive face from a set of five male faces (40% masculinized, 20% masculinized, average, 20% feminized, 40% feminized). For both Japanese and Caucasian raters and faces, more feminized male faces were preferred by women at low risk of conception while more masculine males were preferred by women at high risk of conception. Furthermore, it was found that this preference, linked to risk of conception, was present only within short term sexual relationship contexts;

when asked to choose a face for a long term relationship, women's preferences were for feminized male faces and this did not vary with conception risk. Although Johnston et al. (2001) found general preferences for masculine male faces, they also found that women's preference shifted to even more masculine faces during the high risk phase of the menstrual cycle. Thus, regardless of whether the baseline preference is for more masculine or more feminine male faces, female preferences have been found to shift towards more masculine faces in phases of the menstrual cycle at which conception is most likely.

A perceptual bias explanation for the attractiveness of sex-typicality suggests that its origin lies in an overgeneralization of the processes used in gender discrimination. Enquist and colleagues (1993, 2002) suggest that gender discrimination in our evolutionary history was not as simple as it may seem, and thus, mechanisms arose to address this task. As previously mentioned, we process a face quickly and one of the first things we perceive is a face's gender (Santos & Young, 2004). Consequently, it is hypothesized that sex-typical features are attractive because they facilitate the task of gender discrimination, since extremely feminine female faces and masculine male faces are easy to categorize. This perceptual hypothesis is plausible as an explanation for the bulk of the empirical research with female faces and a few studies with male faces that demonstrate preferences for sex-typicality. Yet, for the research on sex-typicality and male faces, overgeneralization of gender discrimination processes cannot explain why feminine-looking male faces should be preferred and why a shift might occur during the menstrual cycle and with relationship context.

Evolutionary explanations have been able to account for the research findings for both male and female faces using two sets of theories. The first are

"good genes" theories, which suggest that exaggerated sex-typical features are signals of health. The handicap principle was first suggested by Zahavi (1975). A classic example of this principle is illustrated by the peacock's elaborate tail, which does not serve any functional purpose other than being attractive to peahens. Zahavi suggested such extreme traits act as "handicaps," as only individuals with superior health can afford to devote the biological resources needed to develop these traits as well as the energetic resources to be able to deal with the costs of maintaining such an ornament. Peahens that choose peacocks with elaborate tails will then produce offspring who inherit the peacock's elaborate tail and robust health. Thus, any costs of the handicap are outweighed by the benefits conferred to offspring and the traits are said to "honestly" advertise the higher quality of the mate.

Exaggerated sex-typical characteristics have been suggested to act as honest handicaps. Sex hormones have been shown to regulate immune function (Grossman, 1985) and evidence with non-human species suggests that testosterone has immunosuppressive effects (Folstad & Karter, 1992). Thus, the development of exaggerated secondary sexual characteristics, such as large jaw and chin and prominent brow ridge, may signal a robust immune system in men. Indeed, facial masculinity has been positively related to perceived health in male faces (Rhodes et al., 2003). Perceived health was in turn considered to be more attractive, though the direct relationship between masculinity and attractiveness did not reach significance. Thus, the handicap principle may be able to account for results showing sex-typicality to be attractive in male faces.

It has been suggested that oestrogen may also act as an honest handicap, as it may also be immunosuppressive and related to disease, but less research exists

demonstrating this (Grossman, 1985; Service, 1998). It is therefore unclear whether sex-typical features in female faces can be considered an honest handicap. Nevertheless, oestrogenized features in female faces (such as fuller lips and more slender jaws) indicate lower levels of testosterone during puberty and signal youth and fertility, as oestrogen levels decline with age (Johnston & Franklin, 1993). Youth and fertility are, of course, highly relevant to female mate value and this can account for why facial features that advertise these attributes might be considered attractive.

For those studies in which sex-typicality was not found to be attractive for male faces, these counterintuitive results may be explained by differences between males and females in parental investment (Trivers, 1972). Theories stemming from this difference, which leads to different criteria for male and female attractiveness in mate value, will be termed the "good provider" theories. In humans, the investment required by offspring in terms of biological resources is much greater for females than males. Females are limited in the number of children they can have as they must devote great amounts of time, energy and resources in pregnancy and childcare. On the other hand, males' potential to father offspring is much greater as the biological resources required from them to reproduce are comparatively small. Instead, males' principal contributions to offspring survival come in the form of material resources, important during pregnancy and childcare. Given that they stand to lose more, women are choosier about mate selection and will look for men who are not only genetically fit, but who can also provide resources. On the other hand, men will look for women who appear healthy and fertile to ensure the viability of future offspring, which can be reasonably ascertained by physical appearance.

It should be no surprise then that female faces with feminine features are considered reliably attractive by males, since feminine features connote health, youth and fertility. Preferences for female sex-typicality can be accounted for both by good genes and good provider theories. Only the good provider theory, derived from differences in parental investment, can offer an explanation as to why feminine-looking males might be attractive. Research suggests that feminine-looking males make better long-term partners and providers (Penton-Voak et al., 1999; Perrett et al., 1998); the reasons for this will be expanded in the next section. That men are healthy is also a concern to women, but studies show that appearance is not necessarily of primary importance in the evaluation of male attractiveness. Feingold (1992a) found that women were much more concerned about status and ambitiousness –two traits linked to resource acquisition—than were men. Waynforth (2001) also showed that in choosing a mate, females would trade off physical attractiveness in a male for the ability to acquire resources, as indicated by willingness for hard work and educational attainment. Such a trade-off is consistent with cyclic shifts in female mate preferences and different preferences for long and short-term relationships, which suggest the importance of long-term partners who can provide resources.

A cross-cultural survey suggests that the ability to acquire and provide resources (as measured by ratings for "good financial prospect" and "ambition-industriousness") is of greater importance to female than male considerations of mate value all over the world (Buss, 1989). As such, it has been suggested that personality attributions relevant to such resource-acquiring abilities and willingness to share resources may account for the appeal of feminine-looking males during low

risk of conception and in long-term relationships. The relationship between personality attributions and attractiveness will be discussed presently.

Personality attributions

An ecological approach to person perception, first proposed by McArthur and Baron (1983), suggests that personality traits may be directly perceived from information present in actions as well as static facial morphology. This information is present as "affordances" which can be used by a perceiver to make decisions relevant to social interaction. These affordances and the ability to perceive them are thus suggested to be adaptive in helping to identify suitable partners, dominant adversaries and helpful allies and to prepare an appropriate response. Support for this theory is found in research demonstrating personality attributions made without previous acquaintance with the target can be both valid and generally reliable across raters (Albright, Kenny, & Malloy, 1988; Borkenau & Liebler, 1992; Kenny, Horner, Kashy & Chu, 1992; Watson, 1989).

Some of these "zero acquaintance" judgements may involve using attractiveness as a heuristic in the attribution of a host of positive traits. A study by Dion, Berscheid and Walster (1972) suggested that we may have a positive bias in the attributions we give to attractive people, displaying a "what is beautiful is good" stereotype. For instance, a meta-analytic study showed attractive people to be perceived as more sociable, dominant, sexually warm, mentally healthy, intelligent and socially skilled in the review of experimental literature (Feingold, 1992b). There may also be some negative attributions that come along with attractiveness, such as vanity and egotism (Dermer and Thiel, 1975).

Study of the actual personalities of attractive people show links that are more limited in scope than the attractiveness stereotype predicts. A meta-analytic review by Eagly, Ashmore, Makhjani and Longo (1991) showed that the attractiveness stereotype only extended to attributions related to social interactions. Furthermore, Eagly and colleagues also found negative aspects of the attractiveness stereotype, which included vanity and a lack of modesty. Albright et al. (1988) also found that the validity of self-stranger ratings of Extraversion was attributable to variations in physical attractiveness. Correlational findings in Feingold's (1992b) meta-analysis showed relationships between physical attractiveness and being less lonely, less socially anxious, more popular, more socially skilled and more sexually experienced. Thus, consistent with Eagly et al. and Albright et al.'s findings, attractiveness appears to be validly linked to social elements of personality.

It has been suggested that the specific preferences for feminine-looking males might be explained by the personality attributions associated with masculine and feminine facial characteristics (Perrett et al., 1998). While masculine males are perceived to be more healthy (Rhodes et al., 2003), the high levels of testosterone responsible for the development of these masculine characteristics have also been linked to dominance (Mazur & Booth, 1998) as well as increased likelihood to be physically abusive to spouses and to have extramarital affairs (Booth & Dabbs, 1993). Masculine-looking male faces are also perceived as lower on the attributes of warmth, honesty, emotionality, co-operativeness, and quality as a parent than are more feminine-looking male faces (Perrett et al., 1998). Preferences for feminine male faces may therefore result from an avoidance of these negative associations with facial masculinity. The relative agreeableness of feminine-looking men

suggests they would make for more caring fathers and effective long-term mates, as offspring viability may be maximized by a pair of doting parents.

While less masculine men may offer more in parental care, they still appear to be relatively less healthy. In order to maximize offspring viability, women have been suggested to use a "multiple mating strategy" to obtain good genes and good fathers for their children. Women may choose to mate with more masculine men to acquire genetic fitness benefits while forging long-term partnerships with and have their offspring raised by less masculine partners. Research consistent with this hypothesis demonstrates that female preferences for male faces shift towards more masculine men at phases of the menstrual cycle when they are most likely to conceive but favour relatively feminine-looking men during other times of their cycle (Johnston et al., 2001; Penton-Voak et al., 1999). Thus, this multiple mating strategy highlights the multiple criteria females use in selecting a male partner and suggests the importance of personality traits as an indication of partner quality in the selection process.

Gangestad, Simpson, Cousins, Garver-Apgar, and Christensen (2004) also found preferences for personality-relevant behaviour that vary with menstrual cycle, which parallel those for facial masculinity. They asked women to judge the attractiveness of men in videotapes whose goal was to convince her to date them. A principal components analysis of the behaviours in these videotaped interviews yielded two main factors: social presence and direct intrasexual competitiveness. Social presence was defined by "composure, presentation as athletic, eye contact, lack of self-deprecation, lack of downwards gaze and lack of nice-guy self-presentation" while direct intrasexual competitiveness was defined by "derogation of the competitor, direct intrasexual competitive tactics, lack of laughing, and lack

of mentioning a nice personality," (Gangestad et al., 2004, p. 204). Social presence and direct intrasexual competitiveness can be classified as behaviours that would be associated with higher potential for resource acquisition. At the same time however, a number of these behaviours are disagreeable and could be construed as behavioural counterparts to the personality attributes associated with facial masculinity.

Women rated the desirability of the men in Gangestad et al.'s study as short-term and long-term partners. For long-term partners, women generally preferred men who showed low levels of social presence and intrasexual competitiveness. For short-term partners however, women preferred high levels of social presence and direct intrasexual competitiveness only in the phase of the menstrual cycle where they were most likely to conceive. These results in preferences for behaviour parallel those previously found for facial masculinity (Penton-Voak et al., 1999). Simpson, Gangestad, Christensen, and Leck (1999) suggested that men who are symmetrical, which they posit is indicative of greater developmental stability and health, tended to use more direct intrasexual competitive tactics with women. The cyclical preferences for social presence and intrasexual competitiveness detailed above link behavioural traits to cyclical preferences for scent and for facial masculinity which vary in similar ways, and suggest that these may all be indicators of male fitness. The fact that these personality traits are only preferred during times of high conception however, also provide support for a multiple mating strategy in which women pursue extra-pair copulation to gain both genetic fitness from short-term, sexual partners as well as securing resources and companionship from a long-term partner.

Other research suggests that women may also seek to gain benefits of both good genes and resources by looking for a balance of these within the same man. That is, compromises in the degree of facial masculinity preferred have been observed at the level of facial features. Cunningham's multiple-motive model of facial attractiveness suggests that the balance between health and positive personality traits is achieved through the preference for a combination of facial features that convey both (Cunningham, Barbee & Pike, 1990). Attractive male faces were found to possess a mix of babyish qualities (large eyes, small nose), mature features (large chin, prominent cheekbones, thick eyebrows) and expressive traits (large smile area and height). Thus, Cunningham suggests that attractive faces possess a optimal combination of qualities, which simultaneously convey the maturity and health of a masculine male face that are offset by the agreeableness suggested by more babyish qualities and the sociability implied by expressive features. Both Cunningham's multiple motive model and the multiple mating strategies reviewed earlier emphasize the balance of health and personality in female selection of male mates.

Similarly, Keating and Doyle (2002) suggested that attractive faces consist of an optimal balance of facial features conveying power and warmth. Impressions of power and warmth were manipulated by altering facial features of real faces to look more dominant and submissive by increasing or decreasing eye and lip size, respectively (Keating, 1985). It was the unchanged faces however, that were rated as most attractive and this was not attributable to the altered faces looking abnormal. They concluded that the naturally occurring faces were most attractive because they possessed a balance of dominant and submissive characteristics. Note that the differences between submissive and dominant parallel those between

feminine and masculine faces. As such, Keating & Doyle's results are also consistent with the suggestion that attractive male faces necessitate a balance of masculine and feminine features, conveying dominant and agreeable personality traits, respectively.

The research reviewed above suggests that facial features are reliably linked to judgements of personality. These personality judgements may also be somewhat accurate (Borkenau & Liebler, 1992; Watson, 1989). This is consistent with McArthur and Baron's (1983) ecological approach to person perception, which suggests that ability to detect information about personality may be adaptive, helping us to decide whether a new person is a friend or foe. These personality attributions have also been shown to relate closely to attractiveness judgements, particularly for aspects of personality linked to social skills (Albright et al., 1991; Eagly et al., 1991; Feingold, 1992b). Furthermore, the attractiveness of sex-typical characteristics may not only depend on what they can tell us about the health of the individual, but may also lie in what they suggest about the individual's personality. Evidence has been presented suggesting that an agreeable personality is attractive in males, particularly when females are choosing long-term mates (Perrett et al., 1998).

Non-Structural Factors Influencing Attractiveness

The factors reviewed above are principally concerned with the physical and invariable structure of the face. Yet, attractiveness may also be affected by other aspects of the face that are less static. Facial motion and expression involve changing configurations of the face and the execution of specific, discrete gestures that may contribute to the attribution of certain personality traits, which in turn may affect attractiveness ratings. With the exception of some research on personality

attributions, attractiveness research has typically used static stimuli that do not take into account the possible effects of motion and expression. Indeed, these factors are important in realistic social interaction and using stimuli that incorporate them will allow for more ecologically valid results. I now turn to discuss the research linking these non-structural factors to attractiveness.

Emotional expression

There is some debate about the origin and function of emotional expressions. In his principle of serviceable associated habits, Darwin (1872) suggested that expressions were vestiges of habitual behaviours and comprised of movements no longer linked to their original purpose. Cross-cultural research beginning in the 1960s showed that a small set of emotional expressions, depicting happiness, anger, sadness, fear, disgust, and surprise were produced and recognized across many disparate cultures (Ekman, Sorenson, & Friesen, 1969; Ekman et al., 1987). An "emotions view" was built around these findings, which presumes that these expressions correspond to the actual emotions felt by the displayer. This view also proposes these six expressions form a basic, innate set from which all our other emotional expressions are blended. To explain why felt emotion does not always match with expressions however (e.g., smiling out of politeness, not pure happiness), Ekman suggested that "display rules," which are learned and may vary by culture, mediate the display of expressions.

In contrast, behavioural ecologists would suggest that the primary purpose of emotional expressions is not necessarily to communicate felt emotion. Instead, expressions are displays that facilitate social interactions and that the meaning of each expression is based on the particular context in which it is used. For instance,

while a smile can indicate happiness in a birthday party context, the same expression could convey politeness at a first meeting, or excitement on a roller coaster ride. This view is not as rigid as that of the emotions view, and takes into account not just the intentions of the displayer, but also the reaction of the receiver. Expressions are thought to have evolved to convey context-specific information that benefits both the displayer and the receiver. For example, a threat display has evolved because the displayer produced a menacing enough display to avoid having to risk battle and to allow the receiver to evaluate the display and decide that the cost of death in fighting outweighs the benefit of keeping certain resources (Fridlund, 1994).

The research linking emotional expression and attractiveness has focused primarily on the influence of smiling. It seems intuitive to expect that smiling faces would be considered more attractive than ones that are neutral or frowning. There has been some empirical support for the assumption that smiling faces are attractive. Otta, Abrosio, and Hoshino (1996) investigated the evaluations made to faces displaying different types of smiles (closed, open or broad) or neutral expressions. These faces were rated on a number of personality traits and it was found that smiling increased the perceived happiness, kindness and attractiveness of a face. Furthermore, it appeared that all forms of smiling increased attractiveness in comparison to a neutral face to a similar degree. This study suggests then that a smiling face is an attractive face and that it may also suggest an agreeable person. Similar findings suggesting the attractiveness of smiles have also been obtained by other studies (Raines, Hechtman & Rosenthal, 1990a, 1990b; Schulman and Hoskins, 1986).

Rhodes et al. (1999) showed that ratings of positive expression of averaged faces are correlated to ratings of attractiveness. That is, despite being composed of neutral faces, averaged faces often show a mildly pleasant expression while individual faces or anti-caricatured faces show relatively unpleasant expressions. Rhodes and colleagues tested the contributions of averageness, symmetry and expression to attractiveness judgements. They found a positive relationship between positive expression and attractiveness when effects of averageness and symmetry were partialled out in both natural and manipulated faces. Studies involving measurements of facial features in attractive faces have also shown that both attractive female and male faces tended to have larger smiles (Cunningham, 1986; Cunningham et al., 1990; Cunningham et al., 1995).

Empirical evidence also exists however that suggests happy faces are no more attractive than neutral ones (Mueser, Grau, Sussman, & Rosen, 1984; O'Doherty et al., 2003). In an fMRI study of the neurological bases of attractiveness, O'Doherty and colleagues found no difference in attractiveness ratings between 48 faces that had neutral or mildly happy expressions (although the more happy faces did seem to be a more rewarding stimulus; see also Kampe, Frith, Dolan & Frith, 2001). Mueser, Grau, Sussman and Rosen (1984) showed raters pictures of 15 female faces showing happy, sad and neutral expressions and asked them to rate these faces for attractiveness. While they found that the sad faces were rated as least attractive compared to other expressions, happy faces were not rated as any more attractive than neutral faces. In this particular study however, it is possible that the emotional expressions produced by actors were not convincing. Stimuli were obtained by stopping people on campus and asking them to spontaneously pose an expression. This method may have produced unnatural-

looking smiles, which may be evaluated more negatively. Mueser et al. do not mention any screening process for the photographs and concede that the smiles may not have been considered highly attractive because they may have looked unrealistic. The uncertainty of these results taken with the opposition of findings between other studies looking at attractiveness and emotional expression provide a rather unclear answer as to whether smiling is generally attractive.

Furthermore, some studies suggest that the influence of smiling on attractiveness differs for male and female faces. Schulman and Hoskins (1986) found that positive expression increased physical attractiveness ratings for female faces but had relatively little effect on male faces. Furthermore, they found that both male and female participants rated female faces with finer discrimination and greater consensus than for male faces. This harsher scrutiny of female faces was argued to be indicative of the greater importance of appearance in the perception of women.

Looking at this from a different angle, a study by Deutsch, LeBaron and Fryer (1987) showed a sex asymmetry in the influence that the *absence* of smiling had on impressions. Pictures of smiling and non-smiling men and women were rated for various personality traits, including attractiveness. The attractiveness results were not reported, but smiling faces of both genders were rated to be more happy, more carefree and more relaxed than non-smiling faces. However, non-smiling female faces were evaluated more negatively on these same traits than were non-smiling males. It is argued that these results are indicative of a social norm for women to be expressive and warm and that the failure to do so results in unfavourable evaluations.

To summarize, the relationship between smiling and attractiveness is unclear. Some studies support the intuitive assumption that smiling, which is typically an expression with positive affective valence, is attractive (Otta et al., 1996; Raines et al., 1990a), while others suggest there is no relationship between smiling and attractiveness (Mueser et al., 1984; O'Doherty et al., 2003). Others still suggest that smiling has an exclusive effect on female attractiveness (Raines et al., 1990b; Schulman & Hoskins, 1986). Further research is needed to clarify this relationship. Also, previous studies have used only static stimuli to investigate smiling and attractiveness. It is of interest to test whether a smile executed in motion, and thereby in a more realistic light, might yield different results.

Facial motion

Few studies have directly investigated the effects of motion on attractiveness and from the general neglect of this factor, one might think its influence unimportant. Recent studies in other areas of facial perception have shown that this is certainly not the case, as facial motion has been shown to contain a great deal of information important to the identification of age, gender, and emotional expression (Bente, Feist, & Elder, 1996; Berry, 1990; Hill & Johnston, 2001), as well as the recognition of identity (Lander, Christie & Bruce, 1999; Thornton & Kourtzi, 2002) that is not present in static images. When we are evaluating the attractiveness of a prospective mate, we more than likely do so during social interaction, in which the faces we see are moving and interacting. Thus, it is important that we consider what effect motion has on attractiveness judgments.

It should be noted that while few attractiveness studies have attempted to directly assess the influence of motion, not all studies have made exclusive use of

static stimuli. Studies examining nonverbal communication in courtship have used videotaped interviews or hidden-camera video footage. Such stimuli are inherently richer and more naturalistic than static stimuli and their use has uncovered a number of behaviours linked to personality and attractiveness judgements. For instance, smiling, eye contact, flirtatious glances and eyebrow flashes were correlated with perceived interest/invitation in an opposite-sex conversational partner (Simpson, Gangestad, & Biek, 1993). The ratio of eye contact while speaking versus that while listening (Dovidio & Ellyson, 1982) has also been linked to greater attributions of dominance, which itself has been shown to influence attractiveness judgements (Jensen-Campbell, Graziano & West, 1995; Sadalla, Kenrick & Vershure, 1987). Given the importance of these dynamic behaviours in interpersonal attraction, it is necessary to use richer, dynamic stimuli to study the effects they may have on attractiveness judgements to better approximate real life interactions.

Brown et al. (1986) used both static and dynamic stimuli, but did not make any direct comparisons between them. In separate regressions for static and dynamic attractiveness, they found that both types of attractiveness were predicted by facial attractiveness, body attractiveness and grooming characteristics. It should be noted however that all their stimuli displayed positive expressions and thus, their design did not allow for the assessment of an interaction between expression and motion. It is possible that the effect of positive expression was strong enough to outweigh possibly smaller effects of motion.

One study has tried to determine what contributions dynamic elements make over static factors to overall attractiveness judgements. Riggio, Widaman, Tucker and Salinas (1991) tested a multi-component model of attractiveness, using

structural equations to test the influence of "dynamic expressive style", attractiveness of dress, facial beauty and body attractiveness and their relation to overall attractiveness. Dynamic expressive style was not a direct measure of movement in the video stimuli however and instead consisted of the actor's score on a questionnaire assessing social skilfulness. The authors rationalized that more socially skilled individuals tend to be more expressive in their movement. Of the factors measured, only facial beauty and dynamic expressive style were found to make significant contributions to overall attractiveness. Although dynamic expressive style was not a direct measure of movement, the findings suggest the importance of both static, structural elements and individual motion to judgements of beauty.

Quite clearly, there is a lack of research looking at the influence of motion on attractiveness. Yet, this need has not gone unnoticed; Berry (2000) suggested that attractiveness research has focused on visual cues, but that factors relevant to attractiveness may extend beyond such morphological characteristics. She suggests that overall attractiveness may have a multimodal nature and suggests that movement may influence attractiveness ratings.

Grammer et al. (2003) suggests movement could influence attractiveness on the basis of evidence suggesting that body movement can yield information about symmetry and female hormone profiles. Research conducted on chickens shows that symmetrical individuals are more coordinated and more efficient in their walking behaviour than asymmetrical individuals (Moller, Sanotra, & Vestergard, 1999, as cited in Grammer et al., 2003). Thus, it may be that movement efficiency reflects body symmetry and, thus, developmental stability. In faces, it is possible that movement serves an analogous purpose in highlighting symmetry as a show of

a person's movement efficiency, which may be indicative of developmental stability.

Movement may also provide information about circulating oestrogen levels. Hampson and Kimura (1988) showed that women performed better on a number of complex manual tasks while in the mid-luteal phase of their menstrual cycle (characterized by high levels of oestrogen and progesterone) than during menstruation. Grammer, Filova & Fieder (1997) demonstrated that the movement from women at high and low oestrogen phases of their menstrual cycle were distinguishable in quality, as determined by a trained neural network. Combined with the findings regarding symmetry above, these results suggest that movement could convey information about health as well as fertility.

As reviewed above, personality attributions can be made based on static facial features, but the accuracy of these attributions is better when viewing dynamic stimuli (Borkenau & Liebler, 1992; Watson, 1989). This advantage of movement in detecting personality attributes suggests that motion carries extra information above and beyond facial structure. Extra information in movement has already been suggested by previous researchers to be used in age, identity and sex recognition (Berry, 1990; Hill & Johnston, 2001; Thornton & Kourtzi, 2002). The question considered in the present set of experiments is whether the extra information conveyed by motion is also relevant to attractiveness judgements.

To conclude, although all the above factors have been suggested to influence attractiveness, it should be noted that there is no one factor that can explain all the variance in attractiveness ratings. While factors such as symmetry, averageness,

and sex-typical traits may provide the structural basis for an attractive face, more variable factors such as emotional expression and facial motion may provide information above and beyond structure. This possibility has not yet been directly examined in regards to facial attractiveness. Attempts to evaluate the influence of emotional expression have thus far yielded mixed results and very few studies have investigated the effect of motion directly on attractiveness. Furthermore, these factors may interact, though as of yet, no study has investigated this possibility.

The first goal in the current set of experiments is to use richer stimuli than have been previously used in attractiveness research. These stimuli will incorporate both expression (specifically, smiles) and motion. Using these stimuli, a second goal is pursued: to establish whether emotional expression and facial motion themselves have effects on attractiveness and whether these factors interact. Finally, beyond investigating the effects of motion and expression upon attractiveness judgements per se, this research also investigates whether previous findings involving attractiveness and the factors of sex-typicality, personality attributions and cultural influence endure when using more realistic stimuli that move and are expressive.

General Overview

The experimental portion of this dissertation begins with an investigation of the effects of non-structural factors on attractiveness. Chapter 2 features a set of experiments examining the effects of motion and expression on ratings of attractiveness and of perceived personality attributes. This chapter yields some interesting sex-dependent effects and suggests that motion and expression may influence the attractiveness of male and female faces differently. Intriguing and

highly specific relationships between sex-typicality and attractiveness are also found in this first chapter.

Chapter 3 investigates whether the sex-typical effects found in Chapter 2 are generalizable to a new stimulus set. As the incorporation of motion and expression in stimuli used in attractiveness research is new, it is important to assess the reliability of these new effects.

Chapter 4 improves upon the correlational approach used to examine the attractiveness of facial sex-typicality in Chapter 2 and extends these findings with stimuli in which greater experimental control is exercised. The perceived facial masculinity/femininity of dynamic, expressive stimuli is manipulated, constituting a technically demanding, but completely novel approach to the study of sex-typicality.

Research suggests that displays of and preferences for motion and expression may be culturally defined (Ekman & Friesen, 1975; Ekman et al., 1987; Friesen, 1972, as cited in Fridlund, 1994; Scherer, Matsumoto, Wallbott, & Kudoh, 1988). The effects of motion and expression are tested cross-culturally in two experiments comparing responses of participants from Japan and Canada. The results from this set of studies are detailed in Chapter 5.

The final chapter will consider the findings yielded by the experiments on the whole. The implications of these effects to attractiveness and the facial perception literature will be discussed and suggestions for future research will be proposed.

Chapter 2: Influence of the Non-Structural Factors of Motion and Expression on Attractiveness and Personality Attributions

The previous chapter reviewed some of the intransient, structural factors known to influence attractiveness judgements, as well as some more variable, non-structural factors. Because most studies of attractiveness have used static stimuli, the influence of structural factors, such as symmetry and averageness, has received more attention than transient characteristics. Yet non-structural factors such as motion and expression convey information that is also relevant to attractiveness judgements. While this information is available during real interactions with faces, it is absent from traditional studies of attractiveness using static stimuli, thus putting the generalizability of the results from such studies into question. This chapter focuses on determining the effects of expression and motion on ratings of attractiveness, as well as investigating the possible interaction of these factors with personality attributions.

Chapter Overview

A number of studies suggest that smiling has a positive effect on attractiveness ratings (e.g., Otta et al., 1996; Raines et al., 1990b). This effect, however, is inconsistent across the literature and it is possible that this enhancing effect is limited to female faces (e.g., Schulman & Hoskins, 1986; Raines et al., 1990a). To investigate whether and under what conditions smiling is attractive, a design was used that combined methodological aspects of a number of previous studies. Experiment 1 involves a design which controls for baseline facial attractiveness across expression conditions, avoids confounds of vocal attractiveness in previous experiments (Raines et al., 1990b, Study 1) by using face only stimuli and takes into account ratings of both male and female faces.

In comparison, little research has been conducted to study the effect of motion on attractiveness, and few studies have actually compared the judgements made of dynamic and static stimuli. In one of the few studies to use both types of stimuli (Brown et al., 1986), the factors which contribute to both dynamic and static attractiveness were not found to differ. Yet, in this experiment, only faces with positive expression were used and differences due to motion may have been overwhelmed by effects of positive expression. It may be that motion influences smiling faces differently than neutral faces, as expressive behaviour has been linked to increased attractiveness (Riggio et al., 1991; DePaulo, Blank, Swain, & Hairfield, 1992). Experiment 2 used stimuli comparing dynamic to static faces as well as positive to neutral expressions to determine how different combinations may affect attractiveness ratings.

In Experiments 1 and 2, interesting sex differences in the effects of motion and expression emerge, replicating previous findings in one instance and constituting a new effect in another. These factors may communicate nonverbal information that is particularly relevant in the formation of personality attributions. In Experiment 3, stimulus faces are rated for personality traits in an effort to understand whether perceived personality traits might explain the effects of motion and expression on evaluations of attractiveness.

Experiment 1: Facial Expression and Attractiveness

Given that smiling faces are attributed with positive personality characteristics (Deutsch et al., 1987; Otta et al., 1996), one might presume that smiling might also positively influence ratings of attractiveness. Yet, when empirically tested, the relationship between expression and attractiveness is unclear.

Some studies show general preferences for smiling faces (Cunningham, 1986, Cunningham et al., 1990; Otta et al., 1996; Raines et al., 1990a, 1990b). In two studies, Raines et al. (1990a, 1990b) compared the attractiveness of persons expressing positive and neutral affect through the face, voice and body. In all modalities, positive affect stimuli were given higher ratings of attractiveness than those with neutral affect. Similarly, Cunningham and colleagues (Cunningham, 1986; Cunningham et al., 1990, 1995) suggested positive expression to be associated with high attractiveness. They conducted a number of studies in which he and his colleagues took measurements of facial feature size and configuration and correlated these with attractiveness ratings. In studies of both male and female faces evaluated both within and across cultures, larger smiles were positively related to higher attractiveness ratings. As these findings were based on correlations, it is not clear whether smiling might increase attractiveness or whether attractive faces are more likely to be perceived as smiling (O'Doherty et al., 2001).

Experimental evidence supporting the possibility that smiling might increase attractiveness was found by Otta and colleagues (1996). Otta et al. compared the rated attractiveness of neutral male and female faces with 3 different smile intensities. It was found that while ratings of happiness increased accordingly with increasing intensity of smile, ratings of attractiveness did not differ significantly between smile conditions. Nevertheless, attractiveness ratings for all smile conditions were higher than that for the neutral condition. Although there is some discrepancy over whether larger smiles are necessarily linked to proportionately higher attractiveness evaluations, the research reviewed above would suggest that smiling faces are considered attractive.

On the other hand, studies exist which find little difference between attractiveness ratings for neutral and smiling faces (Mueser et al., 1984; O'Doherty et al., 2003). Mueser and colleagues compared the attractiveness of faces that were displaying happy, sad and neutral expressions. While they found both happy and neutral faces were rated to be more attractive than faces with sad expressions, no significant difference was found between ratings for happy and neutral faces. It should be noted however that they used only female faces in their experiment. O'Doherty and colleagues (2003) evaluated the influence of expression on attractive faces, both by obtaining fMRI measures of brain activity and by collecting ratings of faces. They found that attractive faces increased blood flow to the proposed area for stimulus-reward value, the orbitofrontal cortex, particularly when faces were smiling. Nevertheless, results from the rating task showed that smiling faces were not judged to be any more attractive than neutral faces. Thus, while the neuroimaging data in that study may imply that smiling faces are rewarding, the behavioural data collected in both studies showed no conscious preference for smiling over neutral faces.

Furthermore, a number of studies suggest that smiling behaviour may enhance female attractiveness exclusively (Raines et al., 1990b, Study 1; Rhodes et al., 1999; Schulman & Hoskins, 1986). As mentioned above, Raines and colleagues (1990b) investigated attractiveness evaluations of faces and voices displaying either neutral or positive affect. The analysis for their first study showed that positive affect conveyed by the face alone was rated to be more attractive than neutral affect, but that this finding was only true for female faces; male faces showing positive and neutral affect did not differ significantly in rated attractiveness. Yet, it must be

noted that a subsequent study presenting face and voice stimuli separately yielded an enhancing effect of smiling for both male and female faces.

Rhodes et al. (1999) investigated whether the averaging of faces might increase attractiveness because of increased averageness, symmetry or expression. They created high- and low-averageness versions of real faces and compared these with the original faces in rated attractiveness, averageness, symmetry and expression. When faces in all three conditions were considered, partial correlations showed each of averageness, symmetry and expression to make independent contributions to rated attractiveness. When considering original, unaltered faces only however, expression was the only factor found to correlate with the attractiveness of female faces. Male attractiveness, on the other hand, was influenced by both averageness and symmetry, but not expression.

Finally, Schulman and Hoskins (1986) attempted to evaluate how male and female faces may be perceived on different criteria—specifically that females might be judged to a greater degree on appearance. Their stimuli incorporated faces that were displaying a broad smile, closed smile and neutral expression. It was found that female faces were evaluated with greater consensus, range, and discrimination and that both types of smiles were rated more attractive than the neutral condition. For males on the other hand, little difference was found between the different expression conditions. The complexity of ratings for female compared to male attractiveness was argued to be indicative of the greater importance of appearance to evaluations of females. Thus, a number of studies suggest that positive facial expression may be particularly attractive for female faces.

A number of methodological points need to be raised with several of these studies. To begin, Cunningham and colleagues' studies (Cunningham, 1986;

Cunningham et al., 1990, 1995) and Rhodes et al.'s (1999) study used correlations to investigate the relationship between smiling and attractiveness. This approach does not allow the establishment of causality, as it may be that attractive faces are more likely to be perceived as displaying a positive expression (O'Doherty et al., 2001). In their expression rating task, O'Doherty and colleagues found a small but significant difference between the numbers of high and low attractiveness faces perceived to be smiling (10 and 7, respectively). As the principal concern at present is whether expression can influence judgements of attractiveness, an experimental approach in which expression is the only manipulated variable across conditions would be more appropriate.

It is important to control for identity across conditions, as the invariant aspects of the face (e.g., facial features, hair colour, complexion) may have the greatest influence on ratings of attractiveness (Brown et al., 1986). Yet, Schulman and Hoskins (1986) used different faces across expression conditions. So, while they found that smiling was attractive for female faces alone, there was no control for individual differences in the attractiveness of target faces. Consequently, it is possible that preferences for the smiling condition might have been due to a higher proportion of attractive faces in the smiling condition than in the neutral condition. Most other studies have used a between-subjects design in which the identity of faces are controlled across conditions but subjects rate only one version of the face, either neutral or smiling. Doing this creates a control for the attractiveness of invariant features in faces across all conditions, suggesting that the effects observed will be due only to differences in expression.

To investigate whether the effects of expression are gender-specific, it is also important that both male and female facial stimuli are used. Mueser and

colleagues' study (1984) unfortunately only used stimuli of female faces. Otta and colleagues (1996) emphasized the importance of examining differences in attractiveness ratings for male and female faces and yet did not report any statistics for target gender in their analysis. Given the previous studies suggesting that the attractiveness of female and male faces may be judged differently with regards to expression, it is important to include the factor of face gender in the design of the present study.

Given the controversial findings over the relationship between expression and attractiveness, the purpose of Experiment 1 is to investigate the circumstances under which a smile is attractive, particularly in whether the effect of smiling is gender-specific. This experiment attempts to adopt some of the methodological aspects in previous experiments while also attempting to correct the shortcomings of others. An experimental approach will be taken, comparing the rated attractiveness of both male and female faces displaying positive and neutral expressions. The same actors will be used in both the expression conditions to provide a control for the influence of invariant components of facial attractiveness.

Method

Participants

The participants for this study consisted of 45 undergraduate university students from McMaster University, Canada (10 males and 35 female, mean age = 20.5). They were recruited through a first year psychology course and given course credit for their participation.

Materials

Stimuli. There were 20 facial stimuli in total, consisting of black and white photographs of 10 male and 10 female actors posing positive and neutral expressions (Stimulus Set A, Appendix A). An equal number of male and female faces were chosen from two different databases of faces. Some pictures were reduced or enlarged using Adobe Photoshop; pictures from one database were 3.39 x 5.08 cm while those from the other database were 4.23 x 5.45 (or 5.64) cm. The purpose of this alteration was to ensure the size of face, as opposed to the size of the picture, would be relatively constant across the entire set of stimuli.

Design

A 2 (Expression) x 2 (Face Gender) factorial design was used. Both factors of Expression and Face Gender were within-subjects factors. Face sets were balanced across participants and expression conditions such that a participant saw each face in only one of the expressions. Thus, two sets of stimuli were created, each consisting of the same 20 faces, but counterbalanced for expression.

Procedure

The stimuli were presented on a Macintosh PowerBook laptop using Psyscope 1.2.5. Each of the 20 stimuli was presented in the middle of the screen with a white background for 7 seconds. After this time, the screen switched to a display of the 7-point scale (1 = not attractive, 7 = very attractive) on which the previously viewed face was to be rated. The participants then entered their rating using the keyboard and this was recorded by the PsyScope program.

Results

Reliabilities across participants rating the same stimulus set were .71 and .82 for the two stimulus sets. Given this satisfactory consensus across raters, ratings were averaged over participants to create a mean rating for each face in each of the expression conditions. An items analysis was conducted using a 2 (Expression) x 2 (Face Gender) repeated measures ANOVA[1]. Differences due to Rater Gender were not investigated because the number of male participants (n = 10) was such that any comparisons would not be reliable. Instead, ratings of male and female participants were aggregated. The means for faces displaying neutral and positive expression are displayed for male and female faces in Figure 2.1.

An interaction of Expression with Face Gender was found to be significant, $F(1, 18) = 5.83$, $p < .05$. On average, female faces were rated to be much more attractive when displaying a positive than a neutral expression (positive: $M = 4.54$, $SE = .203$; neutral: $M = 3.67$, $SE = .296$). On the other hand, mean attractiveness ratings for male faces displaying positive and neutral expressions differed little (positive: $M = 3.51$, $SE = .203$; neutral: $M = 3.62$, $SE = .296$). Adjusted t-test post hoc comparisons showed the difference in ratings between positive and neutral expression to be significant for female faces only (female faces: $t(9) = 4.50$, $p = .001$; male faces: $t(9) = -.31$, $p = .765$).

A main effect of Expression was found to be marginally significant ($p = .078$); faces with positive expression were slightly preferred to those with a neutral

[1] Items analyses were conducted for all the experiments in this dissertation. Stimulus face was used as the unit of analysis instead of subject because the primary interest was to compare the way individual faces would be evaluated across different motion and expression conditions. It has already been shown that attractiveness ratings are made with a high degree of inter-rater reliability and the way in which specific subjects rated faces generally in different conditions was of lesser interest.

expression (positive: M = 4.03, SE = .144; neutral: M = 3.64, SE = .209), but this is driven by the Expression by Face Gender interaction.

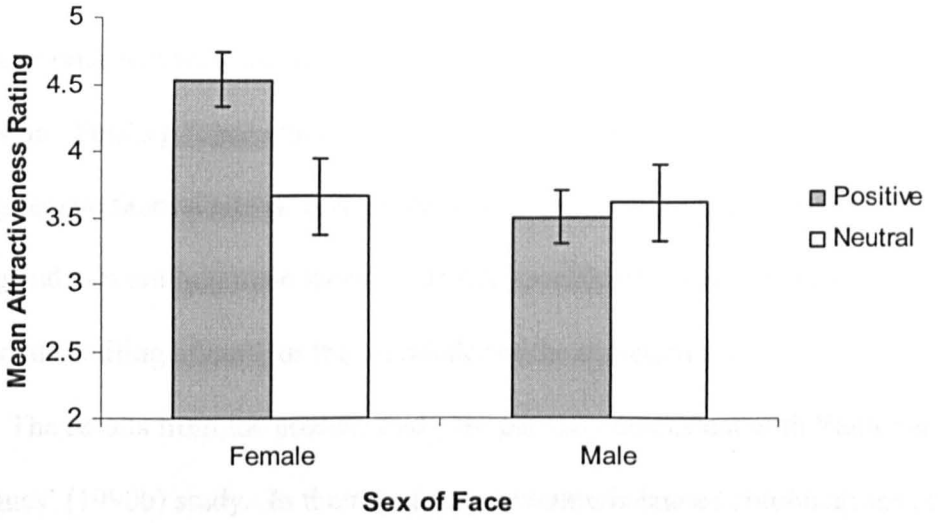

Figure 2.1. Mean attractiveness ratings for female and male faces displaying positive and neutral expressions. (Error bars represent standard error).

It should also be noted that a correlation of the rank ordered attractiveness ratings of faces in the positive and neutral condition they were not related (p = .130). This suggests that not only were faces in the positive condition more attractive than those in the neutral condition, but the faces that were most attractive differed between the two conditions. Thus, positive expression benefits the attractiveness of some faces more than others and does not simply make every face equally more attractive.

Discussion

Previous research investigating the relationship between expression and attractiveness has yielded mixed results; some studies show positive expression to have a general and enhancing effect on attractiveness (e.g., Otta et al., 1996) while others show expression to have no effect on the attractiveness of smiling versus

neutral faces (e.g., Mueser et al., 1984). Furthermore, a number of studies have suggested that expression only enhances female attractiveness (Raines et al., 1990b, Rhodes et al., 1999; Schulman & Hoskins, 1986). The results from the present study are consistent with this latter group of studies showing a sex-specific effect of expression. Smiling female faces were judged to be more attractive than non-smiling female faces while no difference was found between the attractiveness of smiling and non-smiling male faces. This sex-specific effect will be referred to as the "female smiling effect" for the remainder of the dissertation.

The results from the present study are partially consistent with Raines and colleagues' (1990b) study. In their first study, counterbalanced combinations of different faces and voices were used in their stimuli for testing attractiveness. Separating the effects of faces and voices in analysis, they found the female smiling effect in the face channel only. In a second study, when they presented face and voice stimuli separately the female smiling effect was no longer found for faces. In contrast, the present study used only facial information and yet the female smiling effect was obtained, suggesting that voice information is not a necessity for this effect.

Previous correlational studies have also shown an association between smiling and attractiveness. In a number of studies, Cunningham and colleagues (Cunningham, 1986; Cunningham et al., 1990, 1995) demonstrated that larger smiles were correlated with higher ratings of attractiveness. No comparisons were made against neutral faces in his studies however, as all faces were depicted smiling. Rhodes and colleagues (1999) conducted partial correlations on ratings of attractiveness, averageness, symmetry and expression. It was found that for unaltered, natural faces, the attractiveness of female faces increased with the

positivity of expression displayed. The attractiveness of male faces did not show this relationship. While both studies show a strong relationship between smiling and attractiveness, neither can show that smiling increases attractiveness, and leave open the possibility that attractiveness may increase the likelihood of a face being perceived as smiling. The experimental approach in the current study yielded a result consistent with Rhodes et al.'s sex-specific finding and demonstrates that smiling does increase attractiveness of female faces.

Finally, while the results of the present study are consistent with those in Schulman and Hoskins (1986) study, improvements were made upon it by controlling for identity across all expression conditions. This allowed each face to act as a control for itself across conditions. Thus, unlike Schulman and Hoskins' study, the higher average attractiveness rating in the positive condition in this study must be due to the effect of expression and not to differences in the basic attractiveness of faces across different expression conditions.

A possible reason for this sex-specific benefit of smiling is hypothesized to originate from a sex difference in expectations for smiling behaviour. It is known that females smile more than men in a variety of different situations (LaFrance, Hecht, & Paluck, 2003). Consequently, this behaviour may create an expectation for smiling from women, making the display of positive affect a female-typical behaviour. Indeed, the Bem Sex Role Inventory (Bem, 1974) includes cheerfulness as one of the characteristics of femininity. When this expectation is not met however, this may result in negative evaluations, particularly for females.

Deutsch and colleagues (1987) compared the evaluation of women who were depicted photographically in smiling and non-smiling poses with a generic, written description. They also included a control condition where the description

but no photograph was shown. While they did not report their ratings of attractiveness, they found that smiling female faces were perceived as happier, more carefree and more relaxed than neutral female faces. Evaluations of women in the non-smiling condition were found to be lower than those in the control condition. The authors interpreted this as a punishment for faces that do not show the expected sex-typical behaviour. While personality attributes were not collected in the current study, it can be observed that non-smiling women were judged to be lower in attractiveness than smiling women, consistent with Deutsch et al.'s negative evaluations for non-smiling women.

To summarize, the results from Experiment 1 indicate that the attractiveness of men and women appear to be influenced differently by facial expression. Thus, the assumption that smiling faces are always considered more attractive appears to apply to female faces exclusively. This sex difference replicates and supports previous findings (Deutsch et al., 1987; Schulman & Hoskins 1986). The results from this experiment also demonstrate that the expressive aspects in real faces influence attractiveness and the use of neutral stimuli fail to account for this expressiveness. Attempting to further improve the realism of the stimuli, facial motion is incorporated into the stimuli in Experiment 2.

Experiment 2: Facial Motion and Attractiveness

Experiment 1 showed that positive facial expression influences attractiveness judgements, particularly that of female faces. This is one indication that the many attractiveness studies using photographs of faces with neutral expressions may not be generalizable to faces seen in more naturalistic, social contexts where faces display a variety of expressions, including smiles. Despite the inclusion of expression, Experiment 1 still shares another shortcoming with

previous attractiveness studies. Static stimuli are not representative of our typical experience with faces because when we interact with people, we are used to seeing faces not only varying in expression, but also faces that move in complex ways. These movements may contain a great deal of information relevant to attractiveness ratings and thus, it is important to consider what effect motion has on attractiveness judgments.

Of course, it may be that motion affects attractiveness ratings for a reason apart from the information conveyed by movement. Our visual systems are particularly attuned to detecting motion in our environments and thus, dynamic stimuli are naturally more engaging than static stimuli. In this case, one might expect that dynamic stimuli will be considered more attractive than static stimuli for the superficial reason that moving objects are more interesting. Little research has used both dynamic and static stimuli and no studies have explicitly compared attractiveness ratings of the two. Perhaps this is the case because the question of whether dynamic stimuli are more attractive than static stimuli is expected to yield an obvious answer. Nevertheless, for reasons of ecological validity and generalizability, it is a question worth asking.

Although no studies have directly compared static and dynamic attractiveness, a handful of studies have incorporated both types of attractiveness into their design (Brown et al., 1986; Riggio et al., 1991). Brown et al. (1986) asked participants to rate dynamic or static stimuli on aspects of grooming, certain nonverbal measures (Masculinity, Femininity, Self-Consciousness, Friendliness and Awkward-Natural Body Movement) and attractiveness (face, body and overall). They entered the ratings into a regression analysis, where dynamic and static attractiveness were evaluated separately, but found both types of attractiveness were

predicted by facial and body attractiveness as well as overall grooming. Furthermore, attractiveness of dynamic faces was predicted by static attractiveness for both male and female faces, suggesting, as one might expect, that static structural elements of attractiveness are the best predictors of the attractiveness of dynamic faces. Nonverbal measures of awkward-natural body movement, friendliness and self-consciousness were also collected, but none of these factors significantly predicted dynamic attractiveness.

Brown et al.'s (1986) study suggests that dynamic and static attractiveness do not differ much. Yet, it should be noted that the static and dynamic faces in Brown et al.'s study were both presented with positive expressions. It is possible that the effects of positive expression on attractiveness may interact with motion. Perhaps the predictors for dynamic and static faces were so similar because they were related to the positive expression displayed in both conditions, overshadowing what may be smaller effects related to motion. To investigate this possibility, the current study will also include a set of dynamic and static faces with neutral expression and make a direct comparison of attractiveness ratings in these motion/expression conditions.

Although they did not evaluate the effects of motion per se, Riggio and colleagues (1991) study suggests that dynamic attractiveness consists of more than just structural attractiveness. They asked different groups of participants to make attractiveness ratings of a target person's face (Facial Beauty), body (Body Attractiveness and dress (Dress Attractiveness) from photographs. Another set of raters made attractiveness judgements of the same target person from videotaped stimuli (Overall Attractiveness). The target persons had been asked to fill out a Social Skills Inventory (SSI, Riggio, 1986), which is a standardized survey

measuring social communication skill. The authors predicted that Dynamic Expressive Style (corresponding to SSI scores), Facial Beauty, Body Attractiveness and Dress Attractiveness would all make contributions to Overall Attractiveness. Using structural equation modelling techniques, they found that only the first two of these factors significantly predicted Overall Attractiveness. Consistent with Brown and colleagues' (1986) study, Riggio and colleagues found that Facial Beauty was the best predictor of the attractiveness of moving faces. Still, Dynamic Expressive Style also made contributions to Overall Attractiveness. The authors argue that this relationship suggests that expressiveness, as conveyed by behaviour in dynamic stimuli, can account for the variance in attractiveness judgements over and above Facial Beauty.

Support for the attractiveness of expressive behaviour has been found previously by DePaulo and colleagues (1992). Expressiveness has been defined as "the degree to which a person appears to be...open, and uninhibited, as judged from either facial expressions or other nonverbal or verbal behaviours," (DePaulo et al., 1992, p. 276). DePaulo et al. instructed expressive and inexpressive males (as determined by a score on a sociality inventory, the Affective Communication Test; Friedman, Prince, Riggio, & DiMatteo, 1980) to present themselves naturally or specifically as expressive or inhibited on videotape and asked female judges to rate them for attractiveness. Naturally expressive males were found to be more attractive than naturally inexpressive males and the attractiveness of the naturally expressive males did not differ significantly over the different presentation goals. Naturally inexpressive males could increase their attractiveness if they acted in a more expressive manner, though even in this high expressiveness condition, they were still not considered as attractive as a naturally expressive male in an inhibited

condition. Friedman et al. (1988) found that the self-reported expressiveness (as measured by a social skilfulness scale) of targets was correlated with how likable they were to judges. The relationship between expressiveness and likeability remained when the effects of physical attractiveness were partialled out. In fact, expressiveness was a more powerful predictor of likeability than was physical attractiveness. Thus, moving faces may be considered to be more attractive than static faces because dynamic stimuli showcase the expressiveness and social skilfulness of targets more obviously.

Patterns of motion themselves also contain information about the sex of a person. Point light techniques allow motion to be viewed independently of almost all structural information. Studies using this technique have found that sex may be detected from both body movement (Frable, 1987) and from facial movement (Berry, 1990). Bente et al. (1996) tested the effects of displacing movement patterns from one sex to another using computer graphics models. For their stimuli, they showed the conversational interaction of what appeared to be a man and a woman seated beside each other. The sex of each model was evident by the clothing each model wore and sex-typical seated postures. The bodies of the models were static and photographic in quality. The heads however were androgynous, wire-frame models that moved. Bente et al. animated these androgynous heads with the movement of a male or female, creating sex-congruent or sex-incongruent motion, relative to the sex of the body.

Bente et al. found a number of differences between male and female behaviour, such as male head movement being rated as more active and mobile than females. When rated for attractiveness however, there was no indication that congruency of the sex of the model and the sex of the person from which the

movement originated was the most attractive combination. Instead, females displaying more active, male-typical behaviour were considered more attractive by male raters than when females displayed more passive, female-typical behaviour. Female raters, however, showed no preference for male-typical or female-typical behaviour in male faces.

It must be noted however that Bente et al.'s stimuli may suffer from certain faults. They made efforts to avoid confounding the sex of person executing movement from the sex of the model by using wire-frame heads, but may have introduced a different problem. The model heads looked very unrealistic (see Figure 2.2). The rating of the attractiveness of such unnatural stimuli may have been difficult for raters, which is problematic in terms of construct validity. In addition, although these heads were meant to look androgynous, they may appear to look more male, as they have angular features and no hair. Finally, it is also uncertain how realistically the wire-frame heads could be animated to approximate real head motion.

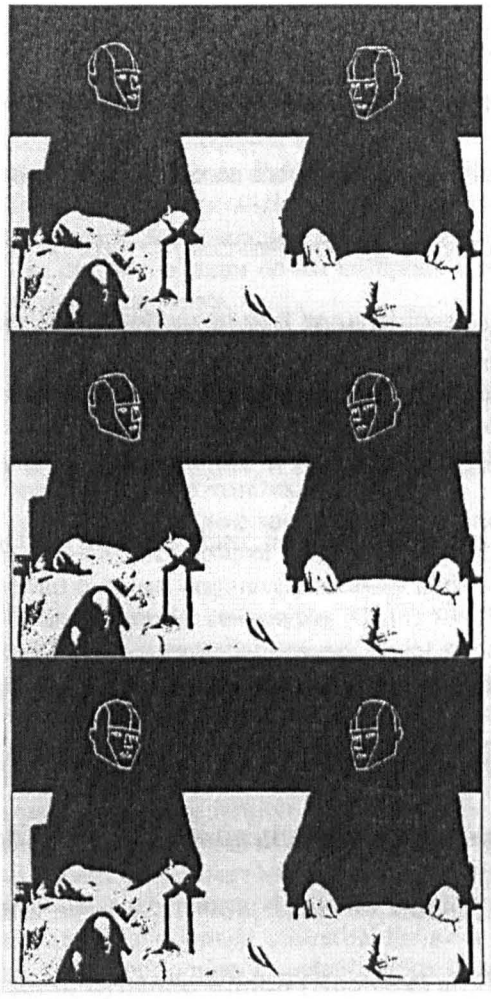

Figure 2.2. Example of stimuli used in Bente et al. (1996)

The first objective in Experiment 2 will be to compare whether static and dynamic stimuli are judged differently in terms of attractiveness. Stimuli of faces that are both static (with neutral or happy expressions) and moving (in smiling, natural conversation or neutral, more repetitive motion) will be compared. It is hypothesized that the attractiveness of male and female faces in motion will differ overall because moving faces provide more information about the target which may be linked to attractiveness (e.g., DePaulo et al., 1992). If dynamic stimuli allow more expressive behaviour to be conveyed and expressiveness is attractive, then motion might increase attractiveness ratings.

The investigation of an interaction between expression and motion will be the second objective. Brown et al. (1986) used only positive expression in their static and dynamic stimuli and this may have clouded any smaller effects of motion when using neutral faces. In an effort to increase ecological validity, stimuli varying in both facial motion and expression will be used to examine how the two factors interact with facial attractiveness. It is possible that the individual effects of expression and motion may be additive. Thus, it may be that moving, expressive faces are judged most attractive whereas static faces with neutral expressions might be judged least attractive.

A third objective is to test whether the female smiling effect will replicate when using a different set of stimulus faces. Indeed, while Raines and collaborators found the female smiling effect when investigating the attractiveness of face and voice using static stimuli (Raines et al., 1990b, Study 1), this effect did not emerge when they used a different set of dynamic stimuli (Raines et al., 1990a) or when they separated face and voice components (Raines et al., 1990b, Study 2). Thus, it is important to test whether the results from Experiment 1 will generalize to a more realistic stimulus set in which faces move and expressions are spontaneous, not posed.

Method

Participants

Participants for this experiment were 56 undergraduate university students from the University of Stirling, UK and McMaster University, Canada. Twenty-eight males and 28 females (mean age = 21.0) were recruited and received either psychology credit or financial recompensation (£3) for their participation.

Materials

Stimuli. The faces of forty different actors (20 male and 20 female) were used in this experiment (Stimulus Set B, Appendix A). The actors depicted in the stimuli were shown with a grey background and framed from the shoulders up. For each face, four types of stimuli were edited from videotaped interviews (yielding a total of 160 different stimuli), corresponding to four different conditions: Neutral Static, Positive Static, Neutral Dynamic, and Positive Dynamic.

The Neutral Static and Positive Static stimuli consisted of single, still frames depicting the actor with neutral or smiling expression, respectively. The Neutral Dynamic stimuli depicted the actor reciting a series of numbers or letters and the Positive Dynamic stimuli showed the actor talking expressively. The dynamic stimuli were approximately 10 seconds in length. The still frames used for the static stimuli were extracted from the dynamic video segments; the Neutral Static stimuli were taken at the most neutral points of the Neutral Dynamic video segment while the Positive Static stimuli were taken at the height of positive expression in the Positive Dynamic segment. The static stimuli were presented for the same amount of time as the corresponding dynamic stimuli.

The faces were either captured from videotape using Media 100 editing software or digitized using Sony DV Gate software, compressed with a Cinepak compressor and exported as QuickTime movies. Each edited stimulus (image size = 7 x 9.3 cm) was mounted onto a 1-slide PowerPoint presentation, centred on a black background. Each stimulus was labelled with a code to help participants match them with the appropriate rating scale on the response sheet. This code was shown

in white at the top of the screen on each trial. All stimuli were presented on a Macintosh PowerBook laptop.

Each participant saw all 40 faces (10 in each condition), but each face only once in one condition. To achieve this, the 160 stimuli (40 faces x 4 conditions) were arranged into four stimulus sets, with conditions balanced across stimulus sets. Each participant saw one of these sets and within each set, presentation order was fully randomized.

Response sheet. Participants were given a rating sheet with a list of forty 7-point scales (1 = "not attractive", 7 = "very attractive"). Each scale was labelled with the stimulus trial code that matched the order of presentation.

Design

A 2 (Motion) x 2 (Expression) x 2 (Face Gender) x 2 (Rater Gender) factorial design was used. The first three factors were within-subjects factors, while Rater Gender was a between-subjects factor.

Procedure

Participants were seated in front of the laptop and instructed to view each face (presented for approximately 10 seconds) and then to rate each face on a 7-point scale. Participants were given as much time as necessary to make their ratings on the given rating sheet. As some of the stimuli were films of students from the same university, participants were also asked to note if they recognized an actor in the stimuli and to state how well they knew them. If a participant was familiar with a face in the stimulus set, their rating for that face was omitted from subsequent analyses.

Results

Inter-rater reliabilities for each of the 4 stimulus sets ranged from .81 to .91, which exceed acceptable standards for Cronbach's alpha (Nunnally, 1978). Ratings were averaged over participants and conditions to obtain mean ratings for each of the stimulus faces in each of the conditions. An items analysis was then conducted with the stimulus face as the unit of analysis using a 2 (Motion) x 2 (Expression) x 2 (Face Gender) x 2 (Rater Gender) repeated measures ANOVA.

The Expression by Face Gender interaction observed in Experiment 1 was found again, $F(1, 38) = 4.16$, $p < .05$. This interaction is shown in Figure 2.3. As before, female faces displaying a positive expression were rated as more attractive than those displaying a neutral expression (positive: $M = 3.59$, $SE = .148$; neutral: $M = 3.30$, $SE = .170$). Ratings of male faces did not appear to be affected much by differences in expression, as faces with positive expression showed virtually no difference in ratings to faces with neutral expression (positive: $M = 3.13$, $SE = .148$; neutral: $M = 3.14$, $SE = .170$). Post hoc t-test adjusted for multiple comparisons showed the difference in ratings between positive and neutral expressions to be significant only for female faces (female faces: $t(19) = -2.80$, $p = .011$; male faces: $t(19) = .07$, $p = .943$). A main effect of Expression was found to be marginally significant ($p = .06$), with faces displaying positive expressions rated slightly more attractive than those displaying neutral expressions (positive: $M = 3.36$, $SE = .105$; neutral: $M = 3.22$, $SE = .120$).

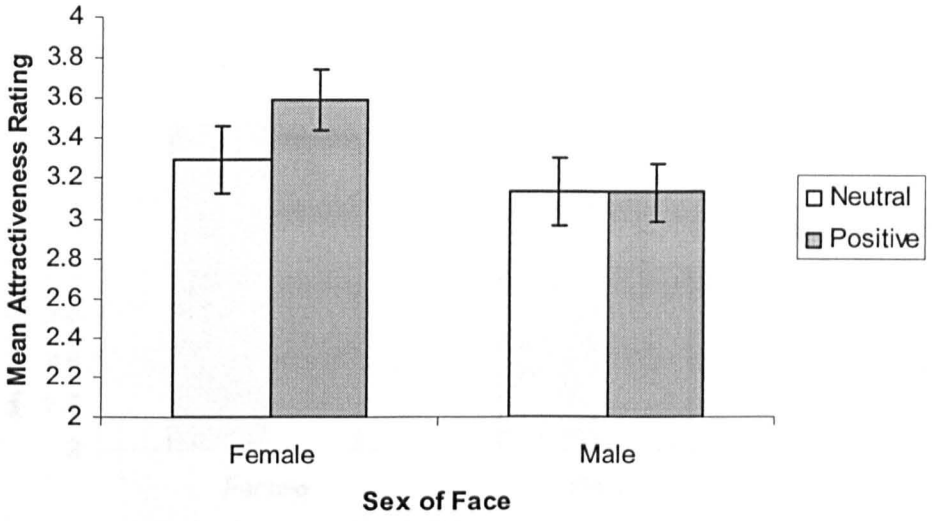

Figure 2.3. Mean attractiveness rating for female and male faces displaying a positive or neutral expression. (Error bars represent standard error).

Moving faces were given higher ratings of attractiveness than static faces (moving: $\underline{M} = 3.46$, $\underline{SE} = .124$; static: $\underline{M} = 3.12$, $\underline{SE} = .114$; main effect of Motion: $\underline{F}\ (1, 38) = 10.01$, $\underline{p} < .01$). However, this main effect of Motion may be better described by the interaction between Motion and Face Gender, $\underline{F}\ (1, 38) = 7.05$, $\underline{p} < .05$. This interaction is shown in Figure 2.4. For male faces, the rated attractiveness of dynamic faces was much higher than that of static faces (dynamic: $\underline{M} = 3.45$, $\underline{SE} = .175$; static: $\underline{M} = 2.82$, $\underline{SE} = .162$). Conversely, little difference was found between the attractiveness ratings for female dynamic faces and female static faces (dynamic: $\underline{M} = 3.47$, $\underline{SE} = .175$; static: $\underline{M} = 3.41$, $\underline{SE} = .162$). Post hoc, adjusted t-tests showed the difference in ratings between dynamic and static conditions to be significant for male faces only (female faces: $\underline{t}\ (19) = .44$, $\underline{p} = .662$; male faces: $\underline{t}\ (19) = 3.56$, $\underline{p} = .002$). No significant main effect or interactions were found involving Rater Gender.

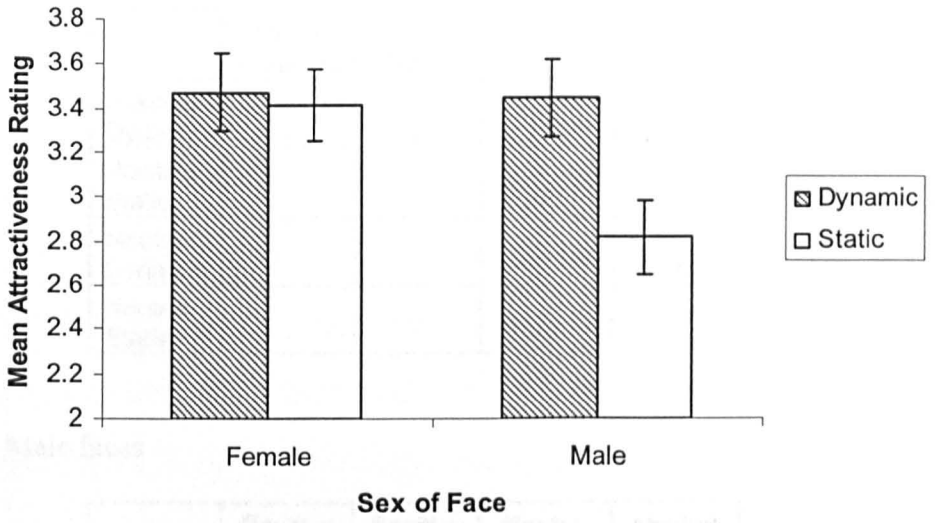

Figure 2.4. Mean attractiveness ratings for female and male faces in the dynamic and static conditions. (Error bars represent standard error)

A correlation of the attractiveness ratings across the 4 different motion-expression conditions showed interesting results. These are displayed separately for female and male faces in Figure 2.5. For female faces, significant correlations were found between conditions (all $\underline{r}$'s < .512), suggesting that attractiveness of female faces is related across conditions. For male faces, while neutral and positive expression conditions were significantly related within motion conditions (Positive Static and Neutral Static, $\underline{r}$ = .589; Positive Dynamic and Neutral Dynamic, $\underline{r}$ = .639), correlations across motion conditions were not significant, suggesting male attractiveness differs when in motion. The results from these correlations mirror the specificity of motion's effect on male faces observed in the comparisons between the mean attractiveness ratings above.

a) Female faces

	Positive Dynamic	Positive Static	Neutral Dynamic	Neutral Static
Positive Dynamic	-	0.727**	0.779**	0.513*
Positive Static		-	0.862**	0.815**
Neutral Dynamic			-	0.745**
Neutral Static				-

b) Male faces

	Positive Dynamic	Positive Static	Neutral Dynamic	Neutral Static
Positive Dynamic	-	0.109	0.639**	0.103
Positive Static		-	0.364	0.589**
Neutral Dynamic			-	0.356
Neutral Static				-

Table 2.1. Correlations between attractiveness ratings between motion-expression conditions (N=20 for each cell) for female and male faces, respectively.
Note: * denotes $p < .05$; ** denotes $p < .01$

Discussion

The current study demonstrated a sex difference in the attractiveness of positive expression, replicating the female smiling effect observed in Experiment 1. While positive expression increased the attractiveness of female faces, the attractiveness ratings of smiling and neutral male faces were virtually the same. The female smiling effect has been obtained in this study using both a different group of raters and a different set of faces than Experiment 1. Furthermore, this new stimulus set is more realistic as it uses dynamic stimuli in which expressions are spontaneously produced, not posed. Thus far, the female smiling effect appears to be reliable and is consistent with previous studies which suggest that positive

expression has a greater influence on female than male attractiveness (Raines et al., 1990b; Rhodes et al., 1999; Schulman & Hoskins, 1986). It has been suggested that this effect of expression occurs specifically for females because smiling may be a sex-typical behaviour that creates expectations that in turn, may influence evaluations (Deutsch et al., 1987).

The results also revealed a new sex difference in the influence of motion, which will be termed the "male motion effect." Motion was found to increase the attractiveness of male faces, but not of female faces. Previous research considering both static and dynamic attractiveness did not find such a sex difference in the effect of motion, nor any explicit benefit of motion for attractiveness ratings (Brown et al., 1986; Riggio et al., 1991). Correlations also showed that attractiveness ratings for male faces appeared to be unrelated across motion conditions and were only related within expression conditions. This highlights the importance of studying male faces in motion to ecological validity, as the results suggest that the attractiveness of moving male faces is unlike that of static male faces.

It may seem unsurprising that moving faces would be considered more attractive. Moving stimuli are by their nature more visually engaging than static photographs. Yet, it must be noted that this benefit of motion was not found with female faces. The attractiveness of motion cannot be explained solely by the moving stimuli being considered more interesting, as this should then have also affected the ratings of female faces. The specificity of this effect on male faces may suggest that the information provided by motion is of particular importance to the evaluation of males.

A number of studies have found differences in the criteria used to judge the attractiveness of males and females (Berry & Miller, 2001; Buss, 1989; Feingold,

1992a). Female attractiveness tends to depend primarily on physical appearance; consistent with this are the strong correlations found between attractiveness ratings for female faces across all conditions of motion and expression. On the other hand, male attractiveness seems to be influenced to a great degree by personality traits. It has also been demonstrated that personality traits made from moving stimuli are more accurate than those made from static stimuli, though they are not necessarily more reliable across raters (Borkenau & Liebler, 1992). Perhaps there is information relevant to personality that is present in motion and that underlies the male motion effect.

Expressiveness is one such aspect of personality that is linked to increased attractiveness (DePaulo et al., 1992) and is better ascertained in moving as opposed to static stimuli. Riggio and colleagues' (1991) findings demonstrated that the attractiveness of moving faces is attributable to expressive elements of movement above and beyond the contributions of static, facial attractiveness. Friedman and colleagues (1988) also found expressiveness to be a more powerful predictor of likeability than was physical attractiveness. In the current study, dynamic stimuli may have received higher ratings of attractiveness than static stimuli because motion allows the demonstration of expressiveness.

Finally, the discovery of the male motion effect and the replication of the female smiling effect serve to reiterate the limited generalizability of using static stimuli in attractiveness research. Both motion and expression have significant and sex-specific effects on faces. This suggests that results obtained using static stimuli should be reinterpreted with caution, as they may only describe attractiveness evaluations in a limited range of realistic scenarios.

To summarize, in Experiment 2, it was found that motion was of particular importance to the attractiveness of male faces and the female smiling effect was replicated. These different effects may reflect sex-typical behaviours as judgements of males and females may be affected by expectations for this behaviour. Some elucidation of what is causing these effects may come from the collection of ratings for personality attributions. It is hypothesized that motion may contain personality cues. Given that personality characteristics are more important to male attractiveness than to female attractiveness, it is possible that personality attributions (such as expressiveness) based on cues from the movement of male faces may underlie the male motion effect. This hypothesis is explored in Experiment 3.

Experiment 3: Personality Attributions and Attractiveness

In the previous experiments, evidence has been found for sex-specific effects of motion and expression on attractiveness ratings. Previous research has shown that smiles are attributed different personality traits than neutral faces. Smiling faces are generally found to be happier and more relaxed, carefree, polite and warm (Deutsch et al., 1987), as well as more kind (Otta et al., 1996) and more pleasant (Mueser et al., 1984) than non-smiling faces. It is clear that many personality attributions are made to smiles.

It has been hypothesized that motion may contain cues about personality that are particularly relevant to male attractiveness. Personality ratings made from moving stimuli have been shown to be more accurate than those made from static stimuli (Borkenau & Liebler, 1992). Although personality attributions made from dynamic stimuli are more valid, participants' ratings are no more reliable when made of dynamic stimuli than with static stimuli. In other words, consensus can

exist without accuracy. This suggests that people use the same criteria for judging faces, but they may be based on commonly held stereotypes, which may not be completely accurate. Moving stimuli must therefore contain valid information that allows for more accurate judgements of personality.

Expressiveness is one factor already reviewed that may account for the attractiveness of faces in dynamic stimuli, apart from static physical attractiveness (Riggio et al., 1991). Expressive behaviour has also been shown to increase the attractiveness of males (DePaulo et al., 1992), even improving the attractiveness of individuals who naturally exhibit low levels of expressive behaviour. As dynamic stimuli allow the communication of greater expressiveness, it is likely that rated expressiveness will be greater for the dynamic conditions. If so, this relationship between attractiveness and expressiveness may account for the male motion effect.

Besides expressiveness, few other personality variables have been specifically linked to attractiveness in dynamic stimuli. Extensive research however has examined how personality attributions influence attractiveness judgements made from static stimuli and it may be that the effects of such variables act differently in dynamic stimuli. A number of these personality variables are particularly relevant to the present study and are reviewed below.

Sex-typicality has been linked to both male and female attractiveness. Feminine appearance has been consistently and reliably related to female attractiveness in the majority of previous studies (e.g., Perrett et al., 1998; Rhodes et al., 1999). Smiling has been suggested to be more sex-typical for females (e.g., LaFrance et al., 2003) and thus, it would be expected that smiling female faces will be considered more feminine as well as more attractive. For male faces, the attractiveness of sex-typical appearance has received mixed support. While some

studies show preferences for masculine men (e.g., Johnston et al., 2001), others show preferences for more feminine males (e.g., Perrett et al., 1998; Penton-Voak & Perrett, 2001). These preferences for feminine male faces have been interpreted to reflect the influence of personality attributions on attractiveness. Masculine males are associated with negative personality characteristics, such as low levels of warmth, honesty and quality as a parent. On the other hand, feminine males are associated with the opposite, positive characteristics and this has been suggested to be why females choose agreeable, feminine-looking men over masculine men. From this interpretation, perceived agreeableness may play an important role in male attractiveness and should vary inversely with facial masculinity.

Closely related to facial masculinity is dominance. Like masculinity, the relationship between dominance and attractiveness is unclear. In Perrett and colleagues' (1998) study, masculine male faces were rated to be more dominant and less attractive than feminine males, suggesting a negative relationship between dominance and attractiveness. Sadalla and colleagues (1987) found the opposite; in their study, after reading written descriptions of males varying in levels of dominance, participants rated these males for attractiveness. It was found that dominant men were consistently considered more attractive than more submissive men. Jensen-Campbell and colleagues (1995) found a more specific relationship between dominance and attractiveness. Although they found that dominance itself did not increase attractiveness of male targets, their results showed dominance to enhance physical and sexual attractiveness only when targets also demonstrated high levels of agreeableness. Thus, as with masculinity, the influence of dominance is controversial and may be tempered by the concomitant effects of agreeableness.

This experiment attempts to assess what relationship expressiveness, femininity-masculinity, dominance and agreeableness may have to the sex-dependent effects we have obtained thus far. Expressiveness has been suggested to account for some of the variance in the attractiveness of dynamic faces (DePaulo et al., 1992; Riggio et al., 1991) and it is hypothesized that this variable will be associated with higher ratings of attractiveness. Femininity-masculinity, dominance and agreeableness have not been studied in combination with experimental manipulations of expression and motion. It will be of particular interest to examine whether these traits, previously linked to attractiveness of neutral, static faces will change with moving, expressive stimuli.

Method

Participants

Sixty students at the University of Stirling, UK participated in this experiment. Twenty-eight males and 32 females (mean age = 22.3) were recruited and received either course credit or financial compensation (£3) for their participation.

Materials

The stimuli used in this experiment were identical to those used in Experiment 2.

Response booklet. A response booklet was provided for participants to record their ratings. For each of the 40 faces viewed, participants made 5 separate ratings (for 4 personality traits and attractiveness) by circling a number on a 7-point scale. The traits rated and their bipolar adjectives corresponding to "1" and "7" on

the scale, respectively, were: Selflessness[2] (selfish-selfless), Masculinity (feminine-masculine), Dominance (submissive-dominant), Expressiveness (reserved-expressive), and Attractiveness (not attractive-very attractive). A different response booklet was made to correspond with each of the 40 pre-randomized orders.

Design

The design of the present experiment was identical to that used in Experiment2. A 2 (Expression) x 2 (Motion) x 2 (Face Gender) x 2 (Rater Gender) factorial design was used, with the first three factors being within-subjects factors and Rater Gender being a between-subjects factor.

Procedure

The stimuli were presented to participants in a quiet room on a Macintosh PowerBook laptop. Each participant saw a total of 40 stimuli, consisting of each face once in one of the four conditions. Conditions were counterbalanced across participants and presentation of stimuli was randomized. Before rating the stimulus face, participants were asked to pay attention to each stimulus for approximately 10 seconds. After this initial viewing period, instructions appeared below the stimulus to prompt the participant to make their rating. The moving stimuli were then played in a loop and the static stimuli remained on the screen until participants were finished recording their ratings on paper and chose to advance to the next face.

[2] Pilot studies showed that participants found the adjective pair "disagreeable-agreeable" too vague. Agreeableness was therefore more specifically referred to as "selfish-selfless" as this adjective pair loads highly on the NEO Agreeableness factor (McCrae & Costa, 1987).

Results

Reliability analyses were conducted on ratings from participants who viewed the same stimulus set. Cronbach's alpha values for Masculinity, Attractiveness and Expressiveness were excellent (.98-.83) and fair to good for Selflessness and Dominance (.50-.76).

Ratings for each of the traits were averaged over all participants and means were calculated for each face stimulus in each condition. However, if a participant was familiar with a face in the stimulus set, the rating for that face was not used.

ANOVA results for trait ratings

Separate analyses were conducted for each trait of Attractiveness, Selflessness, Masculinity, Dominance, and Expressiveness. Ratings for each trait were entered into a 2 (Expression) x 2 (Motion) x 2 (Face Gender) x 2 (Rater Gender) repeated measures ANOVA.

Attractiveness

There was a main effect of Motion, such that moving faces were on the whole considered more attractive than static faces (dynamic: $\underline{M} = 3.96$, $\underline{SE} = .121$; static: $\underline{M} = 3.58$, $\underline{SE} = .111$; $\underline{F}\ (38) = 31.1$, $\underline{p} < .001$. Furthermore, there was an interaction of Motion and Face Gender, $\underline{F}\ (1, 38) = 4.60$, $\underline{p} < .05$, replicating that observed in Experiment 2 was also found (see Figure 2.4). For female faces, there was little difference between the attractiveness ratings for female faces in the dynamic and static conditions (dynamic: $\underline{M} = 3.98$, $\underline{SE} = .171$; static: $\underline{M} = 3.74$, $\underline{SE} = .157$). On the other hand, moving male faces were given much higher

attractiveness ratings than static faces (dynamic: M = 3.95, SE = .171; static: M= 3.41, SE = .157). Post hoc paired t-tests corrected for multiple comparisons showed that the difference in ratings for dynamic and static conditions was significant for both male and female faces (female faces: t (19) = 2.61, p = .017; male faces: t (19) = 5.13, p < .001).

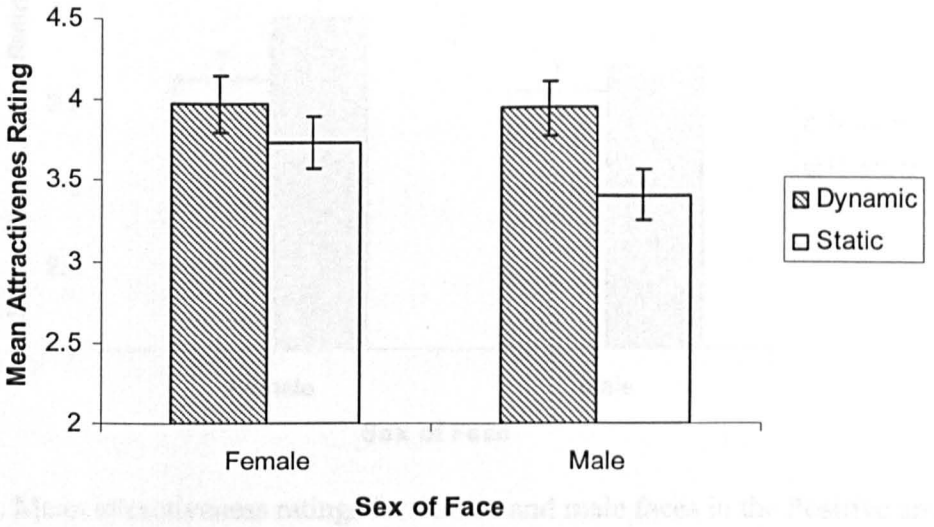

Figure 2.4. Mean attractiveness ratings for male and female faces in Dynamic and Static motion conditions. (Error bars represent standard error).

Faces with positive expressions were generally rated more attractive than faces with neutral expressions, F (1, 38) = 10.74, p < .01; smiling faces were given higher attractiveness ratings than non-smiling faces (positive: M = 3.91, SE = .122; neutral: M = 3.63, SE =.116). An interaction of Face Gender and Expression was not found to be significant (p = .177). From Figure 2.5, it can be seen that both male and female faces were given higher ratings when smiling than when displaying a neutral expression. Similar to what was observed in Experiment 1, this benefit of smiling was larger for females but the interaction was attenuated by the fact that stimuli in the Neutral Dynamic condition were evaluated much more favourably in this experiment than in Experiment 2.

Finally, a main effect of Rater Gender was also found, such that female raters gave higher ratings of attractiveness than did male raters overall (female raters: M = 3.90, SE = .111; male raters: M = 3.64, SE = .116; F (1, 38) = 28.23, p < .001).

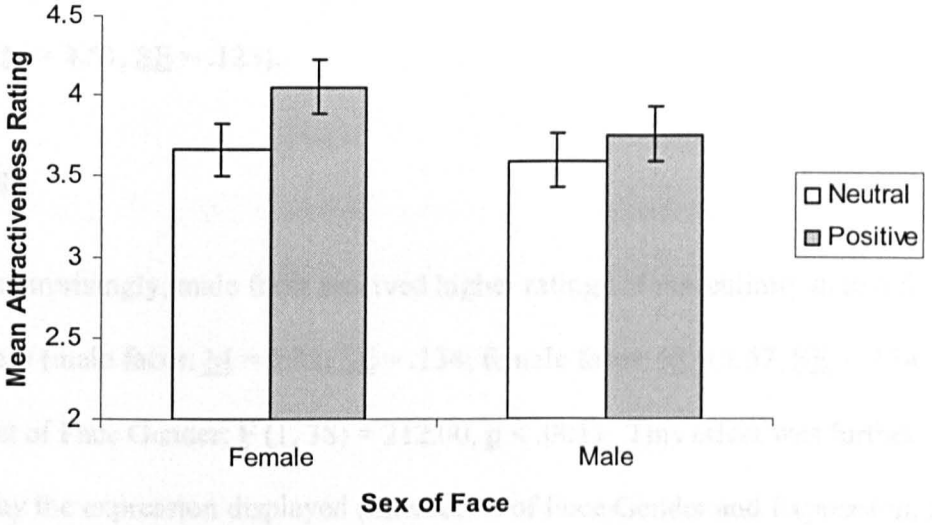

Figure 2.5. Mean attractiveness ratings for female and male faces in the Positive and Neutral expression conditions. (Error bars represent standard error).

Dominance

Few effects were found in the ratings of dominance. Only a main effect of Face Gender was significant, F (1, 38) = 6.17, p < .05. Male faces were generally rated to be more dominant than female faces (male faces: M = 4.33, SE = .121; female faces: M = 3.90, SE = .121). No interactions were found to be significant.

Expressiveness

Overall, faces with positive expressions were rated to be more expressive than those with neutral expressions (positive: M = 4.53, SE = .099; neutral: M = 3.65, SE = .115); main effect of Expression: F (1, 38) = 80.97, p < .001). This main

effect is qualified by an interaction between Expression and Motion, F (1, 38) = 5.12, $p < .05$. Dynamic faces were judged to be more expressive than static faces in the neutral condition (neutral static: $M = 3.49$, $SE = .122$; neutral dynamic: $M = 3.80$, $SE = .153$). Alternatively, little difference was found between motion conditions when faces were smiling (positive static: $M = 4.56$, $SE = .121$; positive dynamic: $M = 4.51$, $SE = .123$).

Masculinity

Unsurprisingly, male faces received higher ratings of masculinity than did female faces (male faces: $M = 5.32$, $SE = .134$; female faces: $M = 2.57$, $SE = .134$, main effect of Face Gender: F (1, 38) = 212.00, $p < .001$). This effect was further modified by the expression displayed (interaction of Face Gender and Expression, F (1, 38) = 5.23, $p < .05$). Female faces with positive expressions were considered less masculine, or more feminine, than female faces with neutral expressions (positive: $M = 2.49$, $SE = .138$; neutral: $M = 2.64$, $SE = .137$). On the other hand, male faces with positive expressions were considered only slightly more masculine than those with neutral expressions (positive: $M = 5.35$, $SE = .138$; $M = 5.29$, $SE = .137$). Thus, positive expression was associated with higher perceived sex-typicality particularly for female faces.

An interaction of Rater Gender and Face Gender was also found to be significant, F (1, 38) = 75.43, $p < .001$. Generally, opposite-sex raters gave higher masculinity ratings to faces than did same-sex raters. Male raters gave female faces higher ratings of masculinity than female raters did (female faces – male raters: $M = 2.77$, SE = .151, female raters: $M = 2.36$, $SE = .122$), while for male faces, female

raters gave male faces higher ratings of masculinity than male raters did (male faces – female raters: M = 5.46, SE = .122, male raters: M = 5.18, SE =.151).

Selflessness

Regardless of expression or motion condition, females were judged to be more selfless than males (female faces: M = 4.52, SE = .105; male faces: M = 4.02, SE = .105; main effect of Face Gender: F (1, 38) = 11.09, p < .01). There was also an overall pattern of smiling faces being rated as more "selfless" compared to neutral faces (positive: M = 4.53, SE = .085; neutral: M = 4.01, SE = .084); main effect of Expression: F (1, 38) = 43.51, p < .001). A difference in attributions of Selflessness to faces also involved both factors in an interaction of Motion and Expression, F (1, 38) = 6.60, p < .05. When faces were neutral, dynamic faces were judged to be more selfless than static faces (neutral static: M = 3.89, SE = .082; neutral dynamic: M = 4.14, SE = .104). When faces were smiling however, static and dynamic faces were rated similarly in Selflessness (positive static: M = 4.58, SE = .095; positive dynamic: M = 4.48, SE = .098). It is possible that such an interaction has arisen because static faces in the neutral condition show an unresponsive expression 100% of the time, while the moving faces show more varied activity, even if this activity is not necessarily particularly social or selfless.

Relationships between trait ratings

As mentioned above, ratings for each stimulus were averaged across participants for each face in each condition, which yielded 160 means (40 faces x 4 conditions) for each of the 5 traits. These ratings were then organized into eight subgroups, separating the male and female faces in each of the Neutral Static,

Positive Static, Neutral Dynamic and Positive Dynamic conditions. Correlational analyses (Pearson's r) were conducted on the ratings of Selflessness, Masculinity, Dominance, Expressiveness and Attractiveness separately for each of the eight subgroups of data.

Although ratings were collected from both male and female raters, only the correlations for opposite-sex judgements will be discussed here. Same-sex ratings will not be discussed because opposite-sex judgements are those of principal theoretical interest and their exclusion simplifies the data summary.

Male faces – Female raters

Pearson's correlation values for female judges' ratings of male faces in the Neutral Dynamic, Positive Dynamic, Neutral Static and Positive Static conditions are listed in Table 2.2. Attractiveness was found to relate positively with Masculinity in the Positive Dynamic condition only, r (20) = .527, $p < .05$. In all other conditions, the correlations between Attractiveness and Masculinity were negative and weak. This suggests that masculinity in male faces is only related to attractiveness when male faces are moving and smiling.

Although masculine faces might be associated with attractiveness in the Positive Dynamic condition, Masculinity still showed associations with negative personality attributes. Masculinity and Dominance were found to be closely related (r's > .387, p's < .01 in all conditions, except Positive Static where $p < .10$). Faces judged to look masculine were also attributed dominant personalities and this is consistent with previous research (e.g., Perrett et al., 1998). Furthermore, both Masculinity and Dominance were negatively related to Selflessness, although the

relationship between Masculinity and Selflessness was significant only in the Neutral Static and Positive Dynamic conditions.

In contrast, in the Neutral Static condition Attractiveness was positively related to Selflessness, r (20) = .467, $p < .05$. Faces in this condition also showed a negative relationship between Masculinity and Selflessness. Thus, it appears that when males are neutral and static, attractiveness of male faces is associated with both Selflessness and a lack of Masculinity, consistent with Perrett and colleagues (1998) findings showing female preferences for agreeable, feminine-looking men.

It should also be noted that Attractiveness was positively correlated with Expressiveness, significant only in the dynamic conditions (r's > .481, p's < .05). When male faces are moving, the faces considered expressive are also the ones considered more attractive. When male faces are still however, there is a trend in this direction, but the correlation does not reach significance. The relationship of Expressiveness and Attractiveness therefore runs parallel to that of the male motion effect. In those conditions where mean Attractiveness ratings were highest, Expressiveness is also significantly related to Attractiveness, suggesting the male motion effect may be somewhat dependent on levels of Expressiveness.

A significant relationship was also found between Dominance and Expressiveness in the Positive Dynamic condition, r (20) = .661, $p < .01$. When male faces were moving and smiling, the faces considered expressive were also judged to be dominant.

		Neutral Static	Positive Static	Neutral Dynamic	Positive Dynamic
Attractiveness	Dominance	-.047	-.027	.139	.372
	Expressiveness	.313	.296	.481*	.586**
	Masculinity	.067	-.110	.176	.527*
	Selflessness	.467*	.256	.255	-.369
Dominance	Expressiveness	.252	.439	.370	.661**
	Masculinity	.576**	.387	.657**	.605**
	Selflessness	-.565**	-.638**	-.623**	-.670**
Expressiveness	Masculinity	.196	.094	.283	.437
	Selflessness	.221	-.013	-.008	-.289
Masculinity	Selflessness	-.490*	-.342	-.310	-.570**

Table 2.2. Pearson's r correlations between the five trait ratings for the four conditions for male faces by female raters.
Note: **p < .01, *p <.05.

Female faces – Male raters

Pearson's correlation values between traits for male judges' ratings of female faces in the Neutral Dynamic, Positive Dynamic, Neutral Static and Positive Static conditions are listed in Table 2.3. It is clear that Attractiveness and Masculinity are the most consistently and most strongly related traits, r's > |-.691|, p's < .001. In all conditions of movement and expression, male participants rated highly feminine faces as also the most attractive faces. This relationship is consistent with the robust finding that sex-typicality is attractive for females (Perrett et al., 1998; Rhodes et al., 2000).

A number of other significant relationships emerged and these can be observed in Table 2.3. Among these, it was found that ratings of Expressiveness were found to be positively related to ratings of Attractiveness in the static conditions (r's > .471, p's < .05). When viewing still images of female faces, male participants tended to rate the most attractive faces as also the most expressive.

Note this contrasts with findings for male faces in which ratings of Attractiveness and Expressiveness were only significant in the dynamic conditions.

There was also a recurring relationship between Dominance and Expressiveness in all conditions, r's > .439, p's < .01 (except in Neutral Static where p = .053). Regardless of the movement or the expression displayed, it appears that those female faces considered most expressive were also considered the most dominant.

		Neutral Static	Positive Static	Neutral Dynamic	Positive Dynamic
Attractiveness	Dominance	.395	.199	-.065	-.147
	Expressiveness	.497*	.471*	.409	.333
	Masculinity	-.797***	-.718***	-.727***	-.691***
	Selflessness	-.223	.006	-.190	.322
Dominance	Expressiveness	.439	.617**	.676***	.578**
	Masculinity	-.306	.110	.266	.456*
	Selflessness	-.490*	-.039	-.270	-.739***
Expressiveness	Masculinity	-.494*	-.264	-.222	-.164
	Selflessness	-.057	.167	-.111	-.116
Masculinity	Selflessness	.184	-.022	.039	-.328

Table 2.3. Pearson's r correlations between the five trait ratings for the four conditions for female faces by male raters.
Note: *** $p < .001$, **$p < .01$, *$p < .05$.

Discussion

Male faces

The results from this experiment show a replication of the male motion effect found previously in Experiment 2. Male faces were given higher attractiveness ratings when moving, regardless of whether they were smiling or not, while attractiveness ratings for female faces differed little whether or not they were in motion. Besides this, general sex differences were also found in ratings of

dominance and selflessness. Males were generally considered to be more dominant and more selfish than females.

Regarding the correlations between trait ratings, no relationships between attractiveness and personality traits were found to be significant in all conditions. Consistent with research suggesting that feminine-looking, static male faces may be preferred because they are perceived to be agreeable (Perrett et al., 1998), selflessness was related to both attractiveness and a lack of masculinity, although these relationships were only significant when faces were neither moving nor smiling.

When using dynamic, expressive stimuli however, the criteria for male attractiveness were very different. Notably, a specific relationship occurred between attractiveness and high levels of masculinity in the Positive Dynamic condition. When male faces were moving and smiling, participants associated masculine appearance with attractiveness. In all other conditions, the opposite or no relationship was found. While masculine faces are still associated with greater levels of dominance and selfishness, masculine faces are considered attractive when moving and smiling.

The difference in criteria for male attractiveness may result from the amount of personality-relevant information available in the stimuli. Personality attributes have been found to be of greater importance in male than female attractiveness (Berry & Miller, 2001). As a result, personality attributions may be particularly salient for female judges when making judgements of male physical attractiveness. Using static stimuli, the attractiveness of masculine features may suffer due to their associations with negative personality attributes (Perrett et al., 1998). When there is no other information available except facial structure, this may necessitate a trade-

off of masculine features for more positive personality traits. When faces are moving and expressive however, personality attributions no longer have to be made from stereotypes based on structural information, but can be made from behaviour, as moving stimuli allow for more valid judgements (Borkenau & Liebler, 1992). Thus, masculine faces displaying prosocial behaviour may constitute the optimal balance of good genes (as signalled by masculine features) and agreeable personality (as conveyed by behaviour), as is found with faces in the Positive Dynamic condition. In this way, negative personality attributions made to masculine faces may be offset by prosocial behaviour. This optimal coupling of facial masculinity and behavioural agreeableness parallels the findings in research of dominance, demonstrating that dominance may need to be offset by altruistic qualities to be attractive in males (Jensen-Campbell et al., 1995).

Support was also found for the hypothesis that expressiveness might underlie the male motion effect. Expressiveness was positively related to attractiveness in both of the dynamic conditions, but not in either of the static conditions. Thus, when faces are in motion, expressive males are considered attractive, though it is also conversely possible that the attractive males are perceived to be more expressive (Feingold, 1992b). Due to the correlational approach taken in this study, conclusions cannot be drawn about causality. Nevertheless, the specific association of expressiveness with attractiveness in those conditions where male faces receive the highest mean attractiveness ratings suggests that expressiveness is important to male attractiveness. This is consistent with previous research showing attractiveness judgements of dynamic stimuli to be positively influenced by expressive behaviour (DePaulo et al., 1992; Riggio et al., 1991).

Female faces

Despite having replicated the female smiling effect with identical faces in Experiment 2, this effect was not fully replicated in the current study. Unlike previous studies, male attractiveness was now also found to be increased by smiling and thus, the benefits of smiling on attractiveness ratings were no longer sex-specific. Furthermore, while smiling female faces in both moving and static conditions were still rated high in attractiveness in this study, faces in the Neutral Dynamic condition were also rated equally favourably. The reasons for this are unclear but perhaps, the salience of personality traits makes moving, non-smiling faces more attractive than before.

Although the female smiling effect was not replicated, there was some indication that expressiveness is related to attractiveness. Faces in both the positive conditions and in the Neutral Dynamic condition received high ratings of expressiveness, mirroring those of attractiveness. Apparently, the motion displayed in the Neutral Dynamic condition, while not particularly social, was enough to increase perceptions of expressiveness. This may suggest that female attractiveness is not only linked to the display of smiling, but also the display of expressiveness in general movement. As Experiments 1 and 2 did not show this pattern of ratings for attractiveness and did not include expressiveness ratings, it is possible that the inclusion and increased salience of this factor in Experiment 3 may account for increased ratings of attractiveness in the Neutral Dynamic condition in the current study. Nevertheless, the correlational data showed that the positive relationship between expressiveness and attractiveness was only significant in the Positive Static and Neutral Static conditions.

Regarding the correlations between trait ratings, the strongest and most consistent relationship for female faces occurred between attractiveness and masculinity. Specifically, the most feminine faces were also judged to be the most attractive. This finding is consistent with previous studies that show exaggerated sex-typical appearance to be attractive for female faces (Perrett et al., 1998; Rhodes et al., 2000).

Another consistent relationship for evaluations of female faces was a positive relationship between dominance and expressiveness. In all conditions, females judged to be dominant were also judged to be expressive. It could be that for women, dominance is somewhat synonymous with expressive behaviour. There has been research conducted on sex differences in leadership styles that has shown that women who adopt a social, expressive style as opposed to a task-oriented style are more effective leaders (Carli, Lafleur & Loeber, 1995).

Some general sex differences were observed. Females were judged to be less dominant and more selfless than men. Women were also rated as more feminine when smiling as opposed to being neutral. This finding suggests that smiling is female-typical as has been found in previous studies of sex differences in behaviour (e.g., LaFrance et al., 2003). That said, the lack of a female-specific smiling effect on attractiveness suggests that this female-typical behaviour is not evaluated as favourably as in previous studies (Experiments 1 and 2, Schulman & Hoskins, 1986; Raines et al., 1990b, Study 1).

General Discussion

The experiments in this chapter demonstrated that motion, expression and personality attributions all have effects on attractiveness which may be sex-specific. Experiments 1 and 2 showed that positive expression has a greater influence on the

attractiveness of female faces compared to that of males. This female-specific effect of positive expression has been found in several previous studies (Rhodes et al., 1999; Raines et al., 1990b; Schulman & Hoskins, 1986). Yet, this effect did not fully replicate in Experiment 3 and has also failed to emerge in previous studies comparing the attractiveness of expression with both male and female faces (Otta et al., 1996; O'Doherty et al., 2001). The intermittent appearance of this effect suggests that it may require the presence of some other variable yet to be identified.

Experiments 2 and 3 demonstrated that motion affects the attractiveness of males more than that of females. Not only has motion never previously been shown to increase attractiveness evaluations, but this sex difference in the effect of motion is also new. While these results are intriguing, it must be noted that Experiments 2 and 3 used the same stimulus set and therefore, it is uncertain whether this effect is an artefact of the faces and behaviours in this particular set of faces. Further investigation with a new set of faces is warranted to establish its validity.

Experiment 3 exhibited a difference in the criteria related to personality for male and female attractiveness. Expressiveness was linked to the male motion effect and a balance between facial masculinity and positive personality traits was suggested to be important for male attractiveness. On the other hand, no personality correlates were found to explain the female smiling effect but femininity was found to be consistently and strongly related to female attractiveness in all conditions of motion and expression. These differences are consistent with the foregoing literature, which draws a distinction in the criteria involved in male and female attractiveness; female attractiveness appears to be based mostly on physical appearance (Schulman & Hoskins, 1986; Feingold, 1992a) while male

attractiveness is more influenced by personality characteristics (Berry & Miller, 2001; Buss, 1989).

In this chapter, the non-structural factors of motion and expression have been shown to have varied and specific effects on male and female attractiveness which cannot be evaluated using neutral, static stimuli. These effects present a case for the use of more realistic stimuli to obtain more ecologically valid studies of attractiveness. The discovery of new and the replication of previously documented sex differences in the criteria for attractiveness will be followed upon in the next chapter where the reliability of these effects are tested using a different and improved set of faces.

Chapter 3: Assessing Replicability of Sex-Dependent Effects of Motion and Expression on Attractiveness and Personality Attributions

In the previous chapter, a number of factors were found to influence attractiveness judgements that were specific to the sex of the target face. The attractiveness of female faces was found to be enhanced by smiling (the female smiling effect; Experiments 1 and 2) and to be correlated with higher levels of sex-typicality across all levels of expression and motion (Experiment 3). Male attractiveness, on the other hand, was enhanced by motion (the male motion effect; Experiments 2 and 3) and was correlated with higher levels of sex-typicality, but only with faces that were moving and smiling (Experiment 3). The discovery of these effects suggests that studying attractiveness using neutral, static stimuli is a method lacking ecological validity, as it neglects the influence of factors present in real social interactions.

The findings for female faces replicate sex differences in the attractiveness of positive expression in previous studies (Deutsch et al., 1987; Raines et al., 1990b) and findings in the attractiveness and sex-typicality literature (Perrett et al., 1998; Rhodes et al., 2000). The enhancement of male attractiveness by motion has not been observed before. While attractiveness preferences for masculinity have been found previously (Johnston et al., 2001), results from Experiment 3 suggest they might be specific to stimuli showing positive expression and motion; this is also a new finding. As with all new effects, it is important to ascertain whether they are replicable. The male motion effect was observed in both Experiments 2 and 3, suggesting reliability across different raters. Yet, these two experiments used the same stimulus set and thus, nothing can be said of whether these effects are due to

the movement displayed in the specific stimulus faces used or whether they are generalizable to other faces.

The female smiling effect was found to replicate across two sets of stimulus faces in the previous chapter, both with static (Experiment 1) and dynamic faces (Experiment 2). Despite using the same stimulus sets in Experiments 2 and 3 however, the female smiling effect did not replicate when trait ratings were also collected. This suggests that this effect may be diluted when trait ratings are collected alongside attractiveness ratings and further investigation is warranted.

To assess the reliability of the male motion effect and the attractiveness of sex-typicality for male faces, in addition to gaining further insight into the reliability of the female smiling effect, the present chapter uses a new set of stimulus faces in testing the effects of motion and expression on ratings of attractiveness (Experiments 4 and 5) and personality attributions (Experiment 5).

Standardization of Stimuli

The new stimulus set differs not only in the use of new faces, but efforts were also made during filming to improve the standardization of the new stimuli. The stimulus sets used in Chapter 1 (Stimulus Sets A and B, Appendix A) were obtained from pre-existing stimulus databases. The set of photographs used for Experiment 1 (Stimulus Set A) were obtained from photograph sets which were collected with the purpose of research on perception of expressions and as such, the use of these pictures was suitable. The stimulus set used for Experiments 2 and 3 however (Stimulus Set B) were obtained from a general database of videotaped interviews. In these interviews, actors were asked to perform a number of activities with the intention of using such stimuli for the perception of moving faces. While

this intention is in line with my research goals, the stimuli in this set were not standardized for certain factors which may influence person perception and the study of attractiveness.

One such factor that may have influenced attractiveness is that of eye gaze. A recent study by Mason, Tatkow, and Macrae (2005) showed that targets shifting eye gaze towards raters were given higher attractiveness ratings than targets with gaze away from the rater; this effect was particularly strong for male raters viewing female targets. Research by Kampe and colleagues (2001) suggests that eye gaze direction may be linked to the reward value of an attractive face. The subject-directed gaze of an attractive face was associated with increased blood flow to the subject's ventral striatum, a brain region associated with reward prediction, particularly for stimuli relevant to social interaction. Conversely, the averted gaze of an attractive face was associated with decreased blood flow to the ventral striatum[3]. Based on this, the authors suggested that the gaze of an attractive person may be rewarding because it represents the satisfied expectation of a positive outcome. That said, although brain activity appeared to change with gaze, no activation differences were found for attractive as opposed to unattractive faces. A recent fMRI study has also shown that looking at an attractive face may be a rewarding stimulus, associated with increased blood flow to regions in the brain thought to be linked to reward (orbitofrontal cortex; O'Doherty et al., 2003).

Given this interaction of attractiveness and eye gaze in reward value, the gaze direction of stimulus faces was a consideration in filming the new stimuli. In Stimulus Set B, many of the actors looked to the left of the screen during filming,

[3] Kampe et al. (2001) did not report whether the attractiveness ratings of faces gazing towards and averted from participants paralleled the fMRI findings. It was only mentioned that no significant differences were found between ratings of male and female faces or by male and female participants.

apparently towards the experimenter who was standing to the left of the camera. In particular, this frequently occurred in the Positive Dynamic condition, in which the experimenter was actively engaging the actors in casual conversation. Gaze was more often directed at the camera in the stimuli for the Neutral Dynamic condition, although some actors would occasionally glance at the experimenter for reassurance during their recitation of numbers and letters. As a direct gaze may enhance the reward value of an attractive face (Kampe et al., 2001), higher attractiveness ratings may have reflected greater time spent in directed gaze for some actors or conditions (e.g., Neutral Dynamic) than others, as opposed to effects of motion and expression In order to remove this possible complication, eye gaze was standardized in the new stimulus set so that all actors were looking at the camera in all static and dynamic stimuli.

In addition, the previous stimulus set was not standardized for lighting conditions or for each actor's distance from the camera. The interviews were filmed in the university atrium with glass roofing. As a result, the amount of lighting was greatly dependent on whether it was sunny on the day of filming. Consequently, a number of the stimuli were overexposed, resulting in a reduced amount of facial information in comparison to stimuli filmed on more overcast days. Furthermore, information about the face may have been reduced for stimuli in which filming distance was greater, resulting in smaller, less-detailed facial images. It should be said however, that while lighting and filming distance may have varied across actors, they were generally consistent across different conditions for each actor and therefore, should not have had an overly substantial effect on ratings. Nevertheless, the new stimulus set was improved by standardizing lighting and filming distance to

provide the best possible resolution and equal filming conditions across stimuli from different actors.

Finally, in the new stimulus set, the duration of dynamic stimuli was reduced from 10 seconds to 3 seconds. The change to a shorter duration was made for two reasons. First, these stimuli were not only used for the replication studies in this chapter, but were also intended as the basis for the manipulation study in Chapter 4. Consequently, the stimulus processing and manipulation procedure for forty 10-second clips was deemed to be prohibitively impractical given testing constraints, and thus, it was decided that the duration be shortened.

Experiment 4: Replication Attempt – Attractiveness ratings

In order to test the reliability of the female smiling effect and the male motion effect with a new set of faces, the present experiment is a replication of Experiment 2, testing the effects of motion and expression on attractiveness ratings. The new stimulus set is improved by adhering to stricter standards for eye gaze direction, lighting, and filming distance than stimuli used in the previous chapter.

Method

Participants

Forty volunteers (20 males, 20 females) were recruited from the undergraduate student population at the University of Stirling. Participants ranged in age from 18 to 29 (mean age = 20.9).

Materials

Stimuli for 40 actors (20 male, 20 female) were edited from videotaped interviews with actors who were instructed to look into the camera at all times. Actors ranged from 18 to 30 years old. The actors were lit by 2 lateral lamps and the stimuli depicted the actors from the shoulders up (Stimulus Set F, Appendix A).

The counterbalancing design was identical to that used in Experiments 2 and 3, except that ratings were made by computer response and not on paper. To reiterate, four stimulus sets were created, each showing all 40 faces, with 10 faces assigned to each of 4 conditions (Neutral Static, Neutral Dynamic, Positive Static, Positive Dynamic). Assignment of faces to condition was counterbalanced across sets and presentation of all stimuli was randomized.

Design

This experiment used a 2 (Motion) x 2 (Expression) x 2 (Face Gender) x 2 (Rater Gender) factorial design. Motion, Expression and Face Gender were within-subjects factors while Rater Gender was a between-subjects factor.

Procedure

Each participant viewed one of the four stimulus sets on a desktop computer. Within each set, each of the 40 faces was displayed for 3 seconds. Following each face, a 7-point scale appeared on the screen, prompting the participant for an attractiveness rating (1 = "not attractive", 7 = "very attractive"). Participants entered their ratings using the number keys and were given as much time as necessary to make their rating before the next stimulus was presented.

Results

Inter-rater reliabilities were very good and ranged from .79 to .86 for the four stimulus sets. Ratings were averaged to create mean attractiveness ratings for each of the 40 faces in each of the 4 conditions. An items analysis was conducted on mean ratings for each stimulus using a 2 (Motion) x 2 (Expression) x 2 (Face Gender) x 2 (Rater Gender) repeated measures ANOVA[4].

Expression was found to interact with Motion, $F(1, 38) = 9.17$, $p < .01$. Faces displaying positive expressions were rated as more attractive when moving than when static (positive dynamic: $M = 3.57$, $SE = .115$; positive static: $M = 3.11$, $SE = .113$). Comparatively, there was no difference in ratings for dynamic and static faces displaying neutral expressions (neutral dynamic: $M = 3.17$, $SE = .095$; neutral static: $M = 3.17$, $SE = .115$). Looking at the mean attractiveness ratings for male and female faces in Figures 3.1 and 3.2, respectively, this interaction appears to reflect a particular preference for the Positive Dynamic condition.

The sex-specific effects obtained in the previous chapter were not found, as neither Motion nor Expression interacted with Face Gender (interaction of Motion by Face Gender: $p = .393$; interaction of Expression by Face Gender: $p = .846$). A main effect was found for Motion; dynamic faces were rated higher in attractiveness than static faces (dynamic: $M = 3.37$, $SE = .091$; static: $M = 3.14$, $SE = .093$; main effect of Motion: $F(1, 19) = 15.43$, $p < .001$). A main effect of Expression was found to be marginally significant ($p = .058$), with smiling faces being slightly preferred to those with neutral expressions (neutral: $M = 3.17$, $SE = .092$; positive: $M = 3.34$, $SE = .104$). It was also found that male raters gave higher attractiveness

[4] The data from this experiment was collected as part of a student project that was closely supervised by the PhD candidate.

ratings to all faces than did female raters (female raters: $\underline{M} = 3.15$, $\underline{SE} = .100$; male raters: $\underline{M} = 3.36$, $\underline{SE} = .084$; main effect of Rater Gender: $\underline{F}\ (1, 38) = 11.93$, $\underline{p} < .01$). Female faces were also given higher ratings than male faces (female faces: $\underline{M} = 3.63$, $\underline{SE} = .123$; male faces: $\underline{M} = 2.88$, $\underline{SE} = .123$; main effect of Face Gender: $\underline{F}\ (1, 38) = 18.82$, $\underline{p} < .001$).

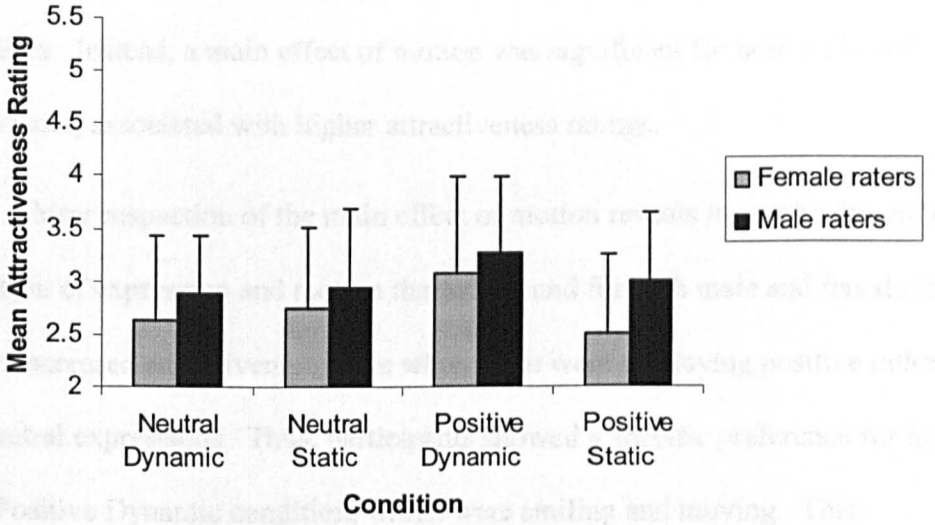

Figure 3.1. Mean attractiveness ratings for male faces (Error bars represent standard error).

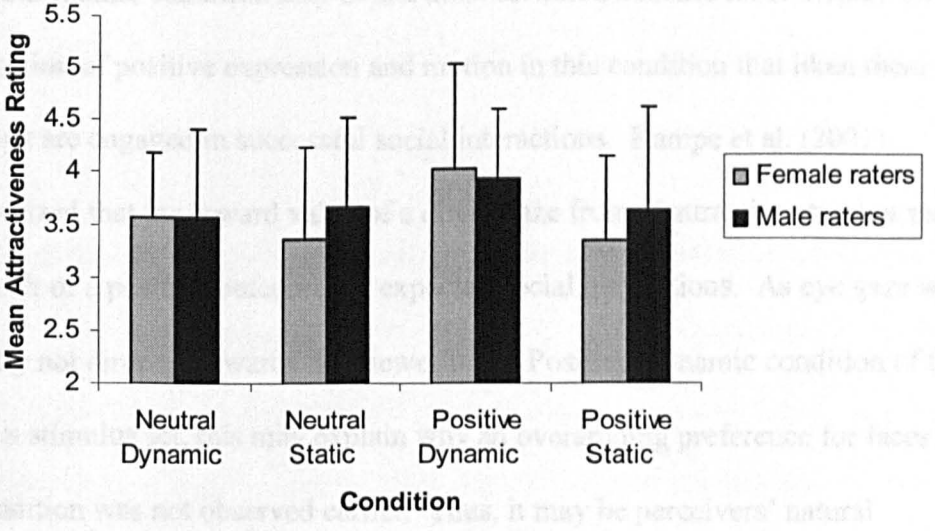

Figure 3.2. Mean attractiveness ratings for female faces (Error bars represent standard error).

Discussion

The purpose of this experiment was to test the reliability of the female smiling effect and the male motion effect using a new set of faces that were standardized for eye gaze and lighting conditions. Neither of these sex-dependent effects was replicated. Expression had no general enhancing effect on either male or female faces and motion did not have an exclusive effect on the attractiveness of male faces. Instead, a main effect of motion was significant for both male and female faces, associated with higher attractiveness ratings.

Closer inspection of the main effect of motion reveals it may be driven by an interaction of expression and motion that was found for both male and female faces. Motion increased attractiveness more when faces were displaying positive rather than neutral expressions. Thus, participants showed a specific preference for faces in the Positive Dynamic condition, which were smiling and moving. This preference cannot be explained purely by the novelty of moving images, as faces in the Neutral Dynamic are similarly active and yet, not as highly preferred. The Positive Dynamic condition may be the most favoured because faces display the combination of positive expression and motion in this condition that liken them faces that are engaged in successful social interactions. Kampe et al. (2001) hypothesized that the reward value of a direct gaze from at attractive stranger may be a result of a positive outcome for expected social interactions. As eye gaze was generally not directed towards the viewer in the Positive Dynamic condition of the previous stimulus set, this may explain why an overarching preference for faces in this condition was not observed earlier. Thus, it may be perceivers' natural inclination for social interaction that underlies the attractiveness of faces that are smiling and moving.

The absence of the female smiling effect in this experiment stands in contrast to the sex-dependent effect of expression found in the previous chapter as well as previous research (Deutsch et al., 1987; Raines et al., 1990a, 1990b). Nevertheless, a number of studies have failed to find this female exclusive effect of smiling, instead finding positive expressions to be rated as more attractive than neutral expressions for both genders (e.g., Otta et al., 1996), or finding no preferences for positive expressions at all (e.g., Mueser et al., 1984; O'Doherty et al., 2003). It appears then that the effect of expression on attractiveness is quite variable. In this set of experiments, this variability may imply that the female smiling effect is linked to some target-specific factor or behaviour present in the stimulus sets used in the previous chapter.

To summarize, sex-dependent effects of motion and expression were not found in the current study. Instead, a general preference was observed for faces in the Positive Dynamic condition. These results may be due to a natural proclivity for positive social interaction. These results may also be attributable to the use of a new set of standardized stimuli, as previous sex-dependent effects may be linked to particular behaviours not demonstrated by actors in the new stimulus set. Further research to code behaviours in the stimulus sets is needed to explore this possibility.

Experiment 5: Replication Attempt – Attractiveness and Trait ratings

Besides the sex-dependent effects, experiments in the previous chapter also demonstrated that perceived structural sex-typicality is attractive in male and female faces, but crucially, that the specificity of this relationship differs between them. It was found that facial femininity was correlated with attractiveness for female faces across all conditions of motion and expression but that facial masculinity was

related to attractiveness in male faces only in the Positive Dynamic condition. It is hypothesized that the specificity of this relationship for male faces is due to smiling, moving faces displaying an optimal combination of facial masculinity and positive personality attributions. In the following experiment, personality attributions and attractiveness judgements are collected on the new, standardized set of faces to test the reliability of the effects involving structural sex-typicality.

Method

Participants

Twenty-four participants (8 males, 16 females) were recruited from the postgraduate and undergraduate student population at the University of Stirling. Participants ranged in age from 19 to 40 (mean age = 27.4) and volunteered for the experiment.

Materials and Design

The stimulus faces, counterbalancing process and design used in this experiment were identical to those used in Experiment 4.

Procedure

Each participant viewed one of the four stimulus sets on a laptop computer. Within each set, each of the 40 faces was displayed for 3 seconds. Following this, five 7-point scales appeared in succession which presented the participants with the following questions: "How attractive was that face?" (1 = "not attractive", 7 = "very attractive"), "How expressive was that person?" (1 = "reserved", 7 = "expressive"), "How masculine was that person?" (1 = "feminine", 7 = "masculine"), "How agreeable was that person?" (1 = "selfish", 7 = "selfless"), "How dominant was that

person?" (1 = "submissive", 7 = "dominant"). These scales were always presented in the same order. Participants entered their ratings using the number keys and were given as much time as necessary to make each rating.

Results

Inter-rater reliabilities for each of the trait ratings varied. Reliabilities for Attractiveness (.72-.82), Expressiveness (.90-.93), and Masculinity (.69-.90) were very good; reliabilities for Selflessness (.41-.77) were good to very good; and reliabilities for Dominance (.17-.61) ranged from poor to good[5]. For each trait, participants' ratings within each stimulus set were averaged together. Due to the small number of male participants, results were not analyzed separately by Rater Gender. Instead, male and female ratings were averaged together to give greater statistical power to the analyses. An average for each of the four conditions was obtained for each of the 40 faces for each trait, creating 160 averages in total.

ANOVA analyses

For each trait, the 160 averages were entered into a 2 (Motion) x 2 (Expression) x 2 (Face Gender) repeated measures ANOVA, with face as the unit of analysis.

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[5] It should be noted that the sample size here was smaller than that in previous experiments. Unfortunately, more participants could not be collected due to time constraints. The between-subjects counterbalancing design of this experiment means that each average had to be calculated from 6 ratings (compared to a minimum of 10 in other studies). Thus, the lower sample size may account for the lower inter-rater reliabilities.

The smaller sample size also means that there may not be enough statistical power to detect all effects. At the same time, this means that those differences that do emerge as significant are likely to reflect stronger effects.

Attractiveness

Overall, faces with positive expression were given higher ratings of attractiveness than those with neutral expressions (neutral: $M = 3.79$, $SE = .120$; positive: $M = 4.16$, $SE = .120$; main effect of Expression: $F(1, 38) = 12.97$, $p < .001$). Although inspection of the means suggested that the attractiveness of female faces increased more with smiling than did that of male faces, the interaction between Expression and Sex of Face was not significant (female faces – neutral: $M = 4.13$, $SE = .170$, positive: $M = 4.59$, $SE = .170$; male faces – neutral: $M = 3.46$, $SE = .170$, positive: $M = 3.73$, $SE = .170$; interaction of Expression by Face Gender, $p = .347$)

A main effect of Motion was not found to be significant ($p = .110$), nor were interactions of Face Gender with Motion or Expression (interaction of Motion by Face Gender: $p = .282$; interaction of Expression by Face Gender: $p = .347$). See Figure 2.3 for a graph of means split by condition. Finally, female faces were also rated as more attractive than male faces (female faces: $M = 4.36$, $SE = .154$; male faces: $M = 3.59$, $SE = .154$; main effect of Face Gender: $F(1, 38) = 12.39$, $p < .01$).

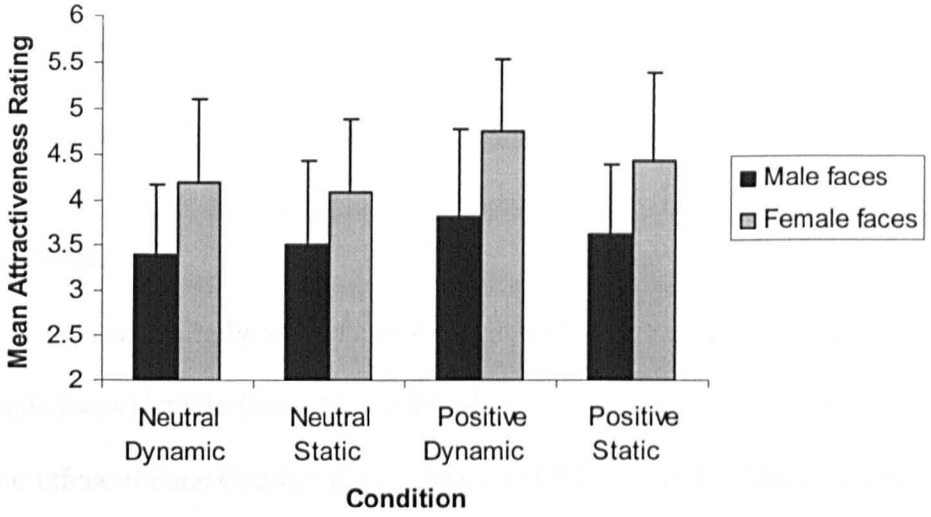


Figure 3.3. Mean attractiveness ratings for male and female faces (Error bars represent standard error)

Dominance

Smiling faces were judged to be more dominant than those with neutral expressions (neutral: $\underline{M} = 4.20$, $\underline{SE} = .113$; positive: $\underline{M} = 3.92$, $\underline{SE} = .065$; main effect of Expression: $\underline{F}\ (1, 38) = 8.03$, $\underline{p} < .01$). Static faces were also rated to be more dominant than dynamic faces (dynamic: $\underline{M} = 3.96$, $\underline{SE} = .096$; static: $\underline{M} = 4.15$, $\underline{SE} = .075$; main effect of Motion: $\underline{F}\ (1, 38) = 5.77$, $\underline{p} < .05$). Furthermore, the effect of motion on ratings of Dominance were more pronounced in female faces than male faces (female faces - dynamic: $\underline{M} = 3.85$, $\underline{SE} = .136$, static: $\underline{M} = 4.21$, $\underline{SE} = .106$; male faces - dynamic: $\underline{M} = 4.08$, $\underline{SE} = .136$, static: $\underline{M} = 4.10$, $\underline{SE} = .106$; interaction of Motion and Face Gender: $\underline{F}\ (1, 38) = 4.36$, $\underline{p} < .05$).

Expressiveness

Smiling faces were judged to be considerably more expressive than those that showed neutral expressions (neutral: $\underline{M} = 2.86$, $\underline{SE} = .081$; positive: $\underline{M} = 5.30$, $\underline{SE} = .093$; main effect of Expression: $\underline{F}\ (1, 38) = 440.55$, $\underline{p} < .001$). There was also

a marginal effect of Face Gender ($p = .057$), suggesting female faces were considered somewhat more expressive than male faces (female faces: $M = 4.21$, $SE = .091$; positive: $M = 3.96$, $SE = .091$)

Masculinity

Unsurprisingly, male faces were given higher ratings of Masculinity than female faces (female faces: $M = 2.89$, $SE = .119$; positive: $M = 4.97$, $SE = .119$; main effect of Face Gender: $F = (1, 38) = 151.97$, $p < .001$). More intriguing was an interaction of Expression and Face Gender that suggests, while masculinity ratings of male faces differ little with different expressions, female faces appear more masculine when neutral than when smiling (female faces – neutral: $M = 3.03$, $SE = .124$, positive: $M = 2.75$, $SE = .139$; male faces: neutral: $M = 4.94$, $SE = .124$, positive: $M = 5.00$, $SE = .139$; interaction of Expression by Face Gender: $F (1, 38) = 4.10$, $p < .05$).

Selflessness

A main effect of Expression was found for ratings of Selflessness; faces were found to be more agreeable when showing a positive than neutral expression (neutral: $M = 3.73$, $SE = .074$; positive: $M = 4.97$, $SE = .072$; main effect of Expression: $F (1, 38) = 281.25$, $p < .001$). A main effect of Motion was significant, suggesting that moving faces were considered to be more selfless than their static counterparts, (dynamic: $M = 4.45$, $SE = .068$; static: $M = 4.25$, $SE = .083$; main effect of Motion: $F (1, 38) = 5.50$, $p < .05$). However, an interaction of Motion and Face Gender showed this main effect was driven by ratings for female faces; female faces appear more selfless when moving than when static, while male faces appear similarly selfless in different motion conditions (female faces – dynamic: $M = 4.55$,

SE = .096, static: M = 4.14, SE = .117; male faces – dynamic: M = 4.34, SE = .096, static: M = 4.36, SE = .117; interaction of Motion by Face Gender: F (1, 38) = 6.72, $p < .05$).

Correlations between trait ratings

The 160 averages (4 conditions x 40 faces) were split into 8 subgroups based on the level of Motion and Expression displayed as well as Face Gender. Within each subgroup, the relationship between ratings for Attractiveness, Dominance, Expressiveness, Masculinity and Selflessness were tested using Pearson's *r* correlations.

Male faces

The Pearson's r correlational values for male faces are shown in Table 3.1. Of particular interest was the relationship between Attractiveness and Masculinity in the Positive Dynamic condition—the correlation approached significance ($p = .052$). While this relationship was also positive in the other conditions, it did not reach significance in any of them. This finding is encouraging as it shows the same pattern for sex-typicality and attractiveness found for male faces in Experiment 3.

		Neutral Static	Positive Static	Neutral Dynamic	Positive Dynamic
Attractiveness	Dominance	.184	.299	.372	.653**
	Expressiveness	.191	.436†	.162	.605**
	Masculinity	.323	.329	.105	.441†
	Selflessness	.579**	.081	.145	.162
Dominance	Expressiveness	-.038	.002	-.316	.495*
	Masculinity	.302	.337	.655**	.521*
	Selflessness	-.493*	-.622**	-.388	-.173
Expressiveness	Masculinity	-.326	.106	.037	.115
	Selflessness	.349	.555*	.631**	.354
Selflessness	Masculinity	.002	-.255	-.105	-.205

Table 3.1. Pearson's *r* correlation values of trait ratings for male faces (N=20). Note: **$p < .001$, *$p < .05$, †$p < .06$

It should also be noted that Attractiveness was positively related to Selflessness in the Neutral Static condition. Agreeable appearance, based on structural cues, was therefore important to Attractiveness when faces were not moving and not smiling. Note however that when faces behaved in a realistic and friendly manner in the Positive Dynamic condition, the importance of an agreeable appearance was no longer related to attractiveness. The scatterplot of Selflessness and Attractiveness shows that this lack of relationship is due to the rating of all faces in the Positive Dynamic on the "selfless" top half of the scale (see Figure 3.4).

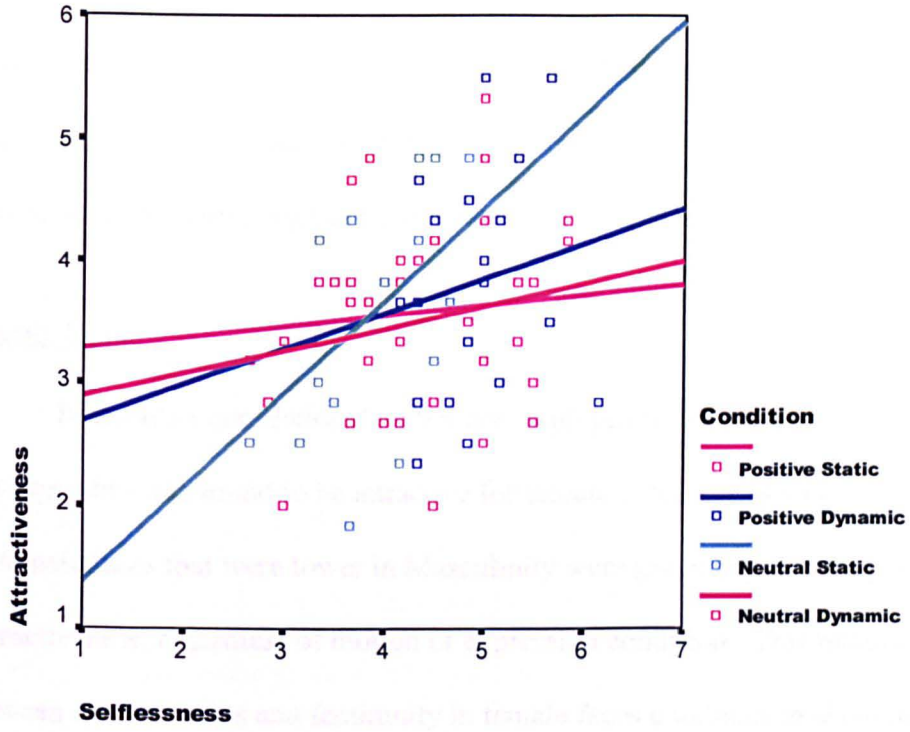


Figure 3.4. Scatterplot of Attractiveness and Selflessness ratings for male faces, separated by condition.

Dominance and Masculinity were positively related in both dynamic conditions, consistent with previous literature showing that masculine faces also tend to be rated as dominant-looking (Perrett et al., 1998). In the Positive Dynamic condition then, this suggests that when male faces are moving and smiling, attractive male faces tend to be those that look masculine and dominant. Dominance also showed a significant, negative relationship with Selflessness in both static conditions. Thus, when faces were not moving, those faces that looked dominant were also deemed to be disagreeable in personality.

Selflessness and Expressiveness were positively related in the Neutral Dynamic and Positive Static conditions. Faces that looked expressive were also judged to be more agreeable when moving but not smiling, or when smiling but not moving.

Finally, Attractiveness and Expressiveness were related marginally in the Positive Static ($p = .054$) and significantly in the Positive Dynamic condition. Thus, those male faces that were considered to be expressive when smiling were also judged to be attractive, regardless of whether or not moving.

Female faces

Pearson's r correlational values are displayed in Table 3.2. It is clear that sex-typicality was found to be attractive for female faces across all conditions. That is, female faces that were lower in Masculinity were given higher ratings of Attractiveness, regardless of motion or expression condition. This relationship between attractiveness and femininity in female faces continues to show its reliability, being consistent both with results in Experiment 3 and with the foregoing literature (Cunningham, 1986; Perrett et al., 1998; Rhodes et al., 2000).

		Neutral Static	Positive Static	Neutral Dynamic	Positive Dynamic
Attractiveness	Dominance	.313	.402	.381	-.128
	Expressiveness	.393	.241	.446*	.351
	Masculinity	-.728**	-.664**	-.455*	-.737**
	Selflessness	-.016	-.156	.452*	.000
Dominance	Expressiveness	.118	.474*	.325	.260
	Masculinity	-.125	.065	.169	-.020
	Selflessness	-.609**	.141	-.114	-.370
Expressiveness	Masculinity	-.373	-.016	.089	-.547*
	Selflessness	.164	.660**	.488*	.389
Selflessness	Masculinity	.037	.209	.028	-.294

Table 3.2. Pearson's *r* correlation values of trait ratings for female faces (N=20). Note: **$p < .001$, *$p < .05$

Expressiveness was found to be associated with positive personality traits. Selflessness was positively related to Expressiveness in the Neutral Dynamic and

Positive Static conditions. Thus, when female faces were either moving and not smiling or smiling and not moving, those faces rated as most expressive were also rated most agreeable. Furthermore, Expressiveness was also positively related to Attractiveness (only significant in the Neutral Dynamic condition) so that when faces were moving but not smiling, those faces considered expressive were also considered attractive.

As in Experiment 3, Expressiveness was also found to be positively related to Dominance. Recall that this effect was previously found to be significant in all conditions in Experiment 3. In the current study however this relationship was only significant in the Positive Static condition; thus, only when female faces were smiling but not moving were those faces judged to be most expressive also judged to be most dominant.

A negative relationship was also found between Expressiveness and Masculinity, significant only in the Positive Dynamic condition. When female faces were both moving and smiling, those faces judged to be most expressive were also considered to be least masculine. This finding is only partially consistent with previous studies suggesting smiling to be female-typical behaviour (Deutsch et al., 1987; LaFrance et al., 2003), as this relationship is not significant in the Positive Static condition.

Finally, Selflessness was negatively related to Dominance, significant only in the Neutral Static condition. Thus, when female faces were neither moving nor smiling, those faces judged to be most dominant were also judged to be least agreeable.

Discussion

Successful replication was found for effects involving sex-typicality and the difference in specificity of these effects for male and female faces. Femininity in female faces was positively related to attractiveness in all conditions of motion and expression, consistent with findings in Experiment 3. This general preference is also in agreement with the foregoing literature (Brown et al., 1986; Perrett et al., 1998; Rhodes et al., 2000), demonstrating that a liking for sex-typicality in female faces is highly robust. This effect applies both to computerized faces with controlled levels of sex-typicality (Perrett et al., 1998; Rhodes et al., 2000) as well as real faces naturally varying in sex-typical appearance (Brown et al., 1986; present study)

In contrast to the general effect of sex-typicality on female attractiveness, preferences for sex-typicality were more specific for male faces; masculinity was positively related to attractiveness only in the Positive Dynamic condition, but this effect was short of reaching significance, though only narrowly ($p = .052$). Nevertheless, this trend is consistent with results from in Experiment 3, where the relationship between masculinity and attractiveness was only significant when males were smiling and moving. The specificity of the relationship between masculinity and attractiveness in male faces has now been suggested using two different sets of real male faces, varying in natural levels of sex-typical appearance. The preference for masculine male faces when moving and smiling is consistent with some of the foregoing literature involving the attractiveness of sex-typicality (Johnston et al., 2001). The preference for masculine male faces in the Positive Dynamic condition is consistent with the hypothesis that male attractiveness

involves an optimal combination of masculine features (advertising health) and agreeable personality (advertising positive partner characteristics).

Also consistent with this masculinity-personality balance hypothesis are certain correlations with other variables. In the Positive Dynamic condition, attractiveness was also related to dominance, which has been closely related to masculinity in previous research (Perrett et al., 1998). A study on the attractiveness of dominance showed that the construct only increased ratings of attractiveness when coupled with altruism (Jensen-Campbell et al., 1995). In the present experiment, altruism may be conveyed by prosocial behaviour of the faces in the Positive Dynamic condition. As dominance is not found to be attractive in any other condition, this finding is consistent with Jensen-Campbell and colleagues' work and shows how the display of positive behaviour might offset negative stereotypes of personality when using Neutral Static stimuli.

Conversely, in the Neutral Static condition, the only personality construct to vary with attractiveness was selflessness. In other words, perceived agreeableness was the construct more closely related to male facial attractiveness when little information about personality from movement or expression is available. This relationship may reflect a trade-off of positive personality traits for masculine facial structure, as personality factors greatly influence evaluations of male attractiveness (e.g., Berry & Miller, 2001). While positive personality attributes are also important in the Positive Dynamic condition, there is no relation to attractiveness ratings because all faces in that condition are rated high in selflessness. With all faces in the Positive Dynamic condition displaying positive behaviour, it is then those male faces perceived to be most masculine and dominant that may be rated as most attractive.

There was some weak evidence in support of the female smiling effect in this experiment. Although an interaction of expression and Face Gender was not significant, the means for attractiveness did suggest that the attractiveness of female faces benefit more from positive expression than do male faces. It has been argued that this preference for smiling female faces may occur because smiling appears to be a sex-typical behaviour for females (LaFrance et al., 2003). Ratings for Masculinity in this experiment showed support for this argument, as females with positive expressions were judged to be more feminine than those with neutral expressions. This finding replicates the interaction of expression and Face Gender found for masculinity ratings in Experiment 3. No differences for masculinity were found between smiling and non-smiling male faces. Nevertheless, it is not clear why this did not influence attractiveness ratings for smiling and non-smiling females.

General Discussion

Considering the experiments thus far, there has been consistent support for the relationship between facial sex-typicality and attractiveness for female faces. This effect appears to be widespread across conditions of motion and expression in both Experiments 3 and 5. This finding is in line with results of previous studies of sex-typicality and attractiveness with female faces (Brown et al., 1986; Perrett et al., 1998; Rhodes et al., 2000).

On the other hand, for males the effects of sex-typicality appear to be more specific to faces that are moving and smiling. Sex-typicality was positively correlated with the attractiveness of male faces only in the Positive Dynamic condition in both Experiments 3 and 5, but narrowly missing significance in the

latter. Preferences for sex-typicality in male faces have been observed previously in some studies (Brown et al., 1986; Johnston et al., 2001). That masculinity and attractiveness are related only with smiling, moving male faces may imply that the attractiveness of male faces in realistic contexts depends on a combination of masculine appearance and positive personality attributes. This combination is suggested to be most favourable because male attractiveness is influenced more by personality factors than is female attractiveness (Berry & Miller, 1991; Buss, 1989). While physical appearance is also of importance to male attractiveness, this may be overshadowed by personality attributions. Facial masculinity may be attractive (Johnston et al., 2001) and an indication of health (Rhodes et al., 2003), but it has also been associated with negative personality traits (Perrett et al., 1998). Using neutral, static stimuli, in which the only information available is that of facial structure, participants can only use stereotypes to make personality attributions. Consequently, the negative aspects associated with facial masculinity may outweigh the positive aspects, resulting in preferences for more feminine-looking males in other studies (Perrett et al., 1998; Rhodes et al., 2000). When faces are moving however, personality attributions can be based on behaviour, which is a more accurate source of information (Borkenau & Liebler, 1992). When masculine-looking men exhibit friendly behaviour, this can override the negative personality stereotype associated with structural masculinity. Consistent with this is the positive relationship of perceived masculinity and attractiveness in conditions where male faces show prosocial behaviour. Thus, masculine faces showing such behaviour may be optimally attractive as they advertise both health and a desirable personality.

It has been suggested that the female smiling effect is a result of sex differences for smiling behaviour, with smiling being sex-typical for female faces (Deutsch et al., 1987; LaFrance et al., 2003; Raines et al., 1990a, 1990b). Consistent with this, both Experiments 3 and 5 showed that female faces were rated to be more feminine when smiling than when displaying neutral expressions, although in neither case was this linked to increased attractiveness for smiling female faces. The female smiling effect has been found in a number of previous studies (Deutsch et al., 1987; Raines et al., 1990a, 1990b) but the conditions necessary for its emergence are still unclear.

The male motion effect did not replicate for experiments in this chapter. Instead, a general preference was found for faces in the Positive Dynamic condition in both experiments. I have suggested above that this inclination for moving and smiling faces may result from an instinct for social interaction and the rewarding nature of positive social outcomes. Alternatively, it could be that the male motion effect was linked to certain gestures in the previous stimulus set that were not present in the new stimulus set. Behavioural coding of the stimulus sets would be required to investigate this possibility.

The stimulus sets in this chapter differed from those used in the previous set in two ways, which may be responsible for the lack of replication of the sex-specific effects. Firstly, all actors in the newer stimulus sets maintained direct gaze at the camera while actors in the previous stimulus set were sometimes directing their gaze towards the experimenter instead of the camera. As discussed above, research shows that faces turning their gaze towards a viewer are rated as more attractive than faces turning away (Mason et al., 2005) and that the direct gaze of an attractive face may be a rewarding stimulus (Kampe et al., 2001). It is possible that the

rewarding nature of direct gaze from actors in the dynamic stimuli in the current chapter overrode effects of expression for female faces; some support for this may be found in the fact that Neutral Dynamic stimuli were rated more favourably in the replication experiments than in the previous chapter. Research by Adams and Kleck (2003) suggests that gaze direction may facilitate the processing of facial expression; the perception of anger and joy expressions was facilitated by direct gaze while that of sadness and fear were facilitated by averted gaze. Consequently, the perception of positive expressions should have been facilitated by the direct gaze of actors in the newer stimulus set. It is unclear however how this should necessarily impact upon attractiveness judgements.

Secondly, the duration of the dynamic stimuli was shortened to 3 seconds from 10 seconds in Chapter 2. The stimuli were originally filmed for use in the manipulation experiment in the next chapter and the change in duration was made to facilitate the manipulation process. Nevertheless, the reduction in stimulus duration necessitates a reduction in the amount of information conveyed in the stimulus. Although the general types of movements in the Positive and Neutral Dynamic stimuli were similar in both sets of stimuli, the longer stimuli were likely to contain more gesturing and dynamic information. If the experiment was redone with longer stimuli, it is expected that the male motion effect would replicate. Duration of dynamic stimuli should not have affected the replication of the female smiling effect however, as this effect has been found previously using static stimuli (Raines et al., 1990b; Schulman & Hoskins, 1986). Yet, the emergence of the female-specific effect of smiling in previous studies and Experiments 1 and 2 suggest that it is a valid effect, but that its specific determinants have yet to be ascertained.

Nevertheless, the relationships between sex-typicality and attractiveness appear to be highly reliable for female faces and somewhat reliable for male faces when comparing the results across stimulus sets. Consequently, it now seems appropriate to study these effects experimentally. In the next chapter, stimulus faces will be manipulated in their structural sex-typicality to test whether 1) female faces continue to be most attractive when feminized in all conditions of motion and expression and 2) male faces are rated as more attractive when masculinized in the Positive Dynamic condition. Using stimuli that differ in degree of facial sex-typicality but not motion and expression, it can be tested whether changes in the masculine/feminine appearance of a face can alter judgements of attractiveness and the personality attributions ascribed to it.

Chapter 4: Manipulating Sex-Typicality of Faces – Effects of Motion and Expression on Attractiveness

The previous chapters revealed sex-typical appearance to be attractive for females across all conditions and for male faces only when moving and displaying positive expressions. For female faces, these results are consistent with previous findings (Perrett et al., 1998; Rhodes et al., 2001). Male facial attractiveness is more variable and, as reviewed earlier, has been linked to facial masculinity, symmetry and personality attributions (e.g. Perrett et al., 1998). Another layer is now added to this complexity by experiments in previous chapters that suggest the importance of motion and expression. While female attractiveness seems to depend little on differences of motion and expression and more on features constant between conditions, male attractiveness seems to involve a mix of facial appearance and personality attributions, the latter of which may be dependent on the type of movement displayed.

In this chapter, I focus on the investigation of the attractiveness of sex-typicality and further this line of research by using stimuli that incorporate motion and expression. While this relationship was examined in Experiment 3 using correlations, it will be tested experimentally in this chapter by using facial stimuli in which structural sex-typicality is manipulated but patterns of motion and facial expression are kept constant.

Manipulation experiments

Although studying the variations of real faces is an ecologically valid way to study the relationship between facial masculinity and attractiveness (e.g., Brown et al., 1986; Cunningham et al., 1990; Grammer & Thornhill, 1994; Scheib et al.,

1999), it does not control for other factors that may co-vary with masculinity (e.g., symmetry; Penton-Voak et al., 2001; Scheib et al., 1999). Greater experimental control has been obtained in recent studies that digitally exaggerate the sexually dimorphic traits of computer-generated faces.

Perrett and colleagues (1998) used caricaturing techniques to masculinize and feminize average faces (see Figure 4.1). By constructing male and female averages, they were able to exaggerate the differences between them to create sex-typical caricatures. For instance, the masculinized average was created by exaggerating how it differed from the female average, e.g., wider jaw, thicker eyebrows, squarer hairline. Feminized faces would be altered in the opposite direction to take on more feminine characteristics, e.g., more delicate jaw and thinner, higher set eyebrows. Multiple faces with gradually increasing levels of exaggeration were created and placed in sequence to make a continuous range of faces that gradually became more masculine- or feminine-looking. This sequence of faces was presented to participants and the level of masculinity was controlled by a slider that the participant used to indicate at which point the most attractive face appeared in the continuum. This allowed for an exact measure of how masculine/feminine the preferred face was. They found that both male and females of Japanese and Caucasian ethnicity were rated as most attractive when slightly feminized; female faces were preferred 10.2%-24.2% feminized while males were preferred at 9%-20% feminized. While the results for female faces are consistent with findings from studies involving natural variations in sex-typicality, the preference for feminine male faces was relatively new; some suggestion that feminine traits in male faces might be attractive was previously obtained in Cunningham and colleagues' study (1990), which demonstrated that larger eyes and

smaller nose size were correlated with attractiveness. The 50%-masculinized and 50%-feminized versions of the male and female faces were also evaluated on attractiveness as well as personality traits in a forced choice paradigm. Feminization and masculinization of face shape was found to increase and decrease the attractiveness of both male and female faces, respectively.

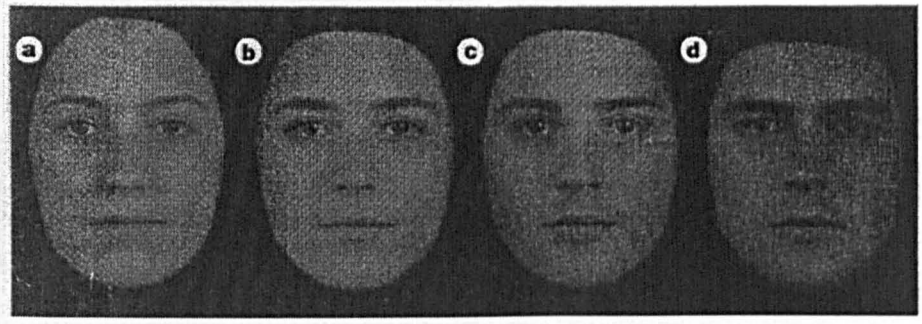


Figure 4.1. Manipulated faces used in Perrett et al., (1998): a) 50% feminized female; b) 50% masculinized female; c) 50% feminized male; d) 50% masculinized male.

Rhodes and colleagues (2000) found a slightly different result. In a similar way to Perrett et al., they made "supermale" and "superfemale" faces by exaggerating the differences between average male and female faces. In their first experiment, they created a 50% masculinized male face and a 50% feminized female face and compared each to their respective average. No preferences were found for the exaggerated faces however, and only a significant preference was found for average male faces. In Experiment 2, they looked for the optimal level of attractiveness and created sets of faces varying in sex-typicality, both exaggerating sex-typicality in the same direction as and away from the sex of the faces. Thus, they created a set of male faces that were exaggerated from the average in steps of 25% up to 100% and also feminized in the same increments away from the average male faces down to 100% (see Figure 4.2). An equivalent set of faces was created for female faces. Preferences for female faces were found at an average of 36%

feminized. For male faces as well however, a preference was also found in the feminized direction of 33%. Thus, like Perrett et al. (1998), they found feminization to be attractive for both female and male faces.

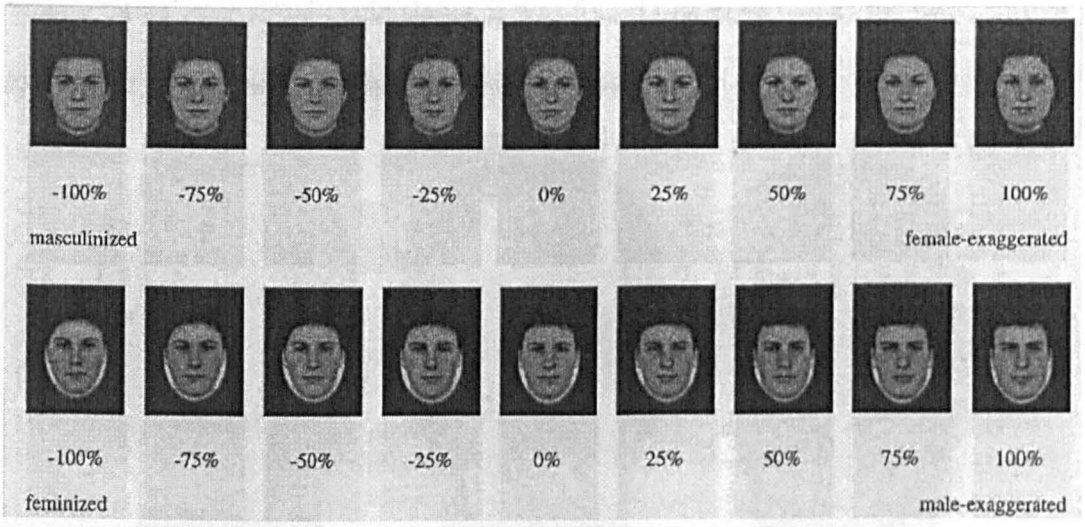


Figure 4.2. Range of manipulated male and female stimulus faces used in Rhodes et al., (2000).

Johnston et al. (2001) created sex-typical caricatures in a different way. While the above studies based their caricatures on structural sex-typicality, Johnston and colleagues based their caricatures on perceived sex-typicality. That is, instead of using the differences between male and female averages to caricature faces, they based their caricatures on the most masculine and feminine face chosen by perceivers from a set of faces evolved for that purpose. They then made graduated morphs between the average faces and the sex-typical faces and created extreme sex-typical faces by caricaturing the differences between the average face and the perceived sex-typical faces. The male and female averages were also averaged together to make an androgynous face and gradual morphs were made between all the images. Johnston et al. then joined all the images together in a continuum going from an extremely masculine face through an androgynous face to an extremely

feminine face. Unlike previous manipulation studies, they found that the most attractive male face was on the masculine side of the continuum, 110 frames more masculine than the perceived average male face. When ratings were analysed by female raters' menstrual cycle status, it was found that preferences for faces shifted to an even more masculine face (see Figure 4.3).

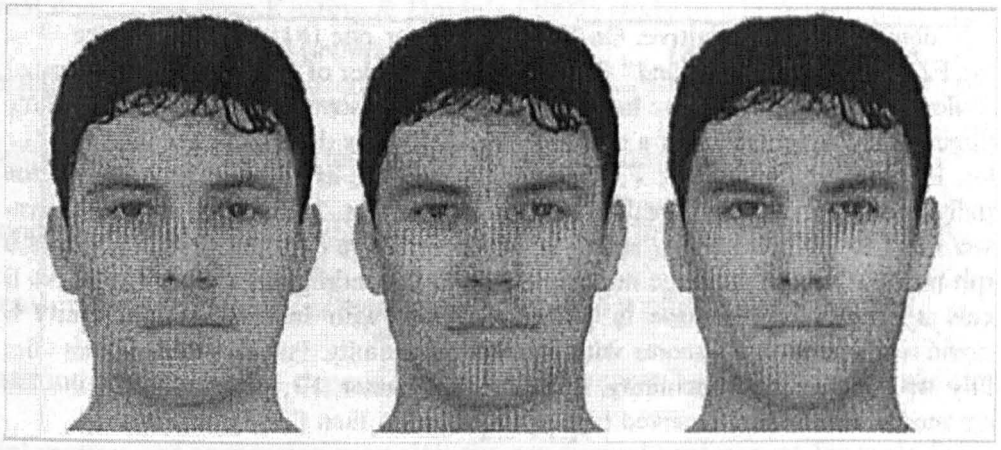


Figure 4.3. From left to right, these faces were judged to be: the average male face, the attractive male face for females with low risk of conception; and the attractive face for female with high risk of conception. (From Johnston et al., 2001).

Some methodological issues should be highlighted. First of all, differences between procedures for constructing sex-typical faces across manipulation studies co-varied with preferences for male faces. Studies using caricatures made by exaggerating differences between average male and female faces found preferences for feminized faces (Perrett et al., 1998; Rhodes et al., 2000) while the study that used caricatures based on differences between faces high in perceived sex-typicality and average faces found a preference for masculinized faces (Johnston et al., 2001). Thus, it is possible that the difference in preferences may be linked to the method of caricature used to create the extreme sex-typical faces.

A commonality amongst the previous studies is that most have only used a small number of male and female faces to test the influence of exaggerated sex-

typicality on attractiveness. Many studies also used average faces, which themselves are already higher in attractiveness than normal faces. These studies have produced very intriguing results but it has not yet been determined whether the effects of feminization/masculinization could increase the attractiveness of real, moving faces. The experiments that follow in this chapter will address this issue. A caveat does come from Keating & Doyle's (2002) study in which they found that altering real faces actually decreased their attractiveness. Their manipulation of submissive/dominant characteristics of faces was thought to upset the natural balance of these qualities in their set of faces. Nevertheless, it is an important extension of the previous sex-typicality research to replicate effects on real, dynamic faces, as the sex-dependent effects in Chapter 2 suggest that the addition of facial motion and expression may alter the sex-typical preferences for male faces.

Experiment 6: Attractiveness of Faces with Sex-Typicality Manipulations

This study uses male and female faces that have been 50% exaggerated away from the average male or female face to look more masculine or more feminine. With these faces, structural sex-typicality is altered while patterns of motion and expression are kept constant. This is the first study of sex-typicality to be done with moving and expressive faces and which makes structurally sex-typical exaggerations to an array of real faces. This study represents a novel and more ecologically valid approach to addressing the controversy over whether male faces are more attractive when masculinized (Johnston et al., 2001) or feminized (Perrett et al., 1998; Rhodes et al., 2000). This experiment tests whether the effects from Experiments 3 and 5, which use faces naturally varying in sex-typical appearance, will replicate to faces manipulated in sex-typicality. Replication of findings from

previous studies of manipulated sexual dimorphism (Johnston et al., 2001; Perrett et al., 1998; Rhodes et al., 2000) would add ecological validity to these effects.

Based on the results from Experiments 3 and 5 and from the existing literature, it is expected that female attractiveness will be positively related to femininity in all conditions. For male faces, hypotheses based on results from Experiments 3 and 5 would suggest that male faces will be considered more attractive when masculinized, but especially so in the Positive Dynamic condition, in which they display friendly, expressive motion. Previous studies using manipulated masculinity in male faces have also found preferences for feminized male faces (Perrett et al., 1998; Rhodes et al., 2000), and thus, it is possible that in conditions which do not convey prosocial attributes, (i.e., Neutral Static, Neutral Dynamic) the feminized version of male faces may be preferred.

Method

Participants

In total, 84 participants (40 males, 44 females) were recruited for this experiment in two groups. The first groups consisted of 48 volunteers (24 male, 24 female) that were recruited from the Open University summer sessions student population at Stirling University. Participants in this group viewed stimuli from the neutral condition and their ages ranged from 21 to 53 (mean age = 34.8). In the second group, 36 undergraduate psychology student volunteers (16 males, 20 females) were recruited to view stimuli from the positive condition[6], ranging in age from 18 to 36 (mean age = 21.9).

[6] The data for participants in the positive condition was collected as part of a student project that was closely supervised by the PhD candidate.

Materials

Filming. All stimuli were obtained from a database of videotaped interviews (Stimulus Set F, Appendix A), filmed of undergraduate and graduate students from York University, Toronto, Canada. All actors were between 18 and 30 years of age. Forty faces (20 male, 20 female) were selected as stimuli from this database. These faces were chosen if desired behaviours could be edited into 3 second segments. Actors were filmed against a grey background with consistent lighting, and only from the shoulders up on a PAL Sony (DCR-TRV140E) digital video camera. All actors maintained direct gaze at the camera throughout.

Editing. Video segments of approximately 3 seconds were edited from these interviews, depicting each actor speaking naturally and smiling (Positive Dynamic, PD) and reciting letters or numbers (Neutral Dynamic, ND). From these dynamic sequences, single frames were extracted which depicted each actor smiling (Positive Static, PS) or displaying a neutral expression (Neutral Static, NS). These editing procedures were carried out using Sony DV Gate software to digitize raw video into movie clips (DV Motion), to grab individual frames from video segments (DV Still), and to export movies in AVI format (DV Assemble).

Manipulation of stimuli. To begin the manipulation process, each 3 second AVI movie was separated into individual JPEG frames using VideoMach editing shareware (v. 2.7.2, Nikolic & Tiblijas, 1997-2003). All frames were reviewed and those frames depicting the most extreme displacements due to movement were selected as index frames. The features (eyes, brows, nose, mouth, cheek contours), face outline and neck in these index frames were delineated by placing points around these landmarks (see Figure 4.4). This delineation was done by hand for the selected frames using PsychoMorph software (Tiddeman, 2000). The remaining

frames were automatically delineated by PsychoMorph, based on the landmark information contained in the set of index frames (Tiddeman & Perrett, 2002).

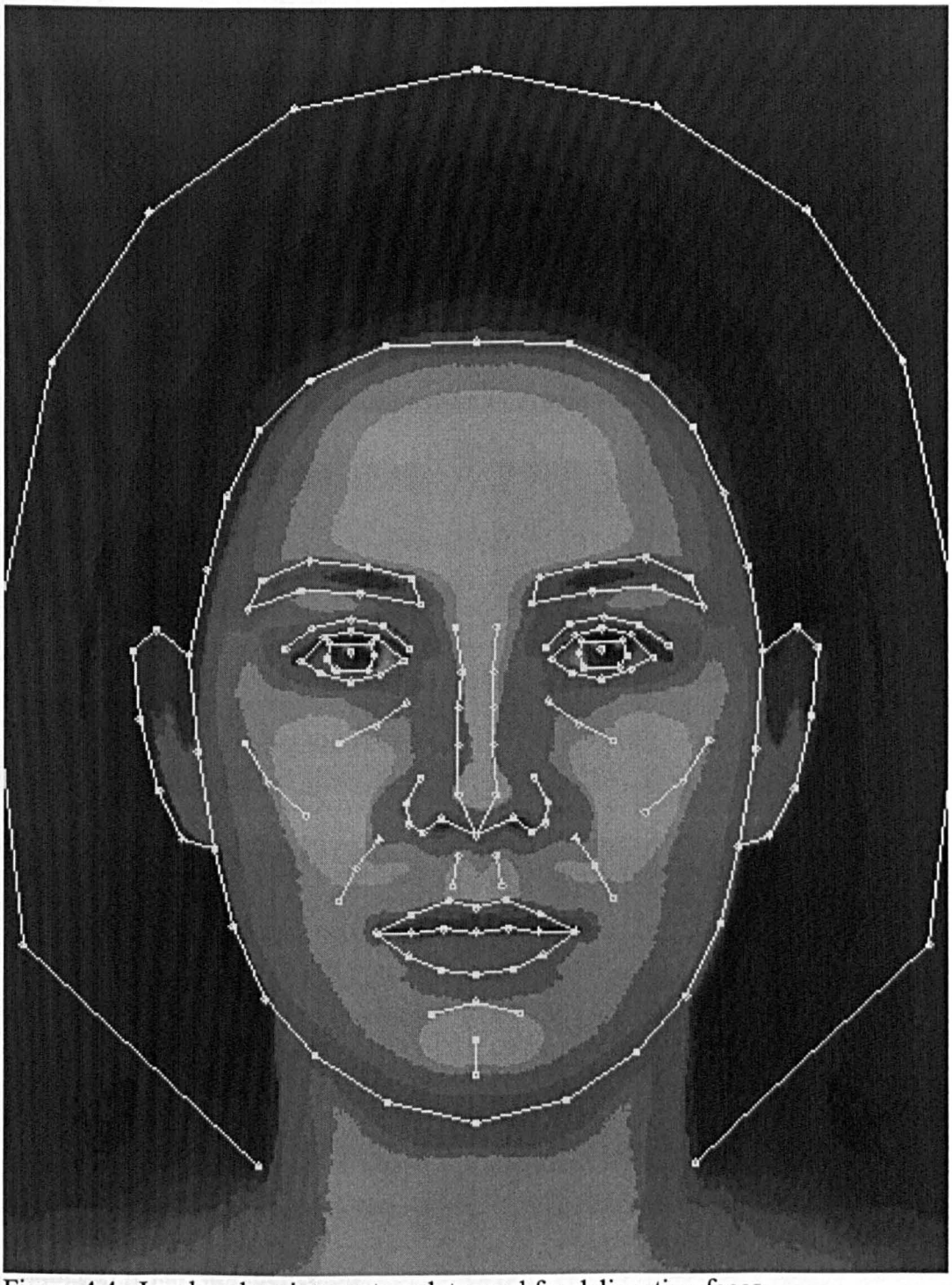


Figure 4.4. Landmark points on template used for delineating faces.

PsychoMorph was then used to transform the masculinity of each face, based on the relative differences between an average Caucasian male and female

face. These male and female Caucasian averages were constructed from a larger database of faces. With the female and male average representing endpoints on the femininity-masculinity dimension, each frame for each face was transformed either 50% towards the female or 50% towards the male average to create feminized or masculinized versions of the face, respectively. After all the individual frames had been transformed, they were recombined into their original 3-second AVI movie format using VideoMach. Static masculinized and feminized versions of each face consisted of single frames taken from the transformed sequence of frames. Examples of manipulated faces are shown in Figure 4.5.

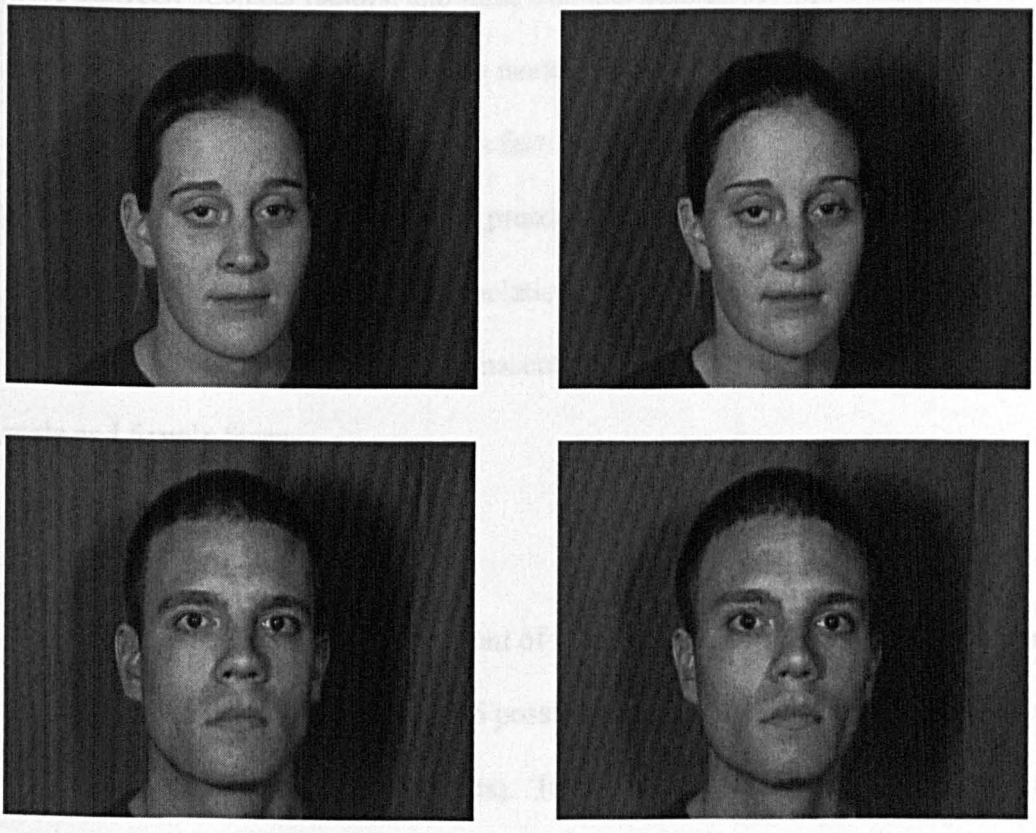


Figure 4.5. Female and male faces with 50% masculinized (left) and 50% feminized (right) manipulations.

All movies were compressed using DivX compression (DivXNetworks, Inc., 2003). All stimuli were presented at a size of 8 x 10 cm and presented in a middle

of a white screen. Data was collected using EPrime presentation software (v. 1.1.4.1, Psychology Software Tools, 1996-2003), which used Microsoft PowerPoint Viewer 97 to present the videos and pictures.

Design

A 2 (Expression) x 2 (Motion) x 2 (Manipulation) x 2 (Face Gender) x 2 (Rater Gender) x 4 (Order) factorial design was used. This design differs from that of previous experiments and increases the number of ratings that are calculated to make the average for a face in the ultimate items analysis. Motion and Expression were between-subjects factors, and thus, each participant saw faces that were all either moving or static and displaying neutral or positive expression. Rater Gender and Order were also between-subjects factors, as each participant viewed a set of stimuli which differed in the order of presentation of the male/female blocks of stimuli (see Table 4.1 below). Manipulation and Face Gender were within-subjects factors so that participants saw both masculinized and feminized versions of both male and female faces.

Procedure

Participants were seated in front of a Sony VAIO notebook computer in a quiet room and were shown one of 16 possible stimulus sets (2 expression levels x 2 motion levels x 4 counterbalanced sets). Table 4.1 shows the eight sets used for the neutral condition. An equivalent eight sets were used for the positive condition. Participants viewed 80 faces in total, presented in four blocks of 20 male or female faces. The presentation of the blocks was such that the gender of the faces alternated between blocks and the presentation order of gender was counterbalanced across all participants. Within each block of male or female faces, half of the faces were

masculinized and half were feminized. This was balanced over the experiment so that ultimately, each participant saw masculinized and feminized versions of all 40 faces.

It was decided that the unmanipulated faces would not be used because they were of noticeably different quality than the manipulated stimuli[7]. Including the unmanipulated faces in the experiment may have indicated to participants that the other faces had been altered. Furthermore, to prevent participants looking for differences between masculinized and feminized versions of the same face, they were told before the experiment that they would rate the same face twice to ensure reliability. In fact, most of the participants did not notice a difference between the masculinized and feminized versions; of the few who did, they assumed that expression of the face had changed and were not aware of the sex-typicality manipulation

Since participants saw each face twice, counterbalanced orders were used to see whether seeing the masculinized or feminized version first made a difference to ratings of the subsequent viewing. The presentation of stimuli within blocks was randomized. Motion and expression were between-subjects factors, and thus, each participant saw faces that were all either moving or static and displaying neutral or positive expression. This design differs from that of previous experiments and increases the number of ratings that are used to calculate the average for a face in the ultimate items analysis.

Before viewing the 80 test faces, participants were given a practice session to accustom them to the rating procedure. The practice session consisted of 4 faces

[7] Keating and Doyle (2002) also suggest that altered faces are less attractive than real faces, as they hypothesized that their alteration of submissive/dominant facial characteristics upset the natural balance of these qualities in the real faces.

displaying neutral expressions in a motion condition congruent to that of the subsequent test faces. These practice stimuli were not used again in the test phase and the ratings for these faces were not entered into the analyses. EPrime was used to collect the data and to organize the PowerPoint slides, which were presented by PowerPoint Viewer 1997. Participants saw each face for 3 seconds, following which the 7-point scale appeared on screen. Participants were prompted to make their rating from 1 ("not attractive") to 7 ("very attractive") using the number keys on the keyboard and were given as much time as necessary to make their ratings. Participants were given a break halfway through the experiment (i.e., between Blocks 2 and 3) and pressed the space bar whenever they were ready to continue.

	Order 1	Order 2	Order 3	Order 4	Order 5	Order 6	Order 7	Order 8
Motion Condition	Static	Static	Static	Static	Dynamic	Dynamic	Dynamic	Dynamic
Expression Condition	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Block 1	Female A	Female B	Male A	Male B	Female A	Female B	Male A	Male B
Block 2	Male A	Male B	Female A	Female B	Male A	Male B	Female A	Female B
Block 3	Female B	Female A	Male B	Male A	Female B	Female A	Male B	Male A
Block 4	Male B	Male A	Female B	Female A	Male B	Male A	Female B	Female A

Table 4.1. Counterbalancing design for Experiment 6. Each block (N=20) contains an equal number of masculinized and feminized faces. Orders 9-16 were of identical blocking except that they involved stimuli with positive expressions.

Results

Preliminary analyses

Inter-rater reliabilities for the sets of ratings for each motion and expression combination were very good and ranged from .83 to .91. Ratings from individual participants were averaged to create mean attractiveness values for each face

viewed. This yielded an average for each of the 40 faces in each of every possible combination of manipulation, motion and expression (40 faces x 2 manipulation levels x 2 motion levels x 2 expression levels = 320 averages).

The mean age in the group that viewed neutral expression faces was higher than that of the group that viewed positive expression faces. Thus, it was possible that effects of rater age could be confounded with those of expression. The median and mean age for participants in this group was 35 and a subjects analysis of ratings from raters above (n = 27) and below (n= 21) the median showed there were no significant differences between the two groups ($p = .810$).

A comparison of ratings across the four orders of presentation for each Motion/Expression condition showed significant differences between them (Neutral Static stimuli: $F(3, 234) = 11.95$, $p < .001$; Neutral Dynamic stimuli: $F(3, 234) = 29.49$, $p < .001$; Positive Static stimuli, $F(3, 234) = 66.69$, $p < .001$; Positive Dynamic stimuli: $F(3, 234) = 26.62$, $p < .001$). However, a 2 (Motion) x 2 (Manipulation) x 2 (Face Gender) x 4 (Order) ANOVA was conducted within ratings for each condition and all analyses showed that Order was not found to interact with any of the other factors. As ratings from each order contribute equally to all averages, a main effect of Order should not interfere with the other variables of interest. Thus, order was disregarded in subsequent analyses.

As this was the first design in which participants saw the same face twice (although with a different sex-typical manipulation each time), it is possible that faces could have been rated differently when viewed the second time. To investigate this, a repeated measures ANOVA was conducted including factors of Manipulation, Motion, Expression , Sex of Face and Viewing (whether viewed in

the first or second half). The analyses revealed that faces viewed the first time were not rated any differently when viewed the second time overall ($p = .134$). An interaction between Viewing, Manipulation and Sex of Face was significant and suggested that female faces that had been masculinized were rated more attractive when viewed in the second half than in the first (first viewing, $M = 3.43$, $SE = .145$; second viewing, $M = 3.70$, $SE = .148$; $F(1, 76) = 16.46$, $p < .001$); all other combinations of Manipulation and Sex of Face showed negligible differences between first and second viewing. No other interactions with Viewing Order were significant.

As the hypotheses for male and female faces involving manipulations were specific to comparisons between faces of the same sex, averages for male and female faces were analysed separately in 2 (Manipulation) x 2 (Motion) x 2 (Expression) x 2 (Rater Gender) repeated measures ANOVAs, with actor's face as the unit of analysis.

Analysis of male faces

It was hypothesized that masculinization would be most attractive when male faces are moving and expressive which would predict an interaction of Expression by Motion by Manipulation. This interaction was found to approach significance ($p = .059$) and inspection of the means shows that the greatest difference between masculinized and feminized faces did occur in the Positive Dynamic condition, as expected. As this difference was predicted a priori, adjusted paired t-tests (corrected alpha = .0125) were used to investigate the differences further. Over all conditions, the only significant difference between ratings for masculinized and feminized faces was found in the Positive Dynamic condition

(Positive Dynamic: t (19) = -5.09, $p < .001$; Positive Static: t (19) = -2.20, $p = .041$; Neutral Dynamic: t (19) = -2.00, $p = .06$; Neutral Static: t (19) = -1.361, $p = .189$). The mean attractiveness ratings collapsed across Rater Gender and split by Manipulation and Condition are shown in Figure 4.6.

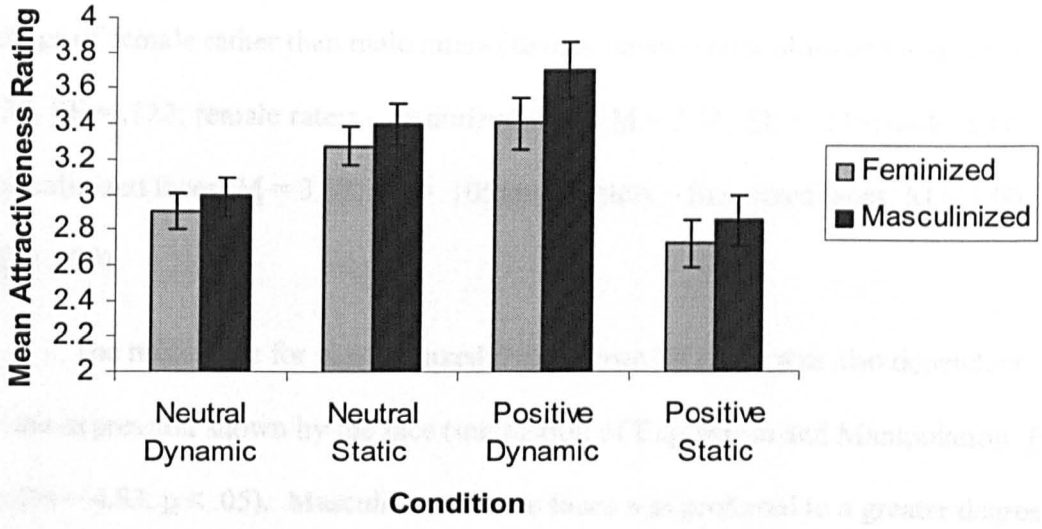


Figure 4.6. Mean attractiveness ratings for feminized and masculinized male faces in each condition of motion and expression (Error bars represent standard error).

A main effect of Motion was found, suggesting moving faces were given higher ratings of attractiveness than static faces overall, (moving faces: $M = 3.25$, $SE = .108$; static faces: $M = 3.06$, $SE = .108$; main effect of Motion: F (1, 19) = 12.87, $p < .01$). This main effect is qualified by an interaction of Expression and Motion, F (1, 19) = 98.35, $p < .001$. Static faces were more attractive than moving faces in the neutral condition (neutral static: $M = 3.34$, $SE = .107$; neutral dynamic: $M = 2.95$, $SE = .098$). When faces were smiling however, moving male faces were preferred to still ones (positive static: $M = 2.79$, $SE = .130$; positive dynamic: $M = 3.56$, $SE = .148$). Furthermore, male raters showed this pattern of ratings to a greater degree than did female raters (interaction of Motion, Expression and Rater Gender: F (1, 19) = 35.97, $p < .001$).

Masculinized male faces were also generally preferred to feminized male faces (masculinized: M = 3.24, SE =.110; feminized: M = 3.08, SE =.102; main effect of Manipulation: F (1, 19) = 17.28, p < .001). An interaction of Rater Gender by Manipulation was also found to be significant, F (1, 19) = 23.55, p < .001. The preference for masculinized male faces appeared to be driven by the ratings of female rather than male raters (female raters – masculinized faces: M = 3.39, SE = .122; female raters – feminized faces: M = 3.16, SE = .115; male raters - masculinized faces: M = 3.09, SE = .105; male raters – feminized faces: M = 3.00, SE = .099).

The preference for masculinized faces shown by raters was also dependent on the expression shown by the face (interaction of Expression and Manipulation: F (1, 19) = 4.83, p < .05). Masculinity in male faces was preferred to a greater degree when faces were smiling as opposed to when they were showing neutral expressions (neutral feminized: M = 3.09, SE = .097; neutral masculinized: M = 3.20, SE = .100; positive feminized: M = 3.07, SE = .129; positive masculinized: M = 3.28, SE = .141).

Finally, female raters gave higher ratings of attractiveness to both male and female faces than did male raters (female raters: M = 3.28, SE =.117; male raters: M = 3.04, SE = .100; main effect of Rater Gender: F (1,19) = 14.49, p < .001). A main effect of Expression was not found to be significant (p = .776).

Analysis of female faces

The mean attractiveness ratings for female faces split by Manipulation, Condition and Rater Gender are shown in Figure 4.7.

A main effect of Motion was found with moving faces preferred to static ones (dynamic: $\underline{M} = 3.91$, $\underline{SE} = .164$; static: $\underline{M} = 3.70$, $\underline{SE} = .188$; $\underline{F}\ (1, 19) = 5.80$, $\underline{p} < .05$). An interaction of Motion and Rater Gender suggests this main effect was driven by male raters, $\underline{F}\ (1, 19) = 7.44$, $\underline{p} < .05$. While female raters showed little preference between moving and static faces (dynamic: $\underline{M} = 3.88$, $\underline{SE} = .171$; static: $\underline{M} = 3.83$, $\underline{SE} = .151$), male raters preferred moving faces to static ones (dynamic: $\underline{M} = 3.94$, $\underline{SE} = .175$; static: $\underline{M} = 3.57$, $\underline{SE} = .231$).

A main effect of Expression was not found to be significant ($\underline{p} = .542$). However, Rater Gender was found to interact with Expression (interaction of Rater Gender and Expression: $\underline{F}\ (1, 19) = 11.43$, $\underline{p} < .01$). Female raters found neutral faces to be more attractive than those with positive expressions while male raters preferred positive expressions to neutral ones (female raters – neutral faces: $\underline{M} = 3.99$, $\underline{SE} = .161$, positive faces: $\underline{M} = 3.72$, $\underline{SE} = .174$; male raters – neutral faces: $\underline{M} = 3.69$, $\underline{SE} = .192$, positive faces: $\underline{M} = 3.82$, $\underline{SE} = .222$).

Manipulation also influenced ratings in the hypothesized direction, with feminized faces being preferred over masculinized faces in all conditions (feminized: $\underline{M} = 4.05$, $\underline{SE} = .164$; masculinized: $\underline{M} = 3.56$, $\underline{SE} = .180$; main effect of Manipulation: $\underline{F}\ (1, 19) = 153.13$, $\underline{p} < .001$). A Rater Gender by Manipulation interaction was found to be significant, $\underline{F}\ (1, 19) = 9.03$, $\underline{p} < .01$. Essentially, the dislike for masculinity in female faces was stronger for male raters than for female raters (female raters – feminized faces: $\underline{M} = 4.07$, $\underline{SE} = .153$; female raters – masculinized faces: $\underline{M} = 3.64$, $\underline{SE} = .160$; male raters – feminized faces: $\underline{M} = 4.02$, $\underline{SE} = .188$; male raters – masculinized faces: $\underline{M} = 3.48$, $\underline{SE} = 4.02$).

Finally, an Expression by Manipulation by Motion interaction was found to be significant, F (1, 19) = 5.37, $p < .05$. In all conditions, feminized female faces were preferred to masculinized female faces, but this preference was weakest in the Positive Dynamic condition. A main effect of Rater Gender was not found to be significant ($p = .290$).

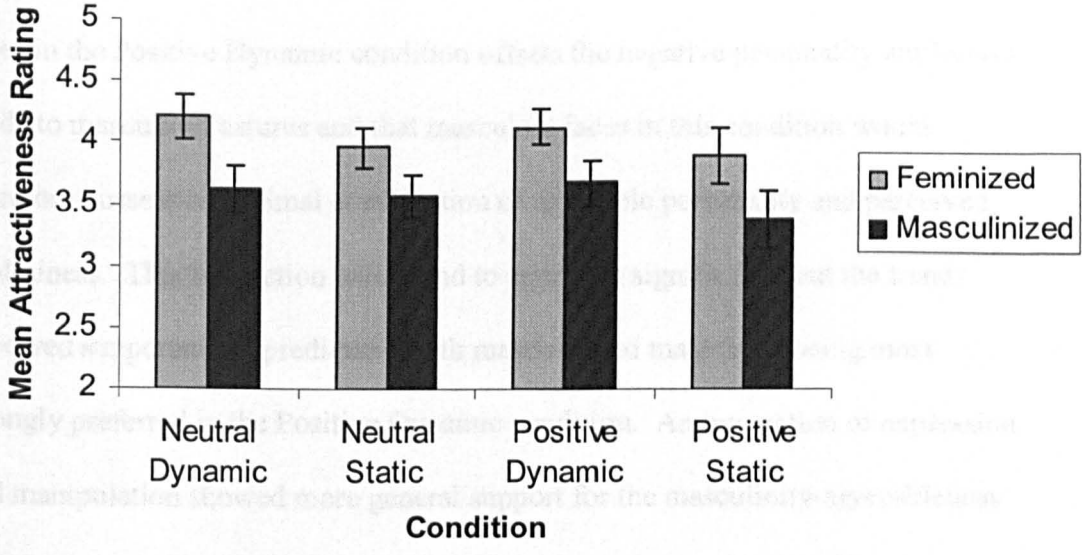


Figure 4.7. Mean attractiveness ratings for feminized and masculinized female faces in each condition of motion and expression. (Error bars represent standard error).

Discussion

The results from the present study are consistent with findings from Experiment 3 and 5, showing structural sex-typical appearance to be attractive for both male and female faces. Structural femininity was found to be preferred in female faces across all conditions of motion and expression and this also replicates findings from the majority of previous studies of female sex-typicality (e.g., Perrett et al., 1998; Rhodes et al., 2000). Masculinized male faces were generally found to be preferred over feminized male faces in all conditions. This finding is consistent with some previous research (e.g., Johnston et al., 2001) but contradictory with

others (e.g., Perrett et al., 1998) that show preferences for more feminized male faces.

It was predicted that an interaction of expression, motion and manipulation would occur for male faces, such that structural masculinity would be preferred to the greatest degree in the Positive Dynamic condition. This prediction was derived from the hypothesis that the prosocial behaviour shown by the moving, expressive faces in the Positive Dynamic condition offsets the negative personality attributions made to masculine features and that masculine faces in this condition would therefore possess an optimal combination of agreeable personality and perceived healthiness. This interaction was found to approach significance but the trends observed supported the prediction, with masculinized male faces being most strongly preferred in the Positive Dynamic condition. An interaction of expression and manipulation showed more general support for the masculinity-agreeableness balance, as masculinity was preferred when males were smiling. In this case, smiling may show enough prosociality to effect negative aspects of masculinity. Taken with the specific relationship of attractiveness and masculinity in Experiments 3 and 5, these results, using an experimental methodology, can be considered weak evidence in support of the masculinity-agreeableness balance theory.

I suggest that when male attractiveness is judged from photographs, facial configurations are the sole basis for judgements about masculinity and personality traits. Although masculinity may convey healthiness (Rhodes et al., 2003), it is also associated with negative personality traits (Perrett et al., 1998) and thus a compromise must be made between masculine appearance and an agreeable personality. Studies using neutral, static stimuli have shown that this compromise

can occur in more or less masculine men being favoured depending on risk of conception (Johnston et al., 2001; Penton-Voak & Perrett, 1999) or in the preference for men whose features convey both dominance and agreeableness (Cunningham et al., 1990; Keating & Doyle, 2002).

When faces move and are expressive however, the stereotyped attributions made from facial configurations may become less important and behaviour could become the primary and more accurate source of information for personality judgements (Borkenau & Liebler, 1992). As a result, facial masculinity can be freed from its ties to stereotyped judgements of dominance and dishonesty, as long as the behaviour demonstrates the opposite characteristics. A previous study investigating the attractiveness of dominance as a personality characteristic showed a similar phenomenon; dominance was optimally attractive when coupled with altruistic personality attributes (Jensen-Campbell et al., 1995). In real situations then, an optimally attractive man may possess a combination of health (conveyed by facial cues) and prosocial disposition (conveyed by expressive cues). Thus, the use of neutral static faces alone excludes information derived from movement and expression that can be vital to making realistic judgements of male attractiveness. This highlights the importance of showing faces dynamically, especially for male faces where personality attributions are an integral part of evaluations about attractiveness.

Another prediction derived from this theory might suggest that more feminine male faces might be preferred in conditions where behaviour did not convey positive personality characteristics. In previous studies using static, non-expressive stimuli, the preferences for feminized faces may then reflect a compromise for personality over masculine features, due to associations between

facial masculinity and negative personality traits (Perrett et al., 1998; Rhodes et al., 2000). This finding was not observed in the current study, as a main effect of Manipulation showed masculinized male faces to be preferred in all conditions of expression and motion. While the current study is similar in using manipulations based on structural differences between male and female faces, it is the first to manipulate real faces. Both Perrett et al. and Rhodes et al. used average faces as the basis for their sex-typical manipulations. It could be that the feminization of real male faces results in less attractive faces than averaged male faces which have been feminized.

Moreover, given the amount of manipulation found to optimize attractiveness in previous studies, it is possible that the overall preference for masculinity occurred because the degree of manipulation used was too extreme for male faces. Previous experiments finding preferences for feminine male faces have shown the degree of exaggeration to range between 9% and 33% (Perrett et al., 1998; Rhodes et al., 2000). Even Johnston et al.'s study (2001), yielding preferences for masculine faces, demonstrated that the most attractive masculinized faces were exaggerated closer to the 15% mark. Thus, as the degree of manipulation used in the current study was 50%, feminized males may have looked overly feminine. In such a case, extremely feminine male faces may have been disliked because the face nears androgyny in appearance, making the ultra-masculine face the more attractive face in comparison. There may be limits on the degree of femininity acceptable in male faces so that while preferring more feminized males may constitute an avoidance of the negative attributions of masculinity, this trade-off of masculinity for agreeable personality may be constrained by costs in terms of perceived healthiness. Further studies comparing

multiple levels of the sex-typicality manipulation are required to investigate this issue.

Although the levels of feminization may have altered sex-typicality beyond the boundaries of attractiveness for male faces, it seems as though manipulation of female faces is related to attractiveness in a more unidirectional and less constrained way. Feminized female faces were consistently considered attractive and this effect was visible over all levels of expression and motion. This differs greatly from the specificity involved with the attractiveness of structural sex-typicality in male faces and echoes a more general trend that female attractiveness seems to be more straightforward than male attractiveness. When studying faces using photographs, the bulk of information relevant to female attractiveness may be better represented by such stimuli than the information relevant to male attractiveness. As previous studies have found that physical appearance is important to female attractiveness (Berry & Miller, 2001; Buss, 1989; Feingold, 1992a), studies using static stimuli are able to display this information adequately, although more information is likely to be available in dynamic stimuli. On the other hand, male attractiveness has been found to be influenced to a greater degree by personality attributes, which are more difficult to ascertain from static stimuli. This is a possible weakness in the stimuli used in most studies of male attractiveness and suggests that efforts be made to use stimuli that provide information not only about facial structure but also personality attributes.

In this chapter, such stimuli incorporating expression and motion have been used and effects of structural sex-typicality found in previous correlational studies have been supported. Using a set of real faces that vary in natural levels of sex-typicality as the basis for sex-typical manipulations, evidence was found for

previous studies showing femininity to be attractive in female faces (Perrett et al., 1998; Rhodes et al., 2000) and masculinity to be attractive in male faces (Johnston et al., 2001). Masculinity may also be particularly attractive in male faces when they are moving and displaying positive expression. This finding is interpreted as an optimal balance of masculinity and prosocial disposition, which parallels previous findings involving dominance and altruistic behaviour (Jensen-Campbell et al., 1995).

It should be noted that neither general nor sex-specific effects of positive expression were obtained in Experiment 6. While this is in line with some previous research which obtained null effects for smiling (Mueser et al., 1984; O'Doherty et al, 2003), smiling has generally been associated with higher attractiveness ratings up to this point. It is possible that the null effect of smiling may be due to the fact that expression was a between-subjects factor in Experiment 5. Participants may judge attractiveness of faces in relation to the set of faces being rated and not according to an absolute standard. That is, participants may calibrate their rating scale to the faces being viewed within a particular session. As the same faces appeared in both the neutral and positive conditions, the relative attractiveness between faces should be approximately the same in both neutral and positive stimulus sets. Thus, it may not be unusual that attractiveness ratings would not differ significantly across conditions. It is also of interest to note that motion was found to exert effects on attractiveness even when used as a between-subjects factor, suggesting effects of expression on attractiveness appear to be smaller than those of motion.

These results continue to illustrate that female and male attractiveness depend on different criteria. In this chapter, the attractiveness of structural sex-

typicality differed in its specificity for male and female faces. In Chapter 2, it was found that male and female faces were influenced differently by motion and expression, but these sex-dependent effects were not found in the present experiment. The following chapter will discuss how motion and expression may have different connotations in Japanese and Western culture and will detail two experiments investigating how they may differentially affect attractiveness judgements in those cultures.

Chapter 5: Cross-Cultural Investigations into the Effects of Motion and Expression on Attractiveness Judgements

While studies looking at cross-cultural agreement in attractiveness ratings have shown general consensus, some cultural differences still exist. Research into the universality of the perception and display of emotional expressions suggests that there may be some culture-specific discrepancies, highlighting differences between Western and Japanese cultures in particular (Ekman, 1972, Ekman et al., 1987; Friesen, 1972, as cited in Fridlund, 1994; Scherer et al., 1988). Given this evidence, it is possible that the effects of motion and expression on attractiveness evaluations may also differ across these cultures. This chapter details cross-cultural experiments carried out at universities in Japan and Canada, in order to investigate whether these cultural differences influence attractiveness judgements.

Cross-Cultural Studies of Attractiveness

Studies show general cross-cultural agreement on the attractiveness of own and other-race faces, although this consensus in judgements is not equivalent to having the identical preferences. While the attractiveness ratings of different groups are similar when judging the same set of faces, most cross-cultural studies of attractiveness seem to suggest that culture-specific differences also influence preferences to a certain degree.

Cunningham and colleagues (1995) showed general consensus among various racial groups in three studies. In their first experiment, they found a mean correlation of .93 between Asian, Hispanic and White judges' ratings of Asian, Hispanic, Black and White female targets. All raters in this first study gave high ratings to narrow faces with large, wide-set eyes, small nose, high cheekbones, small chin and jaw, high set eyebrows, large smile and fuller lower lip. These

preferred features are consistent with Cunningham et al.'s previous research (1990) in which attractive features were proposed to convey a combination of neotonous, sexually mature and expressive traits. A second study looked at the consistency of judgements between raters from the first study and a sample of Taiwanese raters, who were attending a university in Taiwan and judged the same female faces from Study 1. The average correlation between the Taiwanese raters and the White, Asian, and Hispanic raters was .91. Their preferences for particular facial features were similar to those of raters in Study 1. Exposure to Western culture (in terms of amount of time in the US and exposure to Western films, television and magazines) was assessed to see if this influenced ratings. In both studies however, the judgements of low and high exposure were strongly correlated (r's > .95). In a third study, a mean correlation of .94 was found for attractiveness judgements between Black and White American male raters when rating female Black targets for face and body preferences. Again, Black and White raters preferred faces with similar features, such as large eyes, small nose, prominent cheekbones and large smile.

Despite this general consistency, culture-specific differences were also observed. A tendency existed for Asian judges in Study 1 to give higher ratings to faces with fuller cheeks and lower ratings to face with high eyebrows, wide smiles and high cheekbones, in comparison to White judges. This pattern of preferences was also found for the Taiwanese sample in Study 2, though they showed no difference from White judges in the evaluation of smiles. In Study 3, while high agreement was found for attractive facial characteristics, body preferences for White and Black raters differed, with Black raters preferring more voluptuous silhouettes than White raters.

Zebrowitz, Montpare and Lee (1993) asked Korean and White and Black American raters to judge facial photos of Korean, White and Black American male targets. Consensus across groups was found with an average correlation of .64 for other-race ratings, suggesting a considerable amount of agreement among different racial groups. The particular features each group associated with attractiveness in different groups showed differing levels of consistency. For instance, for White faces, Black raters found thin eyebrows attractive while Korean raters found high eyebrows and large eyes attractive. For Black faces, Black and Korean raters agreed that large eyes were attractive, but Black raters also found small nosebridges attractive while Korean raters preferred faces with thick eyebrows. White raters found Black faces with small nosebridge and low eyebrows most attractive. Finally, for Korean faces, all groups of raters found those faces with wide noses most attractive. The judgements of White and Black raters also showed agreement in large eyes being attractive for Korean faces, while the only other factor related to attractiveness for Korean raters was the presence of thick eyebrows. Thus, despite general consensus in overall attractiveness ratings, it is clear that specific preferences differed across ethnic groups. There was also some indication in Zebrowitz et al.'s study for a bias towards more familiar faces. The average correlation for own-race faces was higher than that for other-race faces ($\underline{r} = .78$ and $\underline{r} = .64$, respectively). As well, Korean raters judged less familiar Black faces as less attractive than the more familiar White faces.

The configurational factor of averageness also appears to apply to the attractiveness of faces of different cultures (Rhodes et al., 2001, Experiment 1). Rhodes et al. asked Chinese raters to rate own-race, Caucasian and blended (Caucasian and Chinese) facial stimuli for attractiveness. Individual faces were

warped into low, normal and high averageness shapes. Furthermore, each individual face was combined with a blended average to represent an even more average configuration and texture. Chinese raters were found to prefer own and other race faces to an equal degree, though there was also some evidence that Caucasian blend and high average faces were preferred for male facial stimuli. This study was not fully cross-cultural however as they did not ask a Caucasian sample to judge the same stimuli. Also, the Chinese raters had been living in Australia for 6 months at the time and their preferences could be influenced by Western standards of beauty learned during this time. Nevertheless, Rhodes et al.'s study was the first to show that averageness was preferred in non-Western faces.

Dion (2002) criticizes the predominant use of university students in cross-cultural attractiveness studies, such as those described above. She suggests that university students are more likely to be exposed to media which promote certain standards of attractiveness. Although Cunningham et al. (1995) tried to control for exposure to Western media in their study, they conceded that it is difficult to completely eliminate all influence of Western standards of beauty and suggested conducting future research in remote, rural populations. A study by Jones (1996) tested a wider range of raters, using participants from the United States, Brazil, Russia, Ache Indians from Paraguay and Hiwi Indians from Venezuela. Although participant populations from the US, Brazil and Russia consisted of university students, the Brazilian sample also consisted of members of the general public. The latter two groups were of particular interest as both groups were relatively isolated and had little contact with other groups. Each group was shown photographs of the faces of male and female faces from the US, Brazil and the Ache Indian community. It was found that the three Western cultures showed considerable consistency in

their ratings of faces (average correlation, r = .66) while the two isolated cultures also showed some agreement (average correlation, r = .43). However, the consensus between the Western societies and the isolated societies was much lower (average correlation, r = .14). Jones interpreted these findings as consistent with an averageness explanation for attractiveness preferences, as the two isolated societies had never seen each other, but were facially more similar in comparison to the Western cultures. Jones' study also suggests that while greater cross-cultural variability does occur when using wider populations, there is still some evidence for agreed elements of attractiveness.

Individualistic and Collectivist Cultures

Cross-cultural variability in evaluations may be partially due to how each culture views the relationship of its individual members in regards to the whole group. The individualism-collectivism dimension describes "the degree to which cultures encourage individual needs, wishes, desires and values in relation to group and collective ones," (Matsumoto, 1996, p. 132). Individualistic cultures emphasize the independence of its members, promoting individuals to attend to their own goals, values and self-expression above group ones. On the other hand, in collectivist cultures, individuals define themselves in terms of their role in a group and thus, put group needs above individual ones. In short, individualist cultures place importance on self-assertion and independence while collectivist cultures value harmonious relationships and group belonging. Western cultures, such as Britain, Canada and the United States, demonstrate individualistic leanings while Eastern cultures, such as Japan and China, show more collectivist values (Hofstede, 1984, as cited in Dion, 2002).

Individualism-collectivism orientation has been suggested to explain some cross-cultural differences in attractiveness preferences. Recall that Cunningham et al. (1995) found that while general consensus was found between Asian and Western cultures, slight discrepancies were found in the degree of preferences for certain facial features. Asian raters had greater preferences for more rounded faces and held faces with high eyebrows and wide smiles in less esteem than White raters. Speaking in terms of Cunningham's multiple motive model, Asian raters tended to prefer a feature which emphasizes the neotony of a face, while White raters preferred features conveying expressiveness and sexual maturity. While Asian faces might generally be rounder with less prominent cheekbones, Cunningham et al. suggest that these preferences are not due simply to an own-race bias, as Asian raters' preferences for these traits were only slightly changed when Asian targets were excluded from the analysis[8]. Cunningham et al. suggest that preferences for neotonous traits and against expressive and sexually mature traits in both own-race and other-race faces may be a result of associated personality traits that would be preferred in Asian, collectivist cultures. Individual expressiveness may be undesirable in a collectivist culture as it may upset group harmony. Neotonous features, besides denoting youthfulness, may also convey submissive dispositions (Keating & Doyle, 1995; Zebrowitz et al., 1993), which are more conducive to group cohesion.

Collectivist cultures may also differ from individualistic cultures in the amount of importance that is placed on attractiveness. Dion (2002) suggests that

[8] Although Cunningham tested for a bias for own-race faces, these preferences may still reflect a tendency to prefer own-race features in other-race faces, which would be consistent with an averaging-prototype extraction explanation for attractiveness. If one's prototype for what is attractive is based on the average of faces one sees, then Asian raters will have a prototype that has more Asian features and this would be the standard that all other faces would then be measured against for attractiveness.

physical attractiveness is a quality that calls attention to an individual, differentiating them from others in a group and emphasizing their uniqueness. In collectivist cultures such an individuating factor may be of less importance in mate selection than other traits that would be of greater benefit the group. Indeed, Dion directs attention to Buss et al.'s (1990) cross-cultural survey of mate selection criteria in which all of Asian societies tested (China, Taiwan, Japan, Indonesia and India), except India, had lower preferences for "good looks" in comparison to the international average. Thakerar & Iwazaki (1979) found that English women placed greater importance on physical traits such as height, while Chinese and Indian women ranked non physical traits, such as intelligence and kindness, more highly. Thus, it may be that attractiveness preferences, although similar across cultures, may contribute differently to mate selection.

Cultural Differences in Emotional Expression

The findings for emotion research parallel that of attractiveness, such that universals appear to exist, but that these are tempered with cultural differences. Ekman's (1972) neurocultural theory of emotion suggests that the differences in emotional display are a result of rules which act as an intermediary step between the elicitation of a basic emotion and the actual emotion displayed. Under this theory, "display rules" are said to be able to intensify, de-intensify, neutralize or mask an emotion with a different emotion. An example given of masking can be seen during beauty pageants, losers usually display a happy face to mask their disappointment or sadness upon announcement of the winner. Masking may also produce emotional expressions which look like a blend of different emotions. These display rules are thought to be learned during one's lifetime and therefore, differ across cultures as a result of variations in culture-specific norms.

A study often cited as a classic demonstration of cultural differences in the display of emotion was conducted by Friesen (1972, as described in Fridlund, 1994). American and Japanese participants were first placed in a room alone, viewing aversive video footage. The participants' reactions were secretly videotaped and both groups showed the same facial expressions of negative affect (fear, anger, disgust and sadness). When an experimenter (a graduate student of the same culture) was in the room however and the stressful footage was shown again, the Americans showed the same negative expression while the Japanese participants' behaviour changed, showing more smiles than negative expressions. Ekman and Friesen (1975) suggest this finding is an indication of how the smile is often used to mask negative emotions in Japanese culture[9]. Thus, the connotation of a smile in Japan could be tainted by its association with hidden, negative emotions. Ekman and colleagues (1987) showed that the Japanese tend to rate smiles as showing less intensity of positive emotion than do Americans for the same faces. This tendency for Japanese judges to perceive less intense positive emotion in smiles than do American judges may be linked to the use of smiles being used to mask negative emotions in Japanese culture.

In the only cross-cultural study to test evaluations of smiling and non-smiling faces, Matsumoto & Kudoh (1993) asked separate groups of American and Japanese judges to rate Caucasian and Japanese faces on traits of attractiveness,

[9] Fridlund (1997) disagrees with Ekman's emotions view of this phenomenon and instead, proposes a behavioural ecology explanation which takes into account the cultural differences in social norms. Ekman presumes that the smiles were displayed to mask the culturally-prohibited expression of negative emotion. In Japanese, collectivist culture, deference to authority figures takes precedence to individual expression. Thus, Japanese participants could have displayed smiles out of politeness and respect in speaking with the experimenter and not in direct relation to the films. In contrast, such normative constraints are not present in Western culture and instead, individual expression is encouraged. Thus, Fridlund suggests that while American participants proceeded to communicate their emotions facially, Japanese participants' behaviour may not have been masking their emotions per se; instead they may have put the expression of these emotions second to normative, prosocial behaviour as defined by collectivist cultures.

intelligence and sociability. American and Japanese judges were in agreement for ratings of attractiveness, which were not found to differ with a face's expression or ethnicity. Smiling faces were judged as more intelligent than neutral faces by American judges, but Japanese judges considered faces with both expressions as equally intelligent. Both American and Japanese judges considered smiling faces to be more sociable than neutral faces, but this effect was stronger for American judges. Finally, in terms of ratings of cross-cultural attractiveness, both groups of judges rated Caucasian faces as more attractive than Japanese faces, thus demonstrating consensus.

Matsumoto and Kudoh hypothesized that differences would be found in the evaluation of smiles for attractiveness because of cultural differences between the Japanese and Americans in the display of smiles and their subsequent meaning. That no differences were found in ratings of attractiveness may be attributable to Matsumoto and Kudoh's use of Duchenne smiles (involving innervation of muscles around the face and eyes, denoting felt happiness) in stimuli. They suggest that posed smiles (which do not involve innervation of muscles around the eyes) might be the smile type more commonly used when masking other emotions (Ekman & Friesen, 1982) and that future research using social smile stimuli may yield results more consistent with their hypotheses.

Experiment 7: Cross-Cultural Study of the Attractiveness of Expression

The current study will investigate the attractiveness of smiling and non-smiling faces cross-culturally using static faces. Evidence suggests that smiles may be used differently in Western and Japanese culture (Friesen, 1972, as cited in Fridlund, 1994; Ekman & Friesen, 1975), resulting in different associations with

smiling faces in those cultures. From this, it may be predicted that Japanese raters will rate smiling as less attractive than Caucasian raters.

Evidence exists demonstrating that smiles may be evaluated differently by Caucasian and Japanese raters (Ekman et al., 1987; Matsumoto & Kudoh, 1993) but the only study of cross-cultural attractiveness of expression has shown no differences between smiling and neutral faces (Matsumoto & Kudoh, 1993). Matsumoto and Kudoh used faces with Duchenne smiles, which may not yield cultural differences in evaluations of attractiveness because they are not the type of smile usually used in social situations to mask negative emotion (Ekman & Friesen, 1982). The current study uses mostly posed smiles, which are those more likely to be used in social situations in Japanese culture to study how Caucasian and Japanese faces with positive and neutral expressions are judged by Japanese and Canadian raters. Taking this in conjunction with Friesen's results regarding the negative connotation of smiles, it is hypothesized that Japanese raters will consider smiling faces less attractive than will Caucasian raters.

Method

Participants

For the Japanese sample, 40 raters (20 males, 20 females) were recruited from the student population at Kyoto University. These raters ranged in age from 20 to 31, with a mean age of 23.8. The Caucasian sample consisted of 58 raters (24 males, 34 females) recruited from York University, Toronto, Canada. Raters in this group were of European background and ranged in age from 18 to 30, with a mean age of 21.3. Raters volunteered or were reimbursed with course credit or financial compensation for their participation.

Materials

Both Caucasian and Japanese stimulus faces, displaying neutral and positive expressions, were used in this study. All actors were young adults[10]. The 20 Japanese faces used (10 male, 10 female) were taken from a database of static faces showing various emotional expressions, obtained from Advanced Telecommunications Research (ATR) Laboratories, Japan. These pictures were shown at a size of 7.6 x 10.2 cm in the centre of a white screen. The 20 Caucasian facial stimuli (10 male, 10 female) were obtained from a similar emotional expression face database, first obtained at St. Andrew's University, UK. The pictures from this database were shown at a size of approximately 7.6 x 6.1 cm. For both sets of stimuli, faces were chosen based on the criterion that both neutral and positive expressions were convincing. All stimuli framed the actor from the shoulders up, set against a plain background. All actors directed their gaze at the camera. Each stimulus was centred on a white screen in a 1-slide PowerPoint presentation.

The stimuli were presented on a portable Sony VAIO notebook computer and all instructions given to the Caucasian participants were translated into Japanese and presented to Japanese participants on paper.

Design

A 2 (Expression) x 2 (Face Ethnicity) x 2 (Face Gender) x 2 (Rater Ethnicity) x 2 (Rater Gender) factorial design was used. The first 3 factors were

[10] Exact age details of actors were not available as stimulus sets were filmed previously at a foreign institution.

within-subjects factors while Rater Ethnicity and Rater Gender were between-subjects factors.

Procedure

Two stimulus sets were created and each participant viewed only one of these sets. Both sets consisted of 40 faces with each ethnicity and each expression type represented in half the faces. The assignment of expression and ethnicity conditions to faces was counterbalanced over the two stimulus sets. Thus, both Expression and Ethnicity were within-subjects factors in this design.

Each rater viewed all 40 faces in a particular stimulus set, which were shown in random order. Each stimulus was presented in the middle of the computer screen for 3 seconds, after which a rating scale appeared, prompting the participant for an attractiveness rating ("How attractive was that face?") from 1 ("not attractive") to 7 ("very attractive"). EPrime (v.1.1.4.1, Psychology Software Tools, 1996-2000) was used to collect data and also to present the stimuli, using PowerPoint Viewer 97 to present the pictures. Raters were given as much time as necessary to make their ratings and used the number keys on the keyboard to do so.

Results

Reliabilities across raters viewing the same stimulus set were excellent for both Japanese and Caucasian raters (Japanese raters, Cronbach's alpha = .90 and .94; Caucasian raters, Cronbach's alpha for both stimulus sets = .96). Ratings from Japanese and Caucasian participants viewing the same stimulus set were separately averaged to obtain mean attractiveness ratings for each ethnic group for each stimulus. Paired t-tests showed that male and female raters in the Canadian and Japanese group did not differ in their attractiveness judgements (Japanese: t (79) =

1.122, p = .265; Canadian: t (79) = -1.433, p = .156). Thus, ratings of male and female raters were combined within ethnic groups. With stimulus face as the unit of analysis, the mean attractiveness ratings were analysed in a 2 x 2 x 2 x 2 x 2 repeated measures ANOVA with factors of Expression (neutral, positive), Face Ethnicity (Caucasian, Japanese), Face Gender (male, female), Rater Ethnicity (Caucasian, Japanese) and Rater Gender (male, female).

Faces with positive expressions were generally preferred to those with neutral expressions (positive: M = 4.20, SE = .086; neutral: M = 3.55, SE = .105, main effect of Expression: F (1, 36) = 63.05, p < .001). The effect of Expression was particularly strong on Japanese faces, as suggested by an interaction of Face Ethnicity with Expression, F (1, 36) = 5.15, p < .01. While positive expressions were considered more attractive when displayed by both Caucasian and Japanese faces, this preference was more pronounced in Japanese faces (Japanese face – neutral: M = 3.67, SE = .150, positive: M = 4.51, SE = .120; Caucasian face – neutral: M = 3.42, SE = .150, positive: M = 3.88, SE = .120).

The main effect of Expression is also modified by an interaction of Expression with Rater Ethnicity, F (1, 36) = 108.17, p < .001. The means are displayed in Figure 5.1. Japanese judges rated positive expressions more favourably than neutral ones, while Caucasian judges rated positive and neutral expressions similarly (Japanese raters – neutral expressions: M = 3.33, SE = .103, positive expressions: M = 4.50, SE = .086; Caucasian raters – neutral expressions: M = 3.77, SE = .130, positive expressions: M = 3.89, SE= .102). Corrected, paired t-tests showed that the difference in ratings between the neutral and positive expression conditions was only significant for Japanese raters (Caucasian raters: t (19) = -1.18, p = .246; Japanese raters t (19) = -11.68, p < .001).

An interaction of Expression and Rater Gender was also significant, F (1, 36) = 10.26, $p < .01$. This showed that males preferred neutral expressions more than females (female raters: $M = 3.52$, $SE = .105$; male raters: $M = 3.60$, $SE = .110$) while females preferred positive expressions more than males (female raters: $M = 4.24$, $SE = .095$; male raters: $M = 4.15$, $SE = .081$). However, an interaction of Expression, Rater Gender and Face Gender, F (1, 36) = 5.79, $p < .05$, showed that these preferences were driven in particular by females' preference of positive expression on female faces (neutral expression – female raters: $M = 3.74$, $SE = .148$, male raters: $M = 3.71$, $SE = .156$; positive expression – female raters: $M = 4.55$, $SE = .134$, male raters: $M = 4.25$, $SE = .115$) and males' preference for neutral expression on male faces (neutral expression – female raters: $M = 3.30$, $SE = .148$, male raters: $M = 3.48$, $SE = .156$; positive expression – female raters: $M = 3.92$, $SE = .134$, male raters: $M = 4.05$, $SE = .115$).

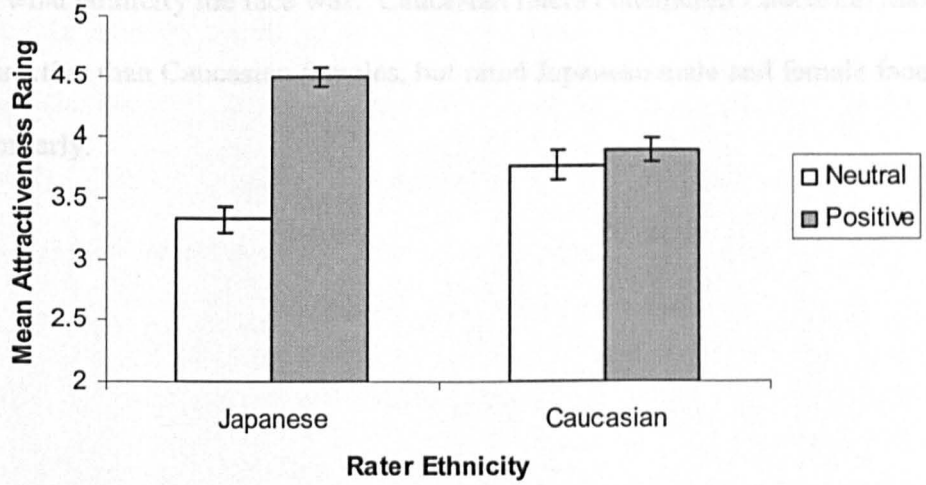


Figure 5.1. Interaction of Rater Ethnicity by Expression. (Error bars represent standard error).

A main effect of Face Ethnicity suggested Japanese faces were rated as higher in attractiveness than Caucasian faces, (Japanese faces: $M = 4.10$, $SE = .13$;

Caucasian faces: $\underline{M} = 3.65$, $\underline{SE} = .13$; main effect of Face Ethnicity: $\underline{F}\ (1, 36) = 6.76$, $\underline{p} < .05$). However, the interaction of Face Ethnicity and Rater Ethnicity demonstrated this main effect to be driven by Caucasian ratings, as a crossover of preferences between ethnic groups was observed, $\underline{F}\ (1, 36) = 5.05$, $\underline{p} < .05$. Japanese faces were rated higher in attractiveness by Caucasian raters than Japanese raters (Caucasian raters: $\underline{M} = 4.15$, $\underline{SE} = .151$; Japanese raters: $\underline{M} = 4.06$, $\underline{SE} = .115$), while Caucasian faces were given higher ratings by Japanese than Caucasian raters (Caucasian raters: $\underline{M} = 3.53$, $\underline{SE} = .151$; Japanese raters: $\underline{M} = 3.77$, $\underline{SE} = .115$).

Furthermore, a higher order interaction involving Face Ethnicity, Rater Ethnicity and Face Gender suggests more disagreement between the two groups of raters, $\underline{F}\ (1, 36) = 13.07$, $\underline{p} < .001$. The means are depicted in Figure 5.2. Japanese raters gave female faces higher ratings of attractiveness than male faces, regardless of what ethnicity the face was. Caucasian raters considered Caucasian males more attractive than Caucasian females, but rated Japanese male and female faces similarly.

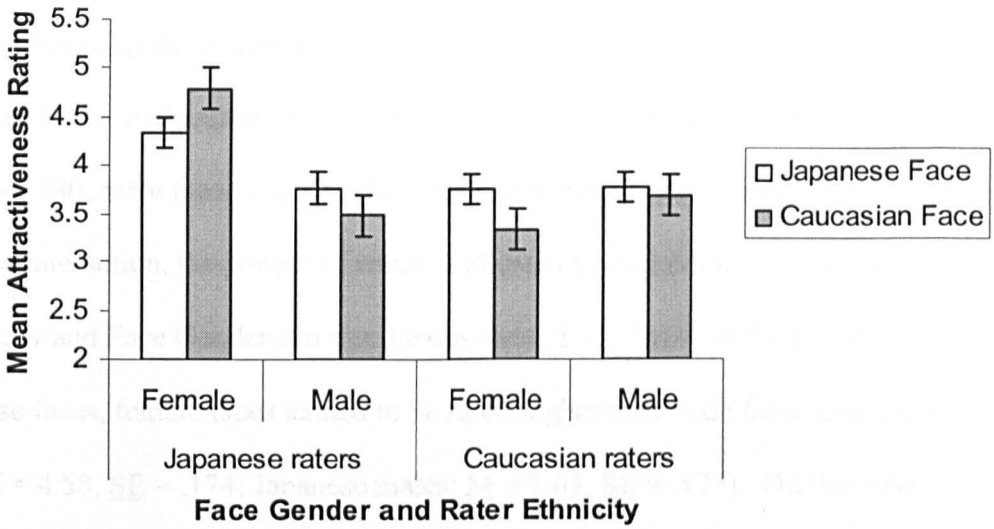


Figure 5.2. Interaction of Face Ethnicity, Rater Ethnicity and Face Gender. (Error bars represent standard error).

Female faces received higher ratings of attractiveness than did male faces (female faces: M = 4.06, SE = .123; male faces: M = 3.69, SE = .123; main effect of Face Gender: F (1, 36) = 4.59, p < .05). However, an interaction of Rater Gender and Face Gender suggested that opposite-sex raters were gave lower attractiveness ratings than same-sex raters (female faces – female raters: M = 4.14, SE = .127; female faces – male raters: M = 3.98, SE = .125; male faces – female raters: M =3.61, SE = .127; male faces – male raters: M = 3.76, SE = .125; interaction of Rater Gender and Face Gender: F (1, 36) = 18.30, p < .001).

Furthermore, an interaction of Rater Gender, Face Gender and Face Ethnicity, F (1, 36) = 6.10, p < .05, showed this greater scrutiny of opposite-sex faces appeared to be particular to judgements of Caucasian faces (female faces – female raters: M = 3.66, SE = .180; female faces – male raters: M = 3.44, SE =

.176; male faces – female raters: M = 3.62, SE = .180; male faces – male raters: M = 3.88, SE = .176). Smaller differences were observed between male and female raters when rating Japanese faces (female faces – female raters: M = 4.63, SE = .180, female faces – male raters: M = 4.53, SE = .176; male faces – female raters: M = 3.61, SE = .180; male faces – male raters: M = 3.65, SE = .176). Under this higher order interaction, the pattern of results indicated by an interaction between Face Ethnicity and Face Gender can also be observed, F (1, 36) = 10.83, p < .01. For Japanese faces, female faces tended to be rated higher than male faces (Japanese females: M = 4.58, SE = .174; Japanese males: M = 3.63, SE = .174). On the other hand, male Caucasian faces were rated somewhat more attractive than female Caucasian faces (Caucasian females: M = 3.55, SE = .174; Caucasian males: M = 3.75, SE = .174).

No main effect of Rater Gender was found, but an interaction of Rater Gender and Rater Ethnicity was significant, F (1, 36) = 5.24, p < .05. This suggested that Caucasian male and female raters were more similar in their ratings than Japanese male and female raters (Caucasian females: M = 3.81, SE = .109; Caucasian males: M = 3.87, SE = .107; Japanese females: M = 3.95, SE = .087; Japanese males: M = 3.88, SE = .085). Furthermore, an interaction of Rater Gender, Face Gender and Rater Ethnicity showed that this dissimilarity was tempered by the opposite-sex scrutiny discussed above. When rating female faces, Caucasian raters made similar judgements while Japanese males were more conservative in their ratings than Japanese females (Caucasian females: M = 4.06, SE = .154; Caucasian males: M = 4.08, SE = .152; Japanese females: M = 4.23, SE = .123; Japanese males: M = 3.88, SE = .120). For male faces, both Caucasian and Japanese males gave higher ratings than did female raters (Caucasian females: M = 3.56, SE = .154;

Caucasian males: $\underline{M}$ = 3.65, $\underline{SE}$ = .152; Japanese females: $\underline{M}$ = 3.67, $\underline{SE}$ = .123; Japanese males: $\underline{M}$ = 3.88, $\underline{SE}$ = .120).

Discussion

The results from the current study showed that smiling faces were generally considered more attractive than those with neutral expressions. This finding is consistent with a number of previous studies linking positive expression with facial attractiveness (e.g., Cunningham, 1986; Cunningham et al., 1995; Otta et al., 1996; Rhodes et al., 1999) as well as previous experiments in this dissertation. The fact that both male and female faces were considered more attractive when smiling differs from the sex-specific effect of smiling obtained in Experiments 1 and 2 of this dissertation and previous studies (Raines et al., 1990b; Rhodes et al., 1999; Schulman & Hoskins, 1986).

The preference for smiling faces was found for both Caucasian and Japanese raters, demonstrating a substantial amount of cross-cultural agreement. This consensus is consistent with previous research suggesting agreement across cultures for ratings of facial attractiveness (Cunningham et al., 1995; Matsumoto & Kudoh, 1993; Zebrowitz et al., 1993). Similar to previous research, although general agreement was observed, some degree of discrepancy also existed. In this case, the discrepancy involved the degree more the than direction of preferences. That is, the interaction of Rater Ethnicity and Expression showed that Japanese raters' preferred smiling to neutral expressions to a much greater degree than Caucasian raters.

The results of the current study suggest that smiles are positively evaluated, especially by Japanese raters. These results are therefore inconsistent with

Matsumoto & Kudoh's (1993) hypotheses regarding the relationship between smiles and cultural differences in display rules. They argued that because Japanese display rules call for smiles to mask negative emotion (Friesen, 1972, as cited in Fridlund, 1994), smiles might be evaluated more negatively by Japanese raters than by Western raters. Consequently, smiles should be more positively evaluated in Western culture because they are not as often linked to negative emotion. In their study, they found no differences in terms of attractiveness, although their hypotheses were supported for ratings of intelligence and, to a lesser degree, sociability. In the current study, we find that both Caucasian and Japanese raters found smiling faces more attractive, with Japanese raters showing this preference to a greater degree. Thus, both cultures evaluated smiling faces positively, suggesting that any cultural differences that may exist in the use of smiles in Japanese do not have a negative impact on their attractiveness ratings.

Matsumoto & Kudoh also suggested that the use of posed smiles might better approximate the type of smile used in situations where negative emotions are masked. They used Duchenne smiles in their study, which are usually shown when experiencing joy or during laughter. The current study did include mostly posed smiles and yielded different results for attractiveness than Matsumoto & Kudoh's study that are contrary to their hypotheses. If social smiles are used to mask negative emotion in Japanese culture, their attractiveness does not appear to be tainted by this use. Instead, perhaps posed smiles are considered attractive because they are linked to personality traits likely to be favoured in a collectivist culture, as smiles show politeness, respect and self-deprecation in comparison to neutral faces.

It may also be that static stimuli do not sufficiently approximate actual social behaviour to elicit cultural differences in attractiveness ratings. The next study uses dynamic stimuli to increase the ecological validity of stimuli differing in expression.

Experiment 8: Cross-Cultural Study of the Attractiveness of Expression and Motion

Although many cross-cultural studies have shown the presence of universal factors in the beauty of a static face, the extra information present in dynamic stimuli may introduce factors affecting attractiveness judgements that are culture-specific. Research has already been reviewed suggesting that smiles are often used to mask negative emotions in Japanese culture (Friesen, 1972, as cited in Fridlund, 1994), and that as a result, the connotation of a smile is less positive than in Western culture.

Matsumoto and Kudoh's (1993) study and Experiment 7 used Duchenne and social smiles, respectively, to test whether smiles would be evaluated differently in attractiveness. Neither study found evidence supporting the hypothesis that smiles lead to negative evaluations for attractiveness, due to their associations with negative emotion in Japanese culture. Perhaps the use of static stimuli in both these studies is not realistic enough to activate culture-specific connotations of smiles. In the current study, cultural differences in the attractiveness of smiles are investigated using moving stimuli, which should better approximate smiling behaviour in actual social situations.

Using dynamic stimuli may also highlight differences in behaviour between cultures that might influence attractiveness judgements. Research suggests that the Japanese differ in their verbal and facial expression for certain emotions (Scherer et

al., 1988). Scherer et al. asked Japanese, European and American raters to report their personal experiences for various emotions. The only significant difference between cultures for verbal behaviour was found for joy/happiness; Japanese participants reported greater verbal expressiveness in their reactions to joy/happiness than did Europeans and Americans. In terms of nonverbal behaviour, Japanese participants also mentioned more facial reactions to joy/happiness than Europeans and Americans. In reports regarding the experience of negative emotions however, Japanese participants reported the least expressiveness of all groups in terms of face, voice and bodily reactions.

It should be noted again that Scherer et al.'s results are based on subjective reports of emotional experience and thus, may be clouded by impression management and selective reporting on the part of the participants. Nevertheless, it seems plausible that in a collectivist culture such as Japan that the expression of positive emotions might be even more favourably perceived than in Western cultures for their role in encouraging social cohesion. Similarly, expression of negative emotions may be discouraged for their potential anti-social consequences.

The current study uses stimuli displaying positive or neutral expressions that are moving or static to test whether motion and expression influence attractiveness differently across Western and Japanese cultures. In light of findings from previous experiments in this dissertation, it is expected that positive expressions will be more attractive than neutral ones. Given the interaction of rater ethnicity and expression found in Experiment 7, it is also possible that this preference for smiles will be shown to a greater degree by Japanese raters.

As for motion, previous experiments have generally shown moving faces to be more attractive than static faces. It is also possible that Japanese raters will

prefer motion to a greater degree with displays of positive expression, compared to neutral ones. This hypothesis follows from research suggesting Japanese individuals are more expressive in their display of happiness than individuals from Western cultures (Scherer et al., 1988). Thus, a Rater Ethnicity by Motion by Expression interaction might also be expected to occur.

Method

Participants

The 24 Japanese raters who participated in this study (10 male, 14 female) were recruited from the student population at Ritsumeikan University, Kyoto, Japan. Ages in this group ranged from 19 to 33 (mean age = 23.0). The 48 Caucasian raters (24 male, 24 female) were recruited from York University, Toronto, Canada. This group consisted of raters ranging from age 18 to 30 with a mean age of 21.4. Participants either received course credit or financial compensation for their participation in this study.

Materials

In total, 80 Caucasian and Japanese (40 of each ethnicity and gender) faces were used as stimuli for this study. All stimuli were taken from videotaped interviews filmed at Stirling University, UK and Kyoto University, Japan. The actors in these videos ranged in age from 18 to 32. All footage showed actors against a grey background and framed from the shoulders up. All actors maintained direct gaze at the camera throughout.

Three-second video footage was edited from these interviews, which depicted actors speaking naturally and reciting numbers or letters; these two types

of video segments were used as stimuli in the Positive Dynamic (PD) and Neutral Dynamic (ND) conditions, respectively. These videos were compressed using Adobe Premiere (version 6) with a Cinepak compressor. Still frames were then extracted from these dynamic stimuli, displaying actors either smiling (Positive Static, PS) or showing neutral expression (Neutral Static, NS).

Both the dynamic and static stimuli were presented at an image size of 7.9 x 10.6 cm. Each stimulus was embedded in a 1-slide PowerPoint presentation, centred on a white screen.

Design

This experiment used a 2 (Rater Ethnicity) x 2 (Rater Gender) x 2 (Face Ethnicity) x 2 (Face Gender) x 2 (Expression) x 2 (Motion) factorial design. The first two factors of Rater Ethnicity and Rater Gender were between-subjects and the remaining factors were within-subjects factors.

Procedure

Participants saw 80 stimuli (10 stimuli from all four conditions of Motion/Expression for both ethnicities), but only saw each actor once in any one condition. The conditions allocated to different stimulus faces were therefore counterbalanced over different participants. EPrime was used to collect data and also to present the stimuli, using PowerPoint Viewer 97 to present the movies and pictures. Participants saw each stimulus for 3 seconds; the dynamic stimuli were allowed to run their full length while static stimuli were presented for 3 seconds. After viewing each stimuli, a 7-point scale appeared where the stimulus was, prompting the participant to enter an attractiveness rating ("How attractive was that

face?") from 1 ("not attractive") to 7 ("very attractive") using the keyboard number keys. The inter-stimulus interval was controlled by the participant.

Results

Cronbach's alpha values for inter-rater reliability between the 4 different stimulus sets ranged from .83 to .89 for Caucasian raters and from .71 to .76 for the Japanese raters. As values above .7 are considered to show good reliability (Nunnally, 1978), it was deemed appropriate to average particpants' ratings in each set. Attractiveness ratings for each stimulus were averaged across participants within each of the Japanese and Caucasian samples. Ratings were examined in an items analysis using a repeated measures ANOVA, with six factors: Rater Ethnicity (Japanese, Caucasian), Rater Gender (Male, Female) Face Ethnicity (Japanese, Caucasian), Face Gender (Male, Female), Expression (Neutral, Positive) and Motion (Dynamic, Static).

Numerous interactions between these factors were found to be significant; all significant interactions with their statistical test values are listed in Table 5.1. Only those interactions involving factors of greatest interest will be discussed here.

Factors	*F*	*p*
Expression x Motion	5.35	.023
Expression x Rater Ethnicity	26.92	< .001
Expression x Rater Gender	24.841	< .001
Rater Ethnicity x Rater Gender	7.1	.009
Face Ethnicity x Motion x Rater Ethnicity	5.64	.020
Face Ethnicity x Motion x Rater Gender	5.16	.026
Face Ethnicity x Rater Ethnicity x Rater Gender	6.01	.017
Face Gender x Motion x Rater Ethnicity	14.48	< .001
Face Gender x Rater Ethnicity x Rater Gender	12.56	.001
Face Ethnicity x Face Gender x Rater Ethnicity x Rater Gender	7.57	.007

Table 5.1. Significant interactions in repeated measures ANOVA of Rater Ethnicity, Rater Gender, Face Ethnicity, Face Gender, Expression and Motion. All *F* values have (1, 76) degrees of freedom.

The interaction between Expression and Rater Ethnicity showed the same pattern of preferences as found in Experiment 7. While both Caucasian and Japanese raters considered smiling faces to be more attractive than faces with neutral expression, this preference was stronger for Japanese raters (Caucasian raters – neutral: $\underline{M} = 3.64$, $\underline{SE} = .088$, positive: $\underline{M} = 3.95$, $\underline{SE} = .079$; Japanese raters – neutral: $\underline{M} = 3.34$, $\underline{SE} = .082$, positive: $\underline{M} = 4.02$, $\underline{SE} = .078$). Paired t-tests showed that the difference in ratings between neutral and positive expression conditions was significant for both Caucasian and Japanese raters (Caucasian raters: $\underline{t}\ (19) = -4.70$, $\underline{p} < .001$; Japanese raters: $\underline{t}\ (19) = -9.04$, $\underline{p} < .001$). These results are in line with the main effect of Expression, which showed that faces that were smiling were given higher ratings than faces that were not (positive: $\underline{M} = 3.99$, $\underline{SE} = .071$; neutral: $\underline{M} = 3.49$, $\underline{SE} = .078$; main effect of Expression: $\underline{F}\ (1, 76) = 64.35$, $\underline{p} < .001$.

Moving faces were given higher attractiveness ratings than non-moving faces (dynamic: $\underline{M} = 3.85$, $\underline{SE} = .078$; static: $\underline{M} = 3.63$, $\underline{SE} = .067$; main effect of Motion: $\underline{F}\ (1, 76) = 16.07$, $\underline{p} < .001$). Furthermore, an interaction between Expression and Motion was observed, demonstrating that when faces display a neutral expression, there was some difference in the attractiveness of moving compared to static faces (neutral dynamic: $\underline{M} = 3.53$, $\underline{SE} = .091$; neutral static: $\underline{M} = 3.45$, $\underline{SE} = .080$). On the other hand, with smiling faces, the enhancement in attractiveness for moving compared to static faces was larger still (positive dynamic: $\underline{M} = 4.16$, $\underline{SE} = .087$; positive static: $\underline{M} = 3.81$, $\underline{SE} = .079$). This pattern for enhanced attractiveness of dynamic faces when showing positive expression was also observed in Experiments 4 and 6.

Significant main effects were obtained for: 1) Rater Ethnicity; Caucasian raters were observed to give higher ratings than Japanese raters (Caucasian raters: $\underline{M} = 3.80$, $\underline{SE} = .077$; Japanese raters: $\underline{M} = 3.68$, $\underline{SE} = .071$; main effect of Rater Ethnicity: $\underline{F}\ (1, 76) = 4.36$, $\underline{p} < .05$); 2) Face Ethnicity; Caucasian faces were rated higher in attractiveness than Japanese faces (Caucasian faces: $\underline{M} = 3.97$, $\underline{SE} = .096$; Japanese faces: $\underline{M} = 3.50$, $\underline{SE} = .096$; main effect of Face Ethnicity, $\underline{F}\ (1, 76) = 11.78$, $\underline{p} < .001$); and 3) Face Gender; female faces were given higher attractiveness ratings than male faces, (female faces: $\underline{M} = 3.97$, $SE = .096$; male faces: $\underline{M} = 3.51$, $SE = .096$; main effect of Face Gender: $\underline{F}\ (1, 76) = 11.29$, $\underline{p} < .01$). However, these main effects are qualified by higher order interactions described below.

A 3-way interaction between Face Gender, Motion, and Rater Ethnicity showed interesting patterns suggesting sex-specific effects of Motion on attractiveness that differs for Japanese and Caucasian raters (see Figure 5.3). Looking at the mean ratings for Caucasian judges, male faces were considered less attractive when static than when moving (male faces – dynamic: $\underline{M} = 3.75$, $\underline{SE} = .120$, static: $\underline{M} = 3.47$, $\underline{SE} = .115$). This pattern was not found for female faces, as moving and static faces received similar ratings (female faces – dynamic: $\underline{M} = 4.01$, $\underline{SE} = .120$, static: $\underline{M} = 3.96$, $\underline{SE} = .115$). That the attractiveness of male faces is influenced more by motion than that of female faces (i.e., the male motion effect) is consistent with what was previously observed in Experiments 2 and 3. Looking at the ratings of Japanese judges, the sex-specific effect of motion seems to apply to female faces instead; while female faces were considered more attractive when moving than when static, a much smaller benefit of motion was observed for male faces (female faces – dynamic: $\underline{M} = 4.13$, $\underline{SE} = .118$, static: $\underline{M} = 3.75$, $\underline{SE} = .097$; male faces – dynamic: $\underline{M} = 3.49$, $\underline{SE} = .118$, static: $\underline{M} = 3.33$, $\underline{SE} = .097$). Paired t-

tests corrected for multiple comparisons (corrected alpha = .0125) support the above interpretation; that is, difference in ratings between dynamic and static conditions were significant only for Caucasian raters judging male faces and Japanese raters judging female faces (Caucasian raters – female faces: $\underline{t}$ (39) = .69, $\underline{p}$ = .497, male faces: $\underline{t}$ (39) = 2.86, $\underline{p}$ = .007; Japanese raters – female faces: $\underline{t}$ (39) = 4.38, $\underline{p}$ < .001, male faces: $\underline{t}$ (39) = 1.91, $\underline{p}$ = .063).

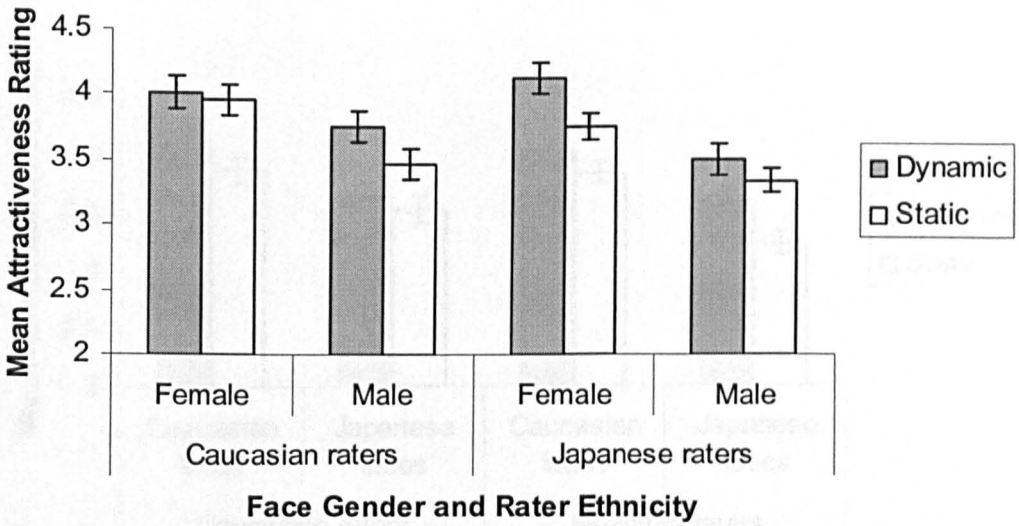


Figure 5.3. Face Gender x Motion x Rater Ethnicity interaction. (Error bars represent standard error)

Finally, the interaction of Face Ethnicity by Motion by Rater Ethnicity suggests that preferences for Motion are particularly strong for judgements of own-race faces (see Figure 5.4). Thus, for Caucasian faces, moving faces were considered more attractive than static faces by Caucasian raters to a greater extent than by Japanese raters (Caucasian faces: Caucasian raters – dynamic: $\underline{M}$ = 4.11, $\underline{SE}$ = .120, static: $\underline{M}$ = 3.89, $\underline{SE}$ = .115; Japanese raters – dynamic: $\underline{M}$ = 4.03, $\underline{SE}$ = .118, static: $\underline{M}$ = 3.85, $\underline{SE}$ = .097). Conversely, for Japanese faces, Japanese raters preferred moving over static faces to a greater degree than did Caucasian raters (Japanese faces: Japanese raters – dynamic: $\underline{M}$ = 3.59, $\underline{SE}$ = .118, static: $\underline{M}$ = 3.24,

SE = .097; Caucasian raters – dynamic: M = 3.65, SE = .120, static: M = 3.53, SE = .115). Paired t-tests corrected for multiple comparisons (corrected alpha = .0125) showed that the differences in ratings between dynamic and static conditions were significant only in own-race combinations of Face Ethnicity and Rater Ethnicity (Caucasian faces – Caucasian raters: t (39) = 2.87, p = .007, Japanese raters: t (39) = 2.42, p = .02; Japanese faces – Caucasian raters: t (39) = 1.11, p = .273, Japanese raters: t (39) = 3.76, p < .001).

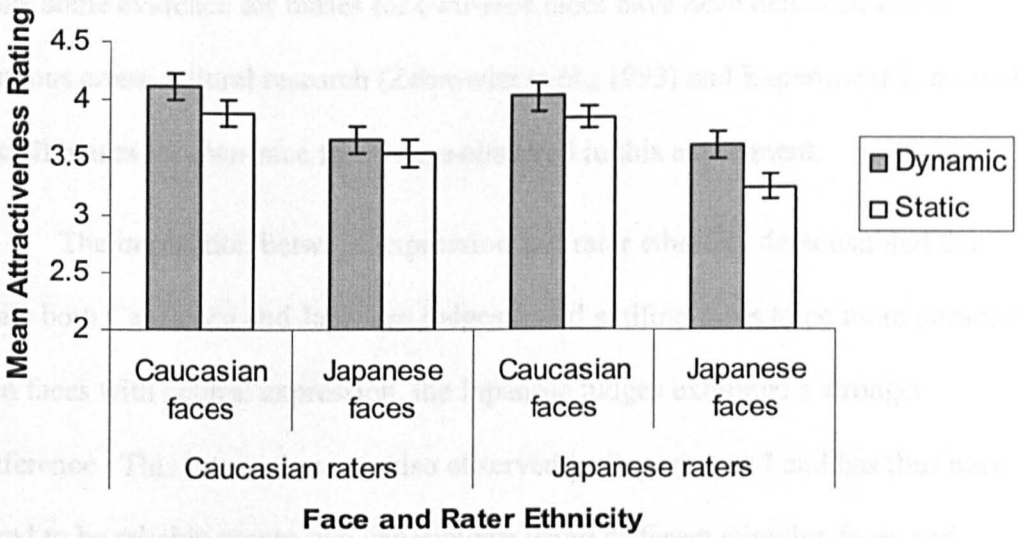


Figure 5.4. Face Ethnicity x Motion x Rater Ethnicity interaction. (Error bars represent standard error)

Female raters were also found to generally give higher attractiveness ratings than male raters (female raters: M = 3.80, SE = .066; male raters: M = 3.68, SE = .074; main effect of Rater Gender: F (1, 76) = 11.69, p < .01).

Discussion

The current study marks the first cross-cultural investigation of the attractiveness of facial motion and expression. Again, considerable agreement can be observed between the ratings of Caucasian and Japanese judges, as all significant effects involve preferences that were of the same direction. However, culture-

specific differences can be observed in the strength of the preferences for motion and expression.

Agreement between raters was observed in main effects for expression, motion, face gender and face ethnicity. Both Caucasian and Japanese raters generally have higher ratings of attractiveness to smiling expressions compared to neutral expressions, dynamic faces compared to static ones, female compared to male faces and Caucasian compared to Japanese faces. Regarding this last finding, while some evidence for biases for own-race faces have been demonstrated in previous cross-cultural research (Zebrowitz et al., 1993) and Experiment 7, no such overall biases for own-race faces were observed in this experiment.

The interaction between expression and rater ethnicity demonstrated that while both Caucasian and Japanese judges found smiling faces to be more attractive than faces with neutral expression, the Japanese judges exhibited a stronger preference. This interaction was also observed in Experiment 7 and has thus been found to be reliable across two experiments using different stimulus faces and different groups of Japanese raters. The greater preference for smiles shown by Japanese raters is inconsistent with Matsumoto and Kudoh's (1993) hypothesis that smiles would be negatively evaluated due to associations with negative emotions.

A possible explanation for the increased attractiveness of smiles for Japanese raters might be found in person perception literature highlighting differences between individualistic and collectivist cultures. Bond and Forgas (1984) found that Hong Kong Chinese raters were more responsive than Australian raters to conscientiousness and agreeableness in target persons. The authors define a conscientious target person to have "responsibly exercised guardianship over others' resources in the past" (Bond & Forgas, 1984, p. 348) and also suggest that

agreeableness is indicative of intentions to associate. In terms of the traits conducive to harmonious relationship when living in a collectivist culture, prosocial characteristics such as selflessness and submissiveness may also be important. These traits are better conveyed by smiling than neutral expressions (see Experiment 3 and 5) and thus may underlie why smiling faces are preferred to a greater degree by members of collectivist cultures, such as Japan.

The 3-way interactions between face ethnicity, motion, and rater ethnicity and between face gender, motion, and rater ethnicity yielded interesting sex-specific effects of motion on attractiveness judgements which apply to own-race faces. Caucasian ratings showed some evidence of the male motion effect, observed previously in Experiments 2 and 3. Japanese raters showed a similar sex-specific preference for motion, except their stronger preference was for moving female faces. Furthermore, it is interesting that both Caucasian and Japanese raters showed preferences for motion that were particular to own-race faces, which suggests that patterns of attractive motion may be culturally defined.

I have argued in previous chapters that motion is attractive for male faces because of the personality cues contained in motion. This possible explanation is based on sex differences in mate selection criteria derived from Trivers' (1972) parental investment theory; this implies that male attractiveness depends more on personality attributions while female attractiveness depends more on physical attractiveness. As such, this argument cannot explain the greater motion preference displayed by Japanese raters for *female* Japanese faces.

Experiment 5 showed a trend for female faces to be considered more dominant in static than in dynamic stimuli. Traditional Japanese culture has stereotypically involved moderate gender inequality, with women holding less

social power than men. Although the balance of power between genders has improved in modern Japan, this inequality still exists to a greater degree than in Western culture, and women generally have less power and lower status in modern society (Smith, 1987). Perhaps then the stronger preference for moving female faces by Japanese raters is attributable to a sex-typical norm for women to behave more submissively. This suggestion is only speculative, as it is uncertain whether Japanese raters attribute the same personality traits to moving faces as British participants in Experiment 5. Further investigation into this possibility would require collecting ratings of personality attributions alongside attractiveness ratings made by Japanese raters.

Finally, although the predicted interaction of rater ethnicity, motion and expression was not significant, the attractiveness of motion was found to differ with the type of expression displayed in an interaction of expression and motion. While moving faces are preferred over static faces in both positive and neutral expression conditions, this difference was greater when faces displayed positive expressions. This effect did not differ between the two groups of raters. This general Expression by Motion interaction cannot be explained by Japanese-specific cultural preference for prosocial expression of happiness. This interaction has been observed in previous experiments in this dissertation (Experiment 4; Experiment 6, male faces only) and may be due to differences in the type of movement in dynamic stimuli for positive and neutral conditions. The movement in Positive Dynamic stimuli is less repetitive, more expressive and generally, greater in amplitude than movement found in Neutral Dynamic stimuli.

It should also be noted that smiles in this experiment were not posed. Positive-static stimuli consisted of frames extracted from casual interviews in which

participants conversed freely. As such, the smiles in this experiment included both been Duchenne smiles (i.e., those taken during laughter) or social smiles. Nevertheless, the similar findings from Experiments 7 and 8 suggest that the type of smile does not make a difference to attractiveness preferences.

General Discussion

Consistent with previous cross-cultural studies of attractiveness (e.g., Cunningham et al., 1995; Perrett et al., 1994, 1998; Zebrowitz et al., 1993), the experiments in this chapter show overall consensus in attractiveness judgements. Neither experiment showed any own-race biases for overall judgements of attractiveness. In fact, Experiment 7 showed a crossover in preferences with other-race faces being given higher ratings of attractiveness.

Despite general agreement between Caucasian and Japanese raters in the direction of preferences, culture-specific differences existed in the degree of preference for motion and expression. In both experiments, positive expression was preferred by Caucasian raters and preferred to a greater degree by Japanese raters. Motion showed sex- and culture-specific enhancements of attractiveness in combination with some own-race bias. For Caucasian faces rated by Caucasian judges, motion increased male attractiveness to a greater degree than female attractiveness. On the other hand, for Japanese faces rated by Japanese judges, it was female attractiveness that was most positively affected by motion. This data suggests that male motion effect viewed here and in Experiments 2 and 3 may be culture-specific.

No evidence was found to support Matsumoto and Kudoh's (1993) hypothesis that smiles should be evaluated more negatively in Japanese culture than

in Western culture. Matsumoto and Kudoh predicted this may occur as a result of the Japanese use of smiles to mask negative emotions. To the contrary, the results from Experiments 7 and 8 showed smiles to be preferred by Japanese and Caucasian raters, suggesting that smiles are not tainted by negative emotion. Indeed, the original study upon which such display rules for negative emotions is based has also been called into doubt by Fridlund (1994) and no study has since been able to replicate Friesen's findings.

Japanese raters' greater preference for smiles was found to be reliable over two experiments using different stimulus faces and different raters. This phenomenon might be related to the collectivist nature of Japanese culture, which emphasizes group success over individual achievement. In such societies, it is likely that such prosocial expressions might be more attractive because they facilitate social interactions relationships and strengthen group bonds. Indeed, some evidence shows that individuals from collective cultures may display positive expressions more expressively than individuals from Western cultures. Scherer et al.'s (1988) study suggested Japanese individuals to be more expressive in their displays of happiness than American and European individuals. Similarly, to maintain group harmony, it is important not only to encourage the expression of emotions that would facilitate group harmony, but also to discourage the expression of emotions that would disrupt group cohesion. Scherer et al.'s findings also suggested that Japanese individuals were less expressive in showing sadness, fear and anger. Although not tested in this study, it would be expected that those negative expressions would be rated as less attractive by Japanese raters than by Caucasian raters.

Culture-specific differences were also found for motion. Caucasian raters were found to prefer motion more for male than female faces while Japanese raters preferred motion more for female than male faces. Also, an own-race bias for faces displaying motion was observed for Caucasian and Japanese raters. Ratings from Caucasian judges are consistent with the male motion effect found in Experiments 2 and 3, which were also obtained with Caucasian faces and raters. However, the Japanese preference for motion in female faces is unprecedented and further investigation is necessary before any firm conclusions about its cause can be made.

Regarding the male motion effect for Caucasian faces and raters, it is important to note that this effect has replicated with stimuli only 3 seconds in duration. At the end of Chapter 3, it was suggested that the decrease in the duration of dynamic stimuli from 10 to 3 seconds may have eliminated information necessary for the emergence of the male motion effect. Having replicated this effect with shorter stimuli, it would now appear that longer duration is not necessary and suggests that it may be the specific behaviours displayed in the dynamic stimulus that underlies the male motion effect.

In summary, the cross-cultural experiments in this chapter were the first to involve moving as well as expressive stimuli and their results showed that Japanese and Caucasian raters are more similar than dissimilar in their judgements of attractiveness. Minor cultural differences were observed in the degree of preference for expression, which may be linked to differences in individualistic-collectivistic orientation. Overall however, smiles were found to be more attractive than neutral expressions. Slight differences between different ethnic groups were also found for motion, suggesting that Caucasian raters and faces regard motion more favourably on male faces, consistent with the male motion effect found in previous

experiments; conversely, greater preferences for motion for female faces were observed for Japanese raters and faces. Thus, as in the foregoing cross-cultural research, it appears that ratings across cultures can be described as generally consistent, but with evidence of culture-specific differences.

Chapter 6: Review, Future Work and Conclusions

The experiments in this dissertation have centred on assessing the effects of expression and motion on evaluations of attractiveness. Previous attractiveness research has rarely used dynamic stimuli and thus, the use of moving, expressive stimuli marks an original and important aspect of the current set of studies. It is clear that both expression and motion can enhance attractiveness and that their effects can also be sex-specific. Such findings highlight the importance for future studies of attractiveness to use more ecologically valid stimuli.

Aside from the central focus on motion and expression, interesting results were also yielded regarding the attractiveness of sex-typicality in faces. Preferences were found for sex-typicality in female faces that are consistent with previous studies. Results also suggest that optimal male attractiveness may consist of both agreeable personality/behaviour and masculine appearance. These findings may help explain conflicting results in previous studies of sex-typicality and attractiveness and suggest the importance of personality attributions in evaluations of male attractiveness. Finally, experiments conducted cross-culturally produced results in line with the foregoing literature, demonstrating striking consistency in preferences for expression and motion that is tempered by slight culture-specific differences.

A review of effects found across experiments follows below, beginning with a focus on the effects of expression and motion and then turning to their influence on attractiveness in combination with sex-typicality, personality attributions, and cultural influence. Table 6.1 below shows the occurrence of effects across all experiments. Following the review of effects, suggestions for future work will be made.

	Experiment							
Effects	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Main effect of Motion	n/a	D>S	D>S	D>S		D>S	n/a	D>S
Main effect of Expression	P>N†	P>N†	P>N	P>N†	P>N		P>N	P>N
Motion x Face Gender interaction	n/a	F: D~S M: D>S	F: D~S M: D>S				n/a	F: D~S M: D >S (CM)
Expression x Face Gender interaction	F: P>N M: P~N	F: P>N M: P~N						
Expression x Motion interaction	n/a			N: S~D P:D>S		N: S>D P:D>S (M)	n/a	N: D~S P:D>S
Stimulus Set:	B	A	A	F	F	F	B/D	C/E

Table 6.1. Overview of effects on attractiveness ratings. Letters in brackets following effect indicate that effect was specific to a particular group of faces. All effects significant at $p < .05$, except $p < .10$ indicated by †.

Note: D – dynamic, S – static, F – female, M – male, P – positive (smiling), N – neutral, C – Caucasian, J – Japanese, r – raters, f- faces,

Positive Expression

Across experiments, positive expression consistently increased ratings of attractiveness, as can be seen in Table 6.1. Less consistent however was the specificity of this effect. In Experiments 1 and 2, the main effect of smiling was found to be driven by its influence on female faces in particular; in Experiments 4, 5, 7 and 8, positive expression was shown to have a general effect on both male and female faces; in Experiment 6, the effect of smiling was not significant for either male or female faces. Although the conditions under which positive expression affects ratings of female faces alone or male and female faces alike are ambiguous, most studies in this set of experiments show that smiling does increase attractiveness to some degree.

The mixed results in this set of experiments reflect the varied findings in foregoing literature on the attractiveness of smiles. Previous studies have shown smiles to have an enhancing effect on female faces exclusively (Schulman & Hoskins, 1987; Raines et al., 1990a; Rhodes et al., 1999), while others have shown this effect to apply to both male and female faces (Cunningham et al., 1990; Otta et al., 1996; Raines et al., 1990b). Other studies still show no difference in attractiveness ratings between smiling and non-smiling faces (Mueser et al., 1984; O'Doherty et al., 2003). Efforts were made in the design of experiments in this dissertation to address possible problematic issues in foregoing research. Nevertheless, the results from the current set of experiments still demonstrate expression to have both general and female-specific effects on attractiveness.

Let us consider the general effect of smiling on attractiveness from different theoretical perspectives reviewed in the introduction. At a perceptual level, it may be that effects arise from differences in configuration between smiling and non-smiling faces. Thus, perhaps the smiling configuration emphasizes particular characteristics in faces that are attractive. A smile generally emphasizes the width of the mouth and the roundness of the cheeks, but decreases eye size and can increase nose width and perceived chin length. Given that such characteristics are the opposite of characteristics found to be attractive in male and female faces (e.g., large eyes and prominent cheekbones for both males and females, small nose and chin for females; Cunningham, 1986; Cunningham et al., 1995), configurational differences of smiling compared to non-smiling faces do not seem likely to account for the attractiveness of smiles.

The attractiveness of smiling may have more to do with nonverbal communication. The emotions view and behavioural ecology perspective differ in

their definition of what this communication entails. An emotions view of emotional expression suggests that expressions reflect the true experience of a particular emotion. Ekman distinguishes between two types of smiles: the Duchenne (felt) smile and social (false) smiles. The former is characterized by activation of involuntary muscles around the eye and both involve the activation of muscles that cause the mouth corners to lift. The Duchenne smiles are thought to reflect felt happiness, while social smiles may be used in other situations, such as masking other emotions when being polite. The behavioural ecology approach suggests a more flexible interpretation of smiles. Under this approach, a smile may convey a multitude of meanings, dependent on the specific context in which it is displayed. Smiles may merely indicate politeness or friendliness as opposed to actual happiness. When smiles are shown under experimental conditions in which the context of an actor's utterance is removed, the meaning of a smile may be difficult to determine. Regardless of whether smiles are meant to express felt emotion or to serve more specific, context-based purposes, the smile appears to convey information important to social interactions. Perceived sociability itself has been linked to attractiveness (DePaulo et al., 1992), and perhaps the sociability signalled by a smile underlies the smile's effect on attractiveness.

Apart from the general effect of smiles on attractiveness, what causes smiles to affect the attractiveness of female faces in particular? It has been suggested that the female-specific effect of smiling might be a result of expectations for sex-typical behaviour. Indeed, smiling has been observed to be displayed more by women than by men under a number of different scenarios (LaFrance et al., 2003). As such, it has been suggested that failure to fulfil these expectations for behaviour may result in negative evaluations (Deutsch et al., 1987). Evidence for smiles as female-

typical behaviour was observed in experiments in this dissertation in which ratings of masculinity-femininity were collected; it was found in both Experiments 3 and 5 that smiling female faces were rated as more feminine than non-smiling female faces. That said however, in one of these studies, it was also found that smiling increased the perceived masculinity of male faces, suggesting that smiling may enhance sex-typicality more generally. Furthermore, the female smiling effect was not found in either of the experiments collecting masculinity-femininity ratings. Thus, results from different experiments provide evidence for the female-typicality of smiling and the attractiveness of female smiling faces, though these effects did not co-occur in any experiments. Given the varied results of the attractiveness of smiles in this set of experiments and the foregoing literature, future research is needed to identify what conditions are necessary to obtain general or sex-specific effects.

Motion

Previous studies have not directly assessed the influence of motion on the attractiveness of faces nor have they been able to determine whether factors of motion and expression interact. The experiments in this dissertation are the first to address these issues. As with findings for expression, it appears that motion is generally attractive, but that in some instances, motion may be sex-specific in its effects. As shown in Table 6.1, all experiments with moving stimuli bar one (Experiment 5) showed significant main effects of motion. In Experiments 2 and 3, the main effect is driven by the male-specific influence of motion on the attractiveness of male faces. In Experiment 8, the male motion effect can also be observed, but only for Caucasian raters when judging Caucasian male faces. Nevertheless, a main effect of motion being significant in 5 out of 6 possible

experiments suggests some general dynamic advantage for attractiveness. Having now established that motion appears to affect attractiveness ratings in a positive way, it is logical to enquire: what causes moving faces to be more attractive than static faces? There are several possible answers to this question.

At a perceptual level, the appeal of moving faces over static faces may arise from information about the face that becomes visible through motion. Research suggests that movement may aid with the recognition of objects (e.g., Stone, 1998) and that movement allows for the inference of depth from 3D structures (Mather, 1989). Moving faces may consequently convey information about facial structure, which may inform judgements about sex-typical characteristics. For example, the prominence of the cheekbones, brow ridge and chin differ characteristically for male and female faces (Merow & Broadbent, 1990). Thus, viewing moving images of faces may allow the judgement of such sex-typical characteristics to be made more accurately. This does not explain however why more accurate information about structure should necessarily lead to higher ratings for moving faces in general. If moving images allow structural information to be ascertained, then motion should benefit only those faces that possess sex-typical features (i.e., male/female faces possessing high/low protuberance of the brow ridge and chin). Instead however, preferences for motion of all males or all faces are observed in these experiments.

Preferences for motion may also be due to the fact that moving faces are more engaging than static faces by their nature. Our visual systems are attuned to detecting motion and thus, moving stimuli will be inherently more interesting than photographs. This increase in interestingness may lead to more positive evaluations in general. Consequently, it might be unsurprising that moving faces are given higher ratings of attractiveness than motionless faces. Yet, interestingness alone

cannot account for all of motion's effect on attractiveness judgements, as occurrences of the male motion effect showed that motion did not increase the attractiveness of female faces. If interestingness was the main reason for the increased attractiveness of moving faces, this should have been observed for male and female faces alike in all instances. Since the male motion effect was observed to occur several times and with two different stimulus sets and three rating groups, it appears that interestingness alone is not a sufficient explanation for the attractiveness of motion.

It may be that motion increases attractiveness for the information it can provide about personality traits, particularly those linked to sociability. Borkenau and Liebler (1992) found that personality trait ratings of unfamiliar persons were more accurate when viewing silent video clips than pictures, particularly for ratings of extraversion. According to the adjectives used in McCrae and Costa's (1987) study validating five-factor personality measures, personality traits such as "sociable", "talkative", "emotional" and "affectionate" were found to load highly on the factor of extraversion. As such, extraversion is closely related to expressiveness, which has also been suggested to be an attractive trait and defined as "the degree to which a person appears to other to be...open, and uninhibited," (DePaulo et al., 1992, p. 276). Expressive people may be particularly skilled socially and this social competence is considered attractive (DePaulo et al., 1992; Riggio et al., 1991). At a superficial level, dynamic stimuli allow movement to be displayed and thus, moving faces will appear more expressive than static faces, regardless of the individual expressiveness of each actor. Ratings of expressiveness in Experiment 3 support this, as actors viewed in dynamic stimuli are considered more expressive than those viewed in static stimuli. Thus, the preference for

motion may be a result of an inclination towards persons who appear to promise positive social interaction.

This partiality to socially-engaging stimuli might also underlie the interaction between expression and motion that was repeatedly observed in Experiments 4, 6 and 8. Dynamic, smiling faces were considered more attractive than static, smiling faces while the difference between moving and static faces was found either to be reversed in direction or non-existent when faces displayed a neutral expression. This interaction suggests that the positive effect of motion on attractiveness is particularly strong when faces are smiling. As discussed earlier, smiles can also signal sociability and thus, it may be that the additive effects of smiles and movement increase impressions of sociability and consequently, attractiveness.

Grammer and colleagues (2003) suggested that other information, related to symmetry and female hormone profiles, may underlie the attractiveness of moving faces. Both these factors are important to evaluations of mate value. Symmetrical motion may be attractive because it indicates movement efficiency that results from developmental stability. Qualitatively different movement from low- and high-estrogen females may advertise their fertility to males. Further investigation of this hypothesis requires correlations of measured symmetry and hormone levels with ratings of attractiveness.

It is also possible that particular aspects of the movement displayed in dynamic stimuli account for increases in attractiveness. During the Positive Dynamic conditions especially, movement patterns were idiosyncratic and may

contain particular gestures that may enhance attractiveness[11]. For instance, certain discrete gestures have been found to increase a person's attractiveness, such as prolonged eye contact and flirtatious glances as well as eyebrow flashes (Simpson et al., 1993; Mason et al., 2005). It is possible that the presence of such gestures within the dynamic stimuli might result in increased ratings of attractiveness. Behavioural coding for attractive gestures in the dynamic stimuli may bear this out.

Finally, motion was observed to affect only male faces in Experiments 2, 3 and 8. Thus, the male motion effect was found with two different stimulus sets and three different sets of raters, suggesting its moderate reliability. The specificity of motion's effect on male faces alone may be a result of differences in attractiveness criteria. A number of studies have shown that personality attributions have a greater influence on evaluations of male than female attractiveness (Buss, 1989; Feingold, 1992a). If motion conveys information about personality (suggested above to be primarily relevant to social aspects of personality, such as expressiveness; DePaulo et al., 1992), then evaluations of male faces will be more affected than those of female faces. The importance of sociability to attractiveness ratings of male faces will be discussed further in the personality attributions section below.

Sex-Typicality

In Experiment 6, the attractiveness of sex-typicality was investigated using dynamic stimuli. The masculinity-femininity of real faces was altered by 50% to create masculinized and feminized versions of the same face that displayed identical patterns of motion. This methodology is original in two aspects: it is the first time

[11] The differences between the behaviour across actors in the Positive Dynamic condition would have been greater for Experiments 2 and 3 as the video clips were longer and there was more opportunity for behaviour patterns to diverge. While individual differences in behaviour were reduced when stimulus duration was shortened to 3 seconds in remaining experiments, some scope for differences still exists.

that sex-typicality manipulations have been applied to moving faces as well as the first to caricature the sex-typicality of real as opposed to computer-averaged faces.

The attractiveness of sex-typicality for female faces was observed in Experiments 3, 5 and 6 and this finding is consistent with the existing literature (Brown et al., 1986; Perrett et al., 1998; Rhodes et al., 2000). Attractiveness was strongly, reliably and inversely related to ratings of masculinity in Experiments 3 and 5. Furthermore, when faces were manipulated in sex-typicality, female faces that were 50% feminized were greatly preferred to 50% masculinized faces in all conditions in Experiment 6. Thus, feminine female faces continue to reliably be considered attractive.

The experiments in this dissertation also suggest that sex-typicality is attractive for male faces. Experiments 3 and 5 showed that correlations between Masculinity and Attractiveness ratings were only significant (marginally in Experiment 5) in the Positive Dynamic condition. When male faces were manipulated in sex-typicality in Experiment 6, 50% masculinized faces were preferred in all conditions, but particularly so in the Positive Dynamic condition. Masculinized faces were also generally more attractive when smiling than when neutral. Thus, facial masculinity appears to be attractive, especially when faces are moving and smiling. The preference for masculine male faces is consistent with results from several previous studies (Brown et al., 1986; Johnston et al., 2001) but also stands in contrast to several studies showing preferences for slightly feminine male faces (Perrett et al., 1998; Rhodes et al., 2000).

The preference for sex-typicality in male and female faces may be accounted for by perceptual explanations, to some degree, as well as by adaptive mate choice hypotheses. Perceptually, an explanation of preferences for masculine/feminine

traits may arise from their utility in differentiating male from female faces (Enquist et al., 2002). The explanation from an adaptive mate choice perspective would propose that sex-typicality is attractive because it is important to judgements of mate value. That is, as high levels of testosterone have been suggested to be immunosuppressive (Folstad & Karter, 1992;Grossman, 1985) and evidence also exists implying high levels of oestrogen may also be detrimental (Grossman, 1985; Service, 1988), sex-typical facial traits may act as honest handicaps, signalling robust health. Furthermore, estrogenized features also convey youth and fertility, factors that increase a female's mate value.

Recall that the preference for masculinity was particularly strong for faces in the Positive Dynamic condition. Perceptual explanations would not predict that preferences for sex-typicality should vary across different behaviour patterns. I have argued this enhanced preference is a result of an optimal balance of facial masculinity (denoting health) with prosocial behaviour (denoting positive personality characteristics). Thus, sex-typical facial traits may also be attractive for the personality attributions such facial features convey and this will be addressed in the next section.

Personality Attributions

Ratings of personality traits (dominance, expressiveness, selflessness) were first collected in Experiment 3 to explore whether personality attributions might account for the sex-specific effects found in Experiments 1 and 2. While none of the ratings fulfilled this role, other intriguing relationships were observed, particularly for male faces. Ratings for male faces in the Neutral Static condition showed a correlation between attractiveness and selflessness, which in turn was

inversely related to masculinity. Thus, when male faces were not moving nor smiling, faces that appeared more selfless were also rated more attractive and less masculine. In the Positive Dynamic condition however, attractiveness was no longer related to selflessness, but was positively related to masculinity and expressiveness. Thus, it appears that masculine and expressive men are also those rated to be most attractive when they are moving and smiling. Experiment 5 showed a replication for the attractiveness-selflessness relationship in the Neutral Static condition and the attractiveness-expressiveness and attractiveness-masculinity (marginal) relationships in the Positive Dynamic condition. The personality attributions related to attractiveness for male faces differed in the Neutral Static and Positive Dynamic conditions. This is interpreted as a difference in criteria for male attractiveness over conditions, suggesting that male attractiveness depends on a balance of personality and masculine features.

Studies have shown that personality traits are of greater importance to evaluations of male than female attractiveness (Buss, 1989; Feingold, 1992a). This difference in criteria may originate from differences in parental investment (Trivers, 1972). This theory suggests the primary importance of a male's ability to share and provide resources in relation to offspring survival. Consequently, this resource-acquiring ability and willingness to invest is important to male mate value and may be closely linked to personality attributes.

Personality attributions have been used to explain the preference for feminized male faces. Perrett et al. (1998) found that masculine appearance was correlated with a number of negative personality traits and suggested that the avoidance of such negative traits might underlie preferences for slightly feminized male faces. Such a perspective suggests that mate value for males involves

evaluations of quality as a partner and father. Indeed, Perrett and colleagues found that masculinized male faces were judged to be of lesser quality as a parent. Thus, females may trade-off genetic benefits (as suggested by masculine features, e.g., Rhodes et al., 2003) for favourable personality traits.

Such trade-offs may only be necessary when using static stimuli because evaluations of health and personality must be made from the same source: facial structure. When faces are moving and expressive however, information about personality may be more accurately ascertained from behaviour (Borkenau & Liebler, 1992). Thus, if males are displaying prosocial behaviour, as in the Positive Dynamic condition, then masculine males might be most preferred because they display both good genes (from masculine appearance) and good partner traits (from behaviour). Masculinity is closely related to dominance, which demonstrates a similar need to be paired with positive personality traits to be considered attractive (Jensen-Campbell et al., 1995).

Given the possible importance of movement in attributions of personality, static stimuli omit information that is necessary when making mate selection judgements in real life. This highlights the need for further investigation of male attractiveness and the balance between personality and masculinity using moving, expressive stimuli.

Cultural Influence

Experiments 7 and 8 investigated the effects of expression and motion across Japanese and Caucasian raters and faces. The latter experiment marks the first study to investigate cross-cultural attractiveness using moving stimuli. Smiles were hypothesized by Matsumoto and Kudoh (1993) to be evaluated less positively

by Japanese raters due to their use in masking negative emotions in Japanese culture (Friesen, 1972, as cited in Fridlund, 1994). Motion might also have been evaluated differently across cultures because of differences in perceptions and displays of the intensity of emotional expressions (Scherer et al., 1988).

The results from both studies showed general consensus between ethnicities, as most preferences for motion and expression were found to occur in the same direction; both Japanese and Caucasian raters generally found smiling more attractive than neutral faces and moving faces more attractive than static faces. Matsumoto and Kudoh's (1993) hypotheses were not supported and any differences existing in perception and display of expression did not appear to affect attractiveness judgements.

Despite general agreement between Japanese and Caucasian raters, some discrepancies were observed in the degree of their preferences. Japanese raters demonstrated a greater preference for smiling than Caucasian raters. There was also some indication that this preference was particularly strong for ratings of Japanese faces. This finding was observed over both experiments, with different stimulus sets and rater groups and runs contrary to Matsumoto and Kudoh's (1993) hypothesis. I suggest that the heightened preference for smiles in Japanese culture may stem from collectivist culture values. As collectivist cultures emphasize the interdependence of its members, prosocial behaviour may be highly encouraged to maintain social harmony. In contrast, while smiles might still be positively evaluated in more individualistic cultures (as most Western cultures are), individual expression is put above group cohesion and thus, the necessity for prosocial behaviour to maintain social harmony may not be as great a concern and smiles may not be as highly regarded as in collectivist cultures.

Differences between Japanese and Caucasian raters in their preferences for motion were also observed. While the Caucasian raters showed the male motion effect for Caucasian faces, Japanese raters showed a preference for motion in female, Japanese faces. This result was unexpected. I have speculated that the Japanese preference for moving female faces may result from preferences for more submissive females (Smith, 1987), as Experiment 3 showed static faces to be considered more dominant than moving faces. It is uncertain however whether Japanese raters would ascribe the same level of submissiveness to moving faces as Caucasian raters did.

Suggestions for Future Work

Having touched on several factors which influence attractiveness, the experiments in this dissertation have highlighted a number of directions for further research. Some suggestions are made below:

Positive Expression – Duchenne smiles

Smiling has generally had a positive effect on attractiveness ratings, with some specificity to the attractiveness of female faces. One possible area of investigation is to see how much the sincerity of a smile may influence its attractiveness. Over the two cross-cultural experiments in Chapter 5, some attention was given to smiling faces that were displaying Duchenne smiles, usually characterized by activation of muscles surrounding the eyes and causing crinkling of the skin in that area. Matsumoto and Kudoh (1993) used Duchenne smiling in their study and made recommendations that social, non-Duchenne smiles may better approximate those used in real social interactions. The stimulus sets used in this dissertation were not filmed with any distinction between Duchenne or non-

Duchenne smiles in mind and nor were positive expression stimuli defined in this way. Thus, based on simple inspection of eye-crinkling of the smiling stimuli in Experiments 7 and 8, it appeared that stimulus sets contained both Duchenne and non-Duchenne smiles. Given that Duchenne and non-Duchenne (i.e., spontaneous or real smiles as opposed to posed or feigned smiles) smiles can be differentiated by people and more positive personality traits are attributed to people displaying Duchenne smiles (Frank, Ekman & Friesen, 1993), Duchenne smiling may account for differences in the effects of positive expression.

The possibility that Duchenne smiles might be considered more attractive than non-Duchenne smiles was informally investigated in an undergraduate student project. Video footage from Stimulus Set F was reviewed and frames were extracted to represent 3 conditions: Duchenne smiles (smile with eye crinkling), social smiles (smile without eye crinkling) and neutral (no expression). Stimuli were obtained for 51 faces. Participants saw all 51 faces, but each in only one condition and viewed the faces twice. After the first viewing, participants made attractiveness ratings and after the second viewing, participants indicated whether they believed the smile to be genuine or posed. While participants were able to identify the genuine smiles at a level significantly better than chance (71%), no significant differences were found between the mean attractiveness rating for Duchenne and non-Duchenne smiles. Furthermore, no significant differences were found between the mean attractiveness rating of either type of smile and the neutral condition. Thus, contrary to the general effect of smiling in the experimental chapters of this dissertation, smiling was not found to increase attractiveness of either male or female faces. Looking at the mean ratings themselves, social smiles

were rated most attractive, followed by the neutral condition, with genuine smiles actually rated as least attractive, though these differences were only slight.

These preliminary results suggest that Duchenne smiles are not rated any differently than non-Duchenne smiles. There were however a number of limitations to this study. Firstly, determination of the Duchenne smile was based on untrained observation of eye crinkling with smiles. More accurate distinctions could be made by enlisting the scrutiny of someone trained in Ekman's Facial Action Coding System, which teaches users how to identify the activation of specific muscle groups. Also, it may be that any differences in attractiveness between Duchenne and non-Duchenne smiles are more apparent when faces are moving. Certainly, the different types of smiles are distinguishable by dynamic aspects of duration and smoothness of execution. In a similar way, the influence of the attractiveness of each smile type may be more salient when being viewed in motion. Thus, future studies of Duchenne smiling and attractiveness should also make use of dynamic stimuli.

Finally, while the initial assumption in this project was that genuine smiles would be more attractive because they are sincere, posed smiles are commonly used in social interaction and, at least in Western cultures, may not be associated with negative connotations. Thus, it may be that ultimately, the distinction between Duchenne and non-Duchenne smiles is only physical and may not make a difference to attractiveness ratings.

Motion – Structural information, discrete behaviours and symmetry

Motion has generally had positive effects on attractiveness, but further research is needed to understand why this is so. One possibility raised earlier was

that of moving objects conveying more information about the physical structure of a face. If this were the case, it would mean it is not the idiosyncratic motion of face, but simply more information about the facial structure that underlies the increased attractiveness of moving faces. Male and female faces are sexually dimorphic in the relative protuberance of cheekbones and brow ridges and the accurate identification of such structures may increase the attractiveness rating for faces with appropriate sex-typical facial structure. A pilot study was conducted to investigate the attractiveness of facial structure. During the filming of Stimulus Set C, participants were asked to slowly rotate their heads from side to side, while maintaining a neutral expression. For each actor, three frames were extracted to create a multiple view static (MVS) condition; frames were taken when the actor was in profile facing left and right and when facing forward. The MVS condition allows the three-dimensional structure of the face to be perceived without any idiosyncratic motion. The three extracted frames were combined in the order left-forward-right and presented for 3 seconds (each frame presented for 1 second). The rated attractiveness of the MVS condition was compared to that of the neutral static and moving stimuli for the same face (each presented for 3 seconds). It was found that the MVS stimuli were rated higher than both the static and moving stimuli; the neutral static and dynamic stimuli were not significantly different.

These preliminary results suggest that structural information may be more important to the attractiveness of motion than idiosyncratic movement. It must be noted however that actors in the neutral dynamic condition do not show a great deal of idiosyncratic movement. Such movement is more commonly found in the positive dynamic condition. Indeed, the presence of expression by motion interactions showed that the influence of motion was sometimes specific to faces

with positive expression. Thus, it is still unclear whether structural information itself could account for the attractiveness of motion. Further research should employ similar stimuli with positive expressions to investigate whether structural information (MVS condition) might be more attractive than idiosyncratic movement (positive dynamic condition). Subsequent studies may also collect 3D measurements of actors' faces to see whether the difference in attractiveness ratings between moving and static faces correlate with factors such as cheekbone and brow ridge prominence. If motion conveys 3D information, this should be particularly beneficial for the attractiveness of those faces that possess attractive sex-typical facial structure.

Different experimental paradigms could also be used to separate the influence of structure from that of motion itself. Although the same faces were used as controls across all conditions in all experiments, it is still not certain whether the increase in attractiveness for dynamic stimuli is due to the motion displayed by the actor, or if the motion simply allows more of the structure to be viewed. To separate the influence of structure from movement, future studies could utilize point light displays or translate motion between different faces. Point light displays involve the motion of light points attached to landmark points on the face. While some structural information is still available through the configuration of the points, this method reduces the amount of structural information available and allows the effect of facial movement to be more prominent. A more sophisticated means of separating movement from structure is to translate motion across different faces. Such a technique allows complete control of structure, permitting the effect of identical movement patterns to be evaluated on number of different faces. This may help to identify whether attractive patterns of motion exist.

If investigation showed that individual patterns of movement are found to underlie attractiveness, the question still remains: what is it about motion that increases attractiveness? In the foregoing review of effects, various answers were suggested. It could be that moving stimuli contain certain discrete gestures that increase the attractiveness of the displayer. Although the experimental paradigm used in the present dissertation is not interactive, it is still possible that the display of gestures that convey acceptance or romantic interest may still affect the evaluation of the displayer. Such gestures include eyebrow flashes (Simpson et al., 1993) and gaze shifts towards the viewer (Mason et al., 2005). Thus, coding such behaviours in the stimuli used in this dissertation could be conducted to see whether the occurrence of such behaviours is related to each actor's rated attractiveness. This process may yield particularly interesting data for male stimuli, as on several occasions, the effects of motion on attractiveness were specific to male faces.

Discussion above has also highlighted the possibility that the symmetrical nature of the movement pattern may indicate something about the developmental stability and consequently, health of the displayer. For women, it may reveal hormonal status, which would suggest certain movements may be particularly important to male raters. Future research could investigate whether the symmetry of movement patterns is correlated with attractiveness ratings. If so, it may be that information regarding health may motivate the increase in attractiveness of moving faces, as would be consistent with adaptive mate choice hypotheses.

Sex-Typicality – Manipulation levels

Experiments in this dissertation suggest that the attractiveness of sex-typicality differs in its specificity for male and female faces. While femininity was

preferred in all conditions of motion and expression for female faces, there is some indication that preferences for masculinity are stronger when males are moving and smiling. Previous studies have shown preferences for both masculinized and feminized male faces. Similar to studies finding preferences for the latter, the experiments in this dissertation show that when using neutral static stimuli, attractiveness is linked to agreeable personalities, though no preferences for feminized male faces themselves were found.

It is possible that such preferences were not yielded because of the level of sex-typical manipulation used in Experiment 6. Attractive male faces in some previous studies has been found to be only somewhat feminine (Perrett et al., 1998; Rhodes et al., 2000) but at a lesser level of feminization (greatest was 33%). Thus, the 50% feminized male faces in Experiment 6 may have been too feminine to be considered attractive, causing the masculinized faces to be preferred by default. Given the masculinity-agreeableness balance suggested to explain specific preferences of masculinity for male faces showing prosocial behaviour, a concomitant prediction would be that, without overt behaviour demonstrating agreeableness in the neutral and static conditions, feminized features (which are associated with more favourable personality attributes) should be preferred. This was not yielded in the current set of studies, perhaps due to coarseness of the manipulation levels used. Future research using sex-typical manipulation should be undertaken with graduated levels of manipulation to provide a more sensitive measure of how much sex-typicality is optimally attractive in male faces.

The coding of behaviour suggested above for further research into motion might also provide evidence in favour of the masculinity-agreeableness balance hypothesis. It would be interesting to see whether masculine males showing a

particularly high proportion of agreeable behaviours (e.g., time spent smiling, nodding, laughing) are found to be more attractive than those masculine males displaying fewer such behaviours.

Cultural Influence – Individualism vs. Collectivism and Culturally Valued Traits

The cross-cultural experiments showed that Japanese and Caucasian raters generally agreed on the attractiveness of expression and motion for faces of both ethnicities. That said, some minor differences were observed between raters; specifically, Japanese raters tended to prefer smiles to a greater degree than Caucasian raters. Japanese raters may also favour motion more in female faces than male faces, which stands in contrast to Caucasian raters' preference for motion in male faces.

I have speculated above that differences in attractiveness ratings may stem from cultural differences in the estimation of smiles or movement. It was suggested that smiles may be particularly favoured in collectivist cultures where such prosocial behaviour will act to encourage cohesiveness. In each culture however, each individual subscribes to the values of their culture to a different degree and thus, while Japanese culture may in general be more collectivist than Western culture, future research could test this hypothesis more accurately by using inventories to measure participants' subscription to individualist vs. collectivist values. Then, the attractiveness preferences of individualists compared to collectivists could be compared, with the prediction that collectivists should prefer smiles more.

Regarding the differences in preference for motion, I speculated that such a preference for female motion by Japanese raters may be linked to gender roles in

Japanese culture. There is some evidence to suggest that modern Japanese culture may be characterized by greater gender inequality than modern Western culture. The personality trait ratings collected in Experiment 5 suggested that moving female faces were considered more submissive, or less dominant, than static female faces. Thus, if the same attributions are made by Japanese raters, it is possible that motion is valued more highly for women in Japanese culture because dominance is not considered appropriate in the Japanese female gender role. Future research could investigate this conjecture by collecting ratings of dominance/submissiveness along with personality attributions. Of course, it is not certain that Japanese raters will necessarily attribute the same personality attributions to motion that Caucasian raters did. Thus, alongside dominance/submissiveness ratings, other ratings of other traits potentially important in Japanese culture should also be collected.

Finally, as a more general issue, the current work may be extended by using different methodologies to evaluate attractiveness. The experiments in this dissertation collected attractiveness ratings, in line with much of the previous attractiveness research. While such ratings have been shown to be rated with high inter-rater reliability, there is the possibility that individual raters may use the rating scale differently. Despite being instructed to use the whole scale for their judgements, there is still the possibility that some participants may use only the middle section of the scale while others may favour extreme ratings. In order to eliminate this complication in future, faces could be ranked for attractiveness or reaction times could be collected for memory of attractive/unattractive faces from brief presentations.

Conclusions

The experiments in this dissertation have shown that there is information in expression and motion that is relevant to attractiveness judgements. Expression and motion have been observed to be both sex-specific and more general in their effects. Their influence on attractiveness suggests the inadequacies in using of neutral, static stimuli in obtaining ecologically valid results, as information relevant to attractiveness judgements, particularly for male faces, is absent in such stimuli.

Apart from the main goal to increase the ecological validity of stimuli with moving and expressive stimuli, it was also of interest to see how ratings of sex-typicality and personality attributions were influenced by motion and expression. The experiments in this dissertation yielded interesting effects regarding sex-typicality, which were consistent with foregoing research on female faces and offered a possible explanation for conflicting results in research focusing on male faces.

While the experiments have made a case for further study of motion and expression in attractiveness research, it has only scratched the surface regarding what underlies the influence of these factors. Future work will be needed to continue to investigate the sex-specificity of the effects of motion and expression and to examine how other factors, such as personality, perceptual factors and mate value indicators may help to explain the benefits of motion and expression on attractiveness.

The use of expressive, moving stimuli in this dissertation has constituted an attempt to increase the richness of stimuli without sacrificing experimental control. It is hoped that future work employing realistic stimuli will help to bring us closer to understanding why beautiful faces are captivating..

References

Adams, R. B, & Kleck, R. E. (2003). Perceived gaze direction and the processing of facial displays of emotion. *Psychological Science, 14*, 644-647.

Albright, L., Kenny, D. A., & Malloy, T. E. (1988). Consensus in personality judgements at zero acquaintance. *Journal of Personality and Social Psychology, 55,* 387-395.

Alley, T. R., & Cunningham, M. R. (1991). Averaged faces are attractive, but very attractive faces are not average. *Psychological Science, 2,* 123-125.

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and Clinical Psychology, 42,* 155-62.

Bente, G., Feist, A., & Elder, S. (1996). Person perception effects of computer-simulated male and female head movement. *Journal of Nonverbal Behaviour, 20,* 213-228.

Berry, D. (1990). What can a moving face tell us? *Journal of Personality and Social Psychology, 58,* 1004-1014.

Berry, D. (2000). Attractiveness, attraction, and sexual selection: Evolutionary perspectives of the form and function of physical attractiveness. *Advances in Experimental Social Psychology, 32,* 273-342.

Berry, D. S., & Miller, K. M. (2001). When boy meets girl: Attractiveness and the five-factor model in opposite-sex interactions. *Journal of Research in Personality, 35,* 62-77.

Bond, M. H., & Forgas, J. P. (1984). Linking person perception to behavior intention across cultures: The role of cultural collectivism. *Journal of Cross-Cultural Psychology, 15,* 337-352.

Booth, A., & Dabbs, J. M. (1993). Testosterone and men's marriages. *Social Forces, 72,* 463-477.

Borkenau, P., & Liebler, A. (1992). Trait inferences: Sources of validity at zero acquaintance. *Journal of Personality and Social Psychology, 62,* 645-657.

Brown, T. A., Cash, T. F., & Noles, S. W. (1986). Perception of physical attractiveness among college students: selected determinants and methodological matters. *Journal of Social Psychology, 126,* 305-316.

Burton, A. M., Bruce, V., & Dench, N. (1993). What's the difference between men and women? Evidence from facial measurement. *Perception, 22,* 153-176.

Buss, D. M. (1990). International preferences in selecting mates: A study of 37 cultures. *Journal of Cross-Cultural Psychology, 21,* 5-47.

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses in 37 cultures. *Behavioral and Brain Sciences, 12,* 1-49.

Carli, L. L., LaFleur, S. J., & Loeber, C. C. (1995). Nonverbal behavior, gender, & influence. *Journal of Personality and Social Psychology, 68,* 1030-1041.

Cunningham, M. R. (1986). Measuring the physical in physical attractiveness: Quasi-experiments on the sociobiology of female facial beauty. *Journal of Personality and Social Psychology, 50,* 925-935.

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

Cunningham, M. R., Roberts, A. R., Barbee, A. P., Druen, P. B., & Wu, C. H. (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.

Darwin, C. (1859). *On the origin of species by means of natural selection.* Retrieved June 14, 2005, from http://charles-darwin.classic-literature.co.uk/on-the-origin-of-species.

Darwin, C. (1871). The descent of man and selection in relation to sex. Retrieved June 14, 2005, from http://charles-darwin.classic-literature.co.uk/the-descent-of-man.

Darwin, C. (1872). *The expressions of the emotions in man and animals. Animals.* Retrieved Feb 20, 2005, from http://charles-darwin.classic-literature.co.uk/the-expression-of-emotion-in-man-and-animals.

DePaulo, B. M., Blank, A. L., Swain, G. W., & Hairfield, J. G. (1992). Expressiveness and expressive control. *Personality and Social Psychology Bulletin, 18,* 276-285.

Dermer, M., & Thiel, D. L. (1975). When beauty may fail. *Journal of Personality and Social Psychology, 31,* 1168-1176.

Deutsch, M., LeBaron, D., & Fryer, M. M. (1987). What is in a smile?. *Psychology of Women Quarterly, 11,* 341-352.

Dion, K. (2002). Cultural perspectives on facial attractiveness. In G. Rhodes & L. A. Zebrowitz (Eds.) *Facial Attractiveness: Evolutionary, Cognitive and Social Perspectives* (pp. 239-260). Westport, CT: Ablex.

Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology, 24,* 285-290.

Dovidio, J. F., & Ellyson, S. L. (1982). Decoding visual dominance: Attributions of power baed on relative percentages of looking while speaking and looking while listening. *Social Psychology Quarterly, 45,* 106-113.

Eagly, A. H., & Ashmore, R. D., Makhijani, M. G., & Longo, L. C. (1991). What is beautiful is good, but...: A meta-analytic review of research on the physical attractiveness stereotype. *Psychological Science, 110,* 109-128.

Ekman, P. (1972). Universals and cultural differences in facial expressions of emotion. In J. Cole (Ed.), *Nebraska Symposium on Motivation, 1971,* (pp. 207-283). University of Nebraska Press.

Ekman, P., & Friesen, W. V. (1975). *Unmasking the face: a guide to recognizing emotions from facial clues* (pp. 21-33). London: Prentice-Hall.

Ekman, P., & Friesen, W. V. (1982). Felt, false and miserable smiles. *Journal of Nonverbal Behavior, 6,* 238-252.

Ekman, P., Friesen, W. V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatzis, I., Heider, K., Krause, R., LeCompte, W. A., Pitcairn, T., Ricci-Bitti, P. E., Scherer, K., Tomita, M., & Tzavaras, A. (1987). Universals and cultural differences in the judgments of facial expressions of emotion. *Journal of Personality and Social Psychology, 53,* 712-717.

Ekman, P., Sorenson, E. R., & Friesen, W. V. (1969). Pan-cultural elements in facial displays of emotion. *Science, 164,* 86-88.

Enlow, D. H. (1990). Faces. In D. H. Enlow (Ed.), *Facial Growth,* (3rd. ed., pp. 1-24). Philadelphia: Saunders.

Enquist, M., & Arak, A. (1993). Selection of exaggerated male traits by female aesthetic sense. *Nature, 361,* 446-8.

Enquist, M., & Arak, A. (1994). Symmetry, beauty & evolution. *Nature, 372,* 169-172.

Enquist, M., Ghirlanda, S., Lundqvist, D., & Wachtmeister, C. A. (2002). An ethological theory of attractiveness. In G. Rhodes & L. A. Zebrowitz (Eds.), *Facial Attractiveness: Evolutionary, cognitive and social perspectives,* (pp. 127-152). Westport, CT: Ablex.

Enquist, M., & Johnstone, R. A. (1997). Generalization and the evolution of symmetry preferences. *Proceedings of the Royal Society of London, Series B, 264,* 1345-1348.

Feingold, A. (1992a). Gender differences in mate selection preferences: A test of the Parental Investment Model. *Psychological Bulletin, 112,* 125-139.

Feingold, A. (1992b). Good-looking people are not what we think. *Psychological Bulletin, 111,* 304-341.

Fellous, J. M. (1997). Gender discrimination and prediction on the basis of facial metric information. *Vision Research, 37,* 1961-1973.

Folstad, I., & Karter, A. J. (1992). Parasites, bright males and the immunocompetence handicap. *American Naturalist, 139,* 603-622.

Frable, D. E. S. (1987). Sex-typed execution and perception of expressive movement. *Journal of Personality and Social Psychology, 53,* 391-6.

Frank, M. G., Ekman, P., & Friesen, W. V. (1993). Behavioral markers and recognizability of the smile of enjoyment. *Journal of Personality and Social Psychology, 64,* 83-93.

Fridlund, A. (1994). *Human Facial Expression: An Evolutionary View.* San Diego: Academic Press.

Gangestad, S. W., & Buss, D. M. (1992). Pathogen prevalence and human mate preference. *Ethology & Sociobiology, 14,* 89-96.

Gangestad, S.W., Simpson, J. A., Cousins, A. J., Garver-Apgar, C. E., & Christensen, P. N. (2004). Women's preferences for male behavioral displays change across the menstrual cycle. *Psychological Science, 15,* 203-207.

Goldstein, A. G., & Papageorge, J. (1980). Jugdements in facial attractiveness in the absence of eye movements. *Bulletin of the Psychonomic Society, 15,* 269-270.

Grammer, K., Filova, V., & Fieder, M. (1997). The communication paradox and possible solutions: Towards a radical empiricism. In Schmitt, A., Atzwanger, K., Grammer, K., & Schafer, K. (Eds.), *New Aspects of Human Ethology* (pp. 91-120). New York: Plenum Press

Grammer, K., Fink, B., Møller, A. P., & Thornhill, R. (2003). Darwinian aesthetics: sexual selection and the biology of beauty. *Biology Review, 78,* 385-407.

Grossman, C. J. (1985). Interactions between the gonadal steriods and the immune system. *Science, 227,* 257-261.

Halberstadt, J., & Rhodes, G. (2000). The attractiveness of nonface averages: implications for an evolutionary explanation of the attractiveness of average faces. *Psychological Science, 11,* 285-289.

Hampson, E., & Kimura, D. (1988). Reciprocal effects of hormonal fluctuations on human motor and perceptual-spatial skills. *Behavioral Neuroscience, 102,* 456-459.

Hill, H., & Johnston, A. (2001). Categorizing sex and identity from the biological motion of faces. *Current Biology, 11,* 880-885.

Hosoda, M., Stone-Romero, E. F., & Coats, G. (2003). The effects of physical attractiveness on job-related outcomes: A meta-analysis of experimental studies. *Personnel Psychology, 56,* 431-462.

Jensen-Campbell, L. A., Graziano, W. G., & West, S. G. (1995). Dominance, prosocial orientation and female preferences: Do nice guys really finish last? *Journal of Personality and Social Psychology, 68,* 427-440.

Johnston, V. S., Hagel, R., Franklin, M., Fink, B., & Grammer, K. (2001). Male facial attractiveness: Evidence for hormone-mediated adaptive design. *Evolution and Human Behaviour, 22,* 251-267.

Johnston, V. S., & Franklin, M. (1993). Is beauty in the eye of the beholder? *Ethology & Sociobiology, 14,* 183-199.

Jones, D. (1996). Five populations. In D. Jones, *Physical attractiveness and the theory of sexual selection,* (pp. 45-64). University of Michigan Press.

Kalick, S. M., Zebrowitz, L. A., Langlois, J. H., & Johnson, R. M. (1998). Does human facial attractiveness honestly advertise health?: Longitudinal data on an evolutionary question. *Psychological Science, 9,* 8-13.

Kampe, K. K. W., Frith, C. D., Dolan, R. J., & Frith, U. (2001). Reward value of attractiveness and gaze. *Nature, 413,* 589.

Keating, C. F. (1985). Gender and the physiognomy of dominance and attractiveness. *Social Psychology Quarterly, 48,* 61-70.

Keating, C. F., & Doyle, J. (2002). The faces of desirable mates and dates contain mixed social status cues. *Journal of Experimental Social Psychology, 38,* 414-424.

Kenny, D. A., Horner, C., Kashy, D. A., & Chu, L. C. (1992). Consensus at zero acquaintance: Replication, behavioral cues and stability. *Journal of Personality and Social Psychology, 62,* 88-97.

LaFrance, M., Hecht, M. A., & Paluck, E. (2003). The contingent smile: A meta-analysis of sex differences in smiling. *Psychological Bulletin, 129,* 305-334.

Lander, K., Christie, F., & Bruce, V. (1999). The role of movement in the recognition of famous faces. *Memory and Cognition, 27,* 974-985.

Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin, 126,* 390-423.

Langlois, J. H., & Roggman, L. A. (1989). Attractive faces are only average. *Psychological Science, 1,* 115-121.

Langlois, J. H., Roggman, L. A., Casey, R. J., Ritter, J. M., 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., & Rieser-Danner, L. A. (1990). Infants' differential social responses to attractive and unattractive faces. *Developmental Psychology, 26,* 363-369.

Little, A. C., Burt, D. M., Penton-Voak, I., & Perrett, D. I. (2001). Self-perceived attractiveness influences human female preferences for sexual dimorphism and symmetry in male faces. *Proceedings of the Royal Society of London, Series B, 268,* 1-6.

Little, A. C., & Jones, B. C. (2003). Evidence against perceptual bias views for symmetry preferences in human faces. *Proceedings of the Royal Society of London, Series B, 270,* 1759-1763.

Marcus, D. K., & Miller, R. S. (2003). Sex differences in judgments of physical attractiveness: A social relations analysis. *Personality and Social Psychology Bulletin, 29,* 325-335.

Mason, M. F., Tatkow, E. P., & McCrae, C. N. (2005). The look of love: Gaze shifts and person perception. *Psychological Science, 16,* 236-239.

Mather, G. (1989). Early motion processes and the kinetic depth effect. *Quarterly Journal of Experimental Psychology, 41A,* 183-198.

Matsumoto, D. (1996). *Unmasking Japan: Myths and realities about the emotions of the Japanese.* Stanford University Press .

Matsumoto, D., & Kudoh, T. (1993). American-Japanese cultural differences in attributions of personality based on smiles. *Journal of Nonverbal Behavior, 17,* 231-243.

Mazur, A., & Booth, A. (1998). Testosterone and dominance in men. *Behavioral and Brain Sciences, 21,* 353-397.

McArthur. L. Z., & Baron, R. M. (1983). Toward an ecological theory of social perception. *Psychological Review, 90,* 215-238.

McCoun, R. J. (1990). The emergence of extralegal bias during jury deliberation. *Criminal Justice and Behavior, 17,* 303-314.

McCrae, R. R., & Costa Jr., P. T. (1987). Validation of five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52,* 81-90.

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,* 151-158.

Merow, W., & Broadbent, B. (1990). Cepahlometrics. In D. H. Enlow (Ed.), *Facial Growth* (3rd ed., pp. 346-395). Philadelphia :Saunders.

Møller, A. P. (1999). Asymmetry as a predictor of growth, fecundity and survival. *Ecology Letters, 2,* 149-156.

Mueser, K .T., Grau, B. W., Sussman, S., & Rosen, A. J. (1984). You're only as pretty as you feel: Facial expression as a determinant of physical attractiveness. *Journal of Personality and Social Psychology, 46,* 469-478.

O'Doherty, J., Winston, J., Critchley, H., Perrett, D., Burt, D. M., & Dolan, R. J. (2003). Beauty in a smile: The role of the medial orbitofrontal cortex in facial attractiveness. *Neuropsychologia, 41,* 147-155.

Otta, E., Abrosio, F. F. E., & Hoshino, R. L. (1996). Reading a smiling face: Messages conveyed by various forms of smiling. *Perceptual & Motor Skills, 82,* 1111-1121.

Penton-Voak, I. S., Jacobson, A., & Trivers, R. (2004). Populational differences in attractiveness judgements of male and female faces: Comparing British and Jamaican samples. *Evolution and Human Behavior, 25,* 355-370.

Penton-Voak, I. S., Jones, B. C., Little, A. C., Baker, S., Tiddeman, B., Burt, D. M., & Perrett, D. I. (2001). Symmetry, sexual dimorphism in facial proportions and male facial attractiveness. *Proceedings of the Royal Society of London, Series B, 268,* 1617-1623.

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., Burt, D. M., Penton-Voak, I. S., Lee, K. J., Rowland, D. A., & Edwards, R. (1999). Symmetry and human facial attractiveness. *Evolution and Human Behaviour, 20,* 295-307.

Perrett, D. I., Lee, K. J., Penton-Voak, I. S., 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.

Perrett, D. I., May, K. A., & Yoshikawa, S. (1994). Facial shape and judgements of female attractiveness. *Nature, 368,* 239-242.

Perrett, D. I., Penton-Voak, I. S., Little, A. C., Tiddeman, B. P., Burt, D. M., Schmidt, N., Oxley, R., Kinloch, N., & Barrett, L. (2002). Facial attractiveness judgements reflect learning of parental age characteristics. *Proceedings of the Royal Society of London, Series B, 269,* 873-880.

Raines, R. S., Hechtman, S. B., & Rosenthal, R. (1990a). Nonverbal behavior and gender as determinants of physical attractiveness. *Journal of Nonverbal Behavior, 14,* 253-267.

Raines, R. S., Hechtman, S. B., & Rosenthal, R. (1990b). Physical attractiveness of face and voice: Effects of positivity, dominance and sex. *Journal of Applied Social Psychology, 20,* 1558-1578.

Rhodes, G., Chang, J., Zebrowitz, L. A., & Simmons, L .W. (2003). Does sexual dimorphism in human faces signal health? *Proceedings of the Royal Society of London, Series B (supplement), 270,* S93-S95.

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.

Rhodes, G., Proffitt, F., Grady, J. M., & Sumich, A. (1998). Facial symmetry and the perception of beauty. *Psychonomic Bulletin and Review, 5,* 659-669.

Rhodes, G., Sumich, A., & Byatt, G. (1999). Are average facial configurations attractive only because of their symmetry? *Psychological Science, 10,* 52-58.

Rhodes, G., Yoshikawa, S., Clark, A., Lee, K., McKay, R., & Akamatsu, S. (2001). Attractiveness of facial averageness and symmetry in non-Western cultures: In search of biologically based standards of beauty. *Perception, 30,* 611-625.

Rhodes, G. & Zebrowitz, L. A. (Eds.). (2002). *Facial Attractiveness: Evolutionary, cognitive and social* perspectives. Westport, CT: Ablex.

Riggio, R. E. (1986). Assessment of basic social skills. *Journal of Personality and Social Psychology, 51,* 649-660.

Riggio, R. E., Widaman, K. F., Tucker, J. S., & Salinas, C. (1991). Beauty is more than skin deep: Components of attractiveness. *Basic and Applied Social Psychology, 12,* 423-439.

Sadalla, E. K., Kenrick, D. T., & Vershure, B. (1987). Dominance and heterosexual attraction. *Journal of Personality and Social Psychology, 52,* 730-738.

Samuels, C. A., Butterworth, G., Roberts, T., Graupner, L., & Hole, G. (1994). Facial aesthetics: babies prefer attractiveness to symmetry. *Perception, 23,* 823-831.

Santos, I., & Young, A. (2004). Perceptual bases of social influences from faces. *Proceedings of the Experimental Psychology Society, Lancaster Meeting,* 17.

Scheib, J. E., Gangestad, S. W., & Thornhill, R. (1999). Facial attractiveness, symmetry and cues to good genes. *Proceedings of the Royal Society of London, Series B, 266,* 1913-1917.

Scherer, K., Matsumoto, D., Wallbott, H., & Kudoh, T. (1988). Emotional experience in cultural context: A comparison between Europe, Japan, and the United States. In K. Scherer (Ed.), *Facets of emotion: Recent research* (pp. 5-30). Hillsdale, NJ: Erlbaum.

Schulman, G. I., & Hoskins, M. (1986). Perceiving and male versus the female face. *Psychology of Women Quarterly, 10,* 141-154.

Service, R. F. (1998). New role for oestrogen in cancer? *Science, 279,* 1631-1633.

Simpson, J. A., Gangestad, S. W., & Biek, M. (1993). Personality and nonverbal social behaviour: An ethological perspective of relationship initiation. *Journal of Experimental Social Psychology, 29,* 434-461.

Simpson, J. A., Gangestad, S. W., Christensen, P. N., & Leck, K. (1999). Fluctuating asymmetry, sociosexuality and intrasexual competitive tactics. *Journal of Personality and Social Psychology, 76,* 159-172.

Smith, R. J. (1987). Gender inequality in contemporary Japan. *Journal of Japanese Studies, 13,* 1-25.

Stone, J. V. (1998). Object recognition using spatiotemporal signatures. *Vision Research, 38,* 947-951.

Swaddle, J. P., & Cuthill, I. (1995). Asymmetry and human facial attractiveness: symmetry may not always be beautiful. *Proceedings of the Royal Society of London, Series B, 261,* 111-116.

Symons, D. (1979). Sexual choice. In D. Symons, *The evolution of human sexuality,* (pp. 166-205). Oxford University Press.

Symons, D. (1994). Beauty is in the adaptations of the beholder: The evolutionary psychology of human female sexual attractiveness. In P. R. Abramson & S. D. Pinkerton, S. D. (Eds.), *Sexual Nature/Sexual Culture* (pp. 80-118). University of Chicago Press.

Tanaka, J. W., & Farah, M. J. (1993). Parts and wholes in face recognition. *Quarterly Journal of Experimental Psychology, 46A,* 225-245.

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

Thornhill, R., & Gangestad, S. W. (1993). Human facial beauty: Averageness, symmetry & parasite resistance. *Human Nature, 4,* 237-269.

Thornhill, R., & Gangestad, S. W. (1999a). Facial attractiveness. *Trends in Cognitive Sciences, 3,* 453-460.

Thornhill, R., & Gangestad, S. W. (1999b). The scent of symmetry. *Evolution and Human Behavior, 20,* 175-201.

Thornton, I. M., & Kourtzi, Z. (2002). A matching advantage for dynamic faces. *Perception, 31,* 113-132.

Tiddeman, B., & Perrett, D. (2002). Transformation of dynamic facial image sequences using static 2D prototypes. *Visual Computer, 18,* 218-225.

Trivers, R. (1972). Parental investment and sexual selection. In B. Campbell (Ed.) *Sexual Selection and the Descent of Man, 1871-1971,* (pp. 136-179). London : Heinemann Educational.

Watson, D. (1989). Strangers' ratings of the five robust personality factors: Evidence of a surprising convergence with self-report. *Journal of Personality and Social Psychology, 57,* 120-129.

Waynforth, D. (2001). Mate choice trade-offs and women's preferences for physically attractive men. *Human Nature, 12,* 207-219.

Zahavi, A. (1975). Mate selection - A selection for handicap. *Journal of Theoretical Biology, 53,* 205-214.

Zebrowitz, L. A., Montpare, 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.

Appendix A: Stimulus Set Summary

Descriptions of stimuli used in the experiments in this dissertation are included below. Examples of static stimuli are displayed here and the corresponding dynamic stimuli, where applicable, can be found on the accompanying CD.

Stimulus Set A: Caucasian stills

There were 20 Caucasian (10 male and 10 female) faces in this stimulus set, selected from two existing picture databases. The second database included colour pictures that were made into black-and-white for this experiment. These particular stimuli were chosen for the convincingness of their expressions as decided by correct identification from three independent judges. Each of the 20 actors was shown Happy and Neutral expressions, resulting in 40 different stimuli.

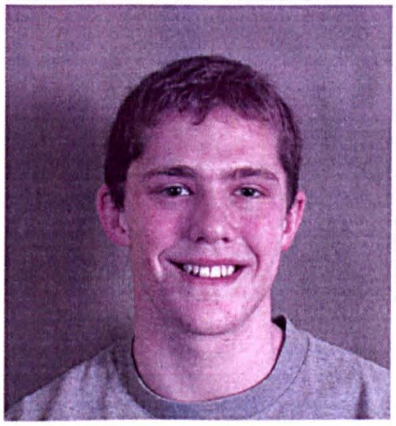
Pictures from Database 1 (Source: Peter Hancock, Stirling University)

Positive

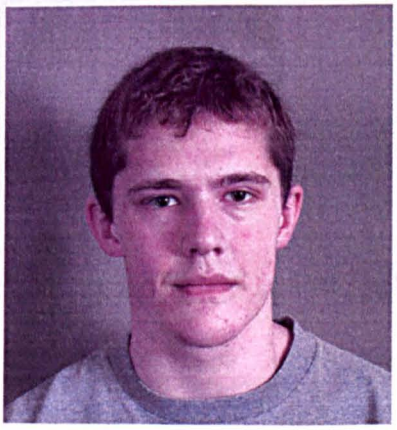
Neutral

Pictures from Database 2 (Source: Ian Penton-Voak, University of Bristol)

Positive



Neutral



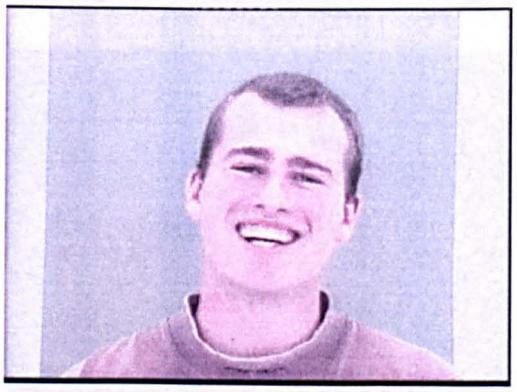
Stimulus Set B: Caucasian video and stills

There were 40 Caucasian (20 male and 20 female) faces in this stimulus set. Twenty-nine (9 male and 20 female) of faces were selected from an existing database of videotaped interviews, in which the actor was filmed in front of a grey background. These actors were filmed in colour, at varying distances and in varying light conditions. In addition, eleven male actors from Stirling University were filmed specifically for this experiment. These actors were filmed in front of a dark grey background and were framed from the shoulders up.

All actors were asked to perform a number of actions and samples of positive valence talking (Positive Dynamic) and recitation of numbers and letters (Neutral Dynamic) were edited for each of the 40 actors. These edited video segments lasted approximately 10 seconds; the variation in segment duration was due to differences in appropriate positions in which to end the segment. Two frames were then extracted, one from each of the positive and neutral dynamic stimuli (Positive Static and Neutral Static), and these static stimuli were presented for the same amount of time as their dynamic counterparts. Thus, 4 types of stimuli were obtained for each of the 40 faces, resulting in 160 stimuli in total.

These stimuli were collected by Karen Lander and Zoe Henderson at Stirling University.

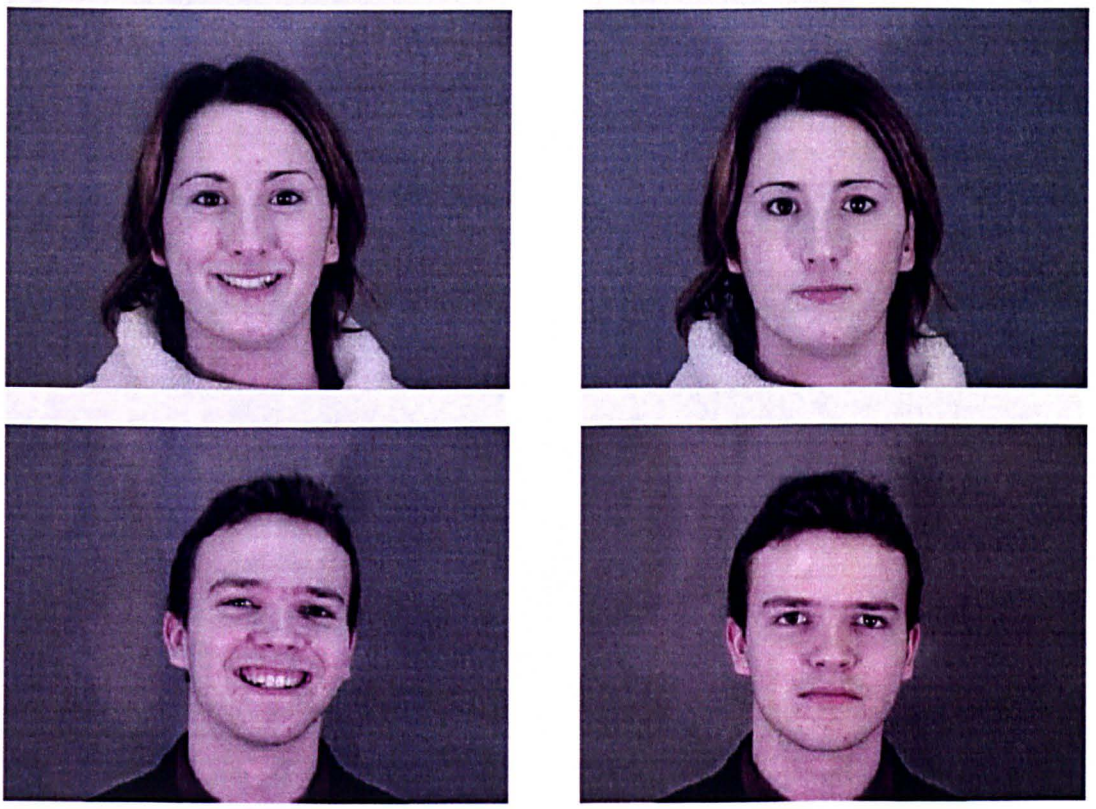
Positive Static **Neutral Static**



Stimulus Set C: Scottish video and stills

This stimulus set was filmed at Stirling University and was comprised of 40 Caucasian (20 male and 20 female) faces. Actors were filmed from the shoulders up in front of a grey background, lit frontally by two lamps. Actors were filmed when speaking positively naturally (Positive Dynamic) and reciting numbers or letters (Neutral Dynamic). These samples of movement were edited to be approximately 3 seconds. Still frames were extracted from both of these moving samples to yield smiling and neutral stills (Positive Static and Neutral Static, respectively) which were presented for 3 seconds.

Positive Static **Neutral Static**



For a pilot study discussed in Chapter 6, frames were extracted for the Multiple View Static condition, depicting the actor in left profile, looking directly at the camera and in right profile. The 3 frames were presented in this order for 1 second each (3 seconds in total).

Multiple View Static

Stimulus Set D: Japanese stills

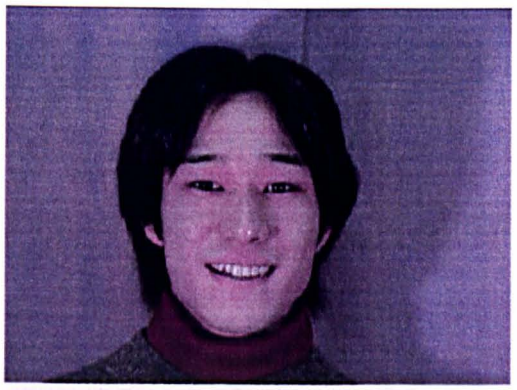
This set of faces was chosen from a database of faces from ATR laboratories, Japan. Twenty Japanese (10 male and 10 female) faces in neutral and smiling poses were selected. Selection of stimuli was based on the convincingness of their (positive) expressions and to include only young adults. Actors are depicted in front of a grey background and from the shoulders up.

Neutral **Positive**

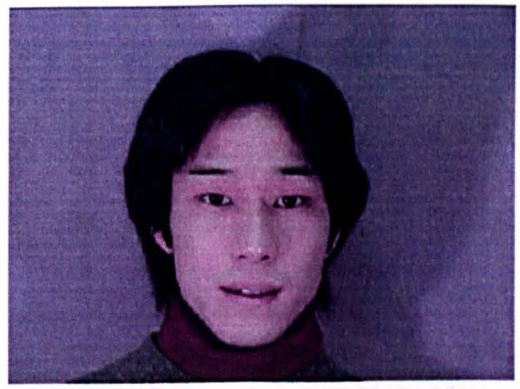
Stimulus Set E: Japanese video and stills

This stimulus set was filmed at Kyoto University, Japan and was comprised of 40 Japanese (20 male and 20 female) faces. Actors were filmed from the shoulders up in front of a grey background, lit frontally by two flood lamps. Actors were filmed when speaking naturally (Positive Dynamic) and reciting numbers or monosyllables (Neutral Dynamic). Still frames were taken from each of the positive and neutral video segments for each actor to yield Positive Static and Neutral Static stimuli, respectively.

Positive Static



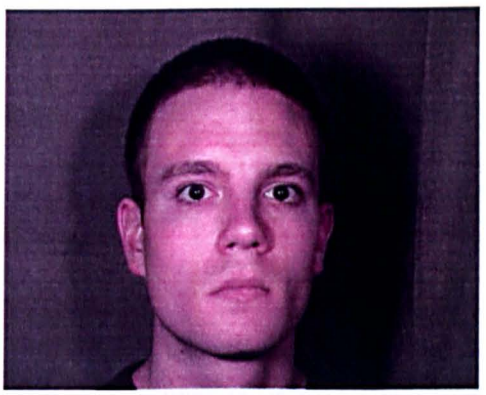
Neutral Static



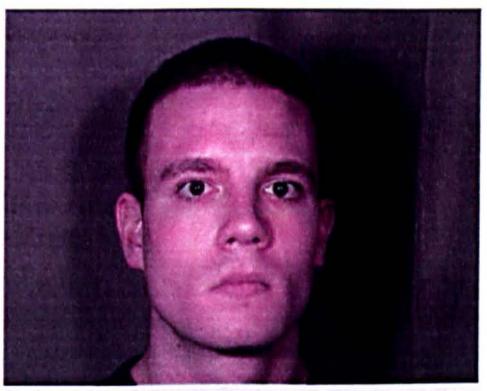
Stimulus Set F: Canadian video and stills

The 40 Caucasian faces (20 male, 20 female) in this stimulus set were filmed at York University, Canada. This set was used primarily as unfamiliar faces to be manipulated in terms of perceived masculinity/femininity, but was also used in replication attempt experiments. Actors were recorded when speaking naturally and smiling (Positive Dynamic) and when reciting numbers or letters (Neutral Dynamic) and 3 second segments were edited for use. Still frames were taken from these dynamic segments to produce stills for the Positive Static and Neutral Static conditions in which the actors are smiling or displaying a neutral expression, respectively.

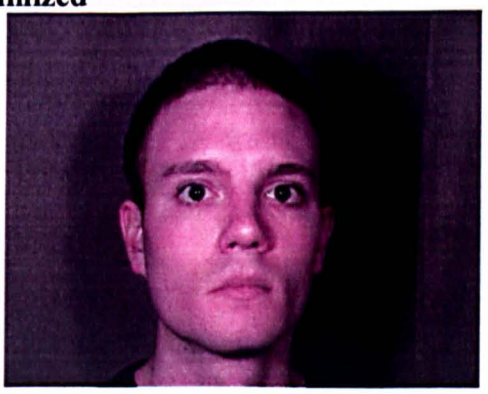
Original (Neutral)

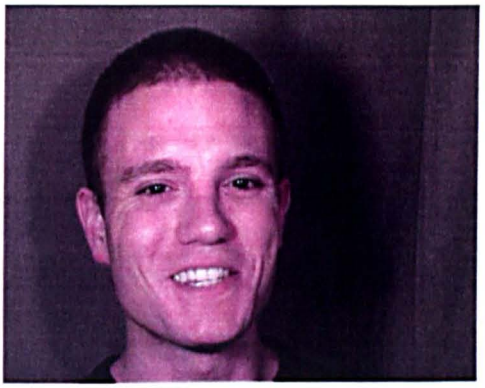
50% masculinized

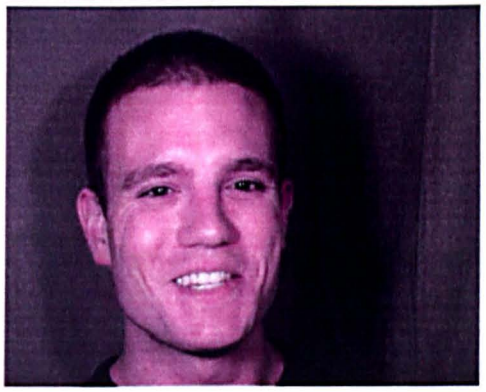
50% feminized

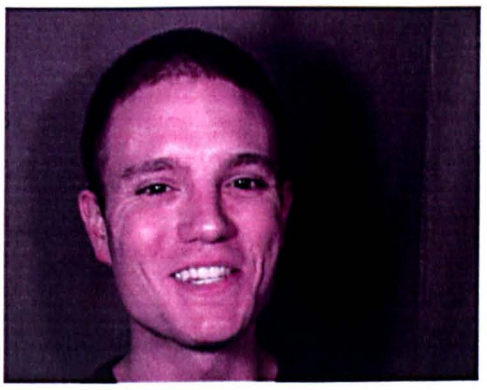
Original (Positive)

50% masculinized

50% feminized

For a pilot study discussed in Chapter 6, stills were also extracted from the videotaped interviews to show examples of Duchenne (genuine) and non-Duchenne (posed) smiling.

Non-Duchenne smile

Duchenne smile