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Familiarity breeds attraction: Effects of exposure on the attractiveness of typical and distinctive faces

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Abstract. Several studies have shown that facial attractiveness is positively correlated with both familiarity and typicality. Here we manipulated the familiarity of typical and distinctive faces to measure the effect on attractiveness. In our first experiment, we collected ratings of attractiveness, distinctiveness, and familiarity using three different groups of participants. Our stimuli included 84 images of female faces, presented in a full-face view. We replicated the finding that attractiveness ratings negatively correlate with distinctiveness ratings. In addition, we showed that attractiveness ratings were positively correlated with familiarity ratings. In our second experiment, we demonstrated that increasing exposure to faces increases their attractiveness, although there was no differential effect of exposure on typical and distinctive faces. Our results suggest that episodic familiarity affects attractiveness ratings independently of general or structural familiarity. The implications of our findings for the 'face-space' model are discussed.

1 Introduction

What makes a face attractive? Few questions have generated such widespread interest and controversy. The quest for beauty has spawned the billion-pound cosmetics and fashion industries and contributed to the rapid rise of fields such as plastic surgery. Yet, until very recently, few have bothered to probe the issue further, instead accepting the longstanding assumption that judgments of attractiveness are subjective and cannot be investigated scientifically. However, new research in developmental, social, and cognitive psychology has led to the speculation that perhaps there are universal qualities that attractive faces possess which separate them from other faces.

Attempts to determine in what ways attractive faces differ from others have identified several components that influence perceived attractiveness. One factor that has been shown to affect facial attractiveness is averageness—how closely a face resembles the mean of a population of faces. Several studies have demonstrated that composite faces produced by averaging together a series of faces are rated as more attractive than the individual faces used to create that composite (Langlois and Roggman 1990; Langlois et al 1994). Moreover, these studies showed a linear relationship between a composite's attractiveness rating and the number of faces entered into that composite: as the number of faces used in the composite increases, so does its perceived attractiveness, although this probably asymptotes at some point (Rhodes et al 2002a). Previous research revealed that the average of a group of objects (including faces) is viewed as familiar, even though it has never before been seen, suggesting that we form mental prototypes to help us better categorise and identify new members of a class (Quinn and Eimas 1986; Strauss 1979). A prototype has been defined as having the average or mean value of a group or category of objects. One possible explanation of the finding that average faces are considered more attractive than other faces then is that they are more prototypical of, or better representatives of, a class of faces (Langlois and Roggman 1990).

As anyone who has tried to evaluate the attractiveness of someone to whom one is close will realise, another dimension that impacts on attractiveness is familiarity.

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Familiarity can be further deconstructed into two types: prior exposure to a particular face or episodic familiarity, and general or structurally induced familiarity. In terms of episodic familiarity, much research has shown that previous or repeated exposure to a stimulus increases the positive affective response to that stimulus (Zajonc 1968). Known as the mere exposure effect, this process has been demonstrated to occur across a wide range of stimuli, including faces.

For example, in a recent study Rhodes et al (2001) found that not only are individual faces rated as more likeable after repeated viewing, but that exposure to veridical faces increases liking ratings of unseen averaged composites of those faces. Rhodes et al (2001) studied in two separate experiments whether increased positive affect for individual faces generalises to averaged composites of those faces. In their first experiment, they found that exposure increased liking ratings for both individual male and individual female faces, and their averaged composites. In comparison with this, attractiveness ratings increased after exposure for individual male faces and their composites only. In their second experiment, different groups of participants provided the attractiveness and liking ratings to avoid possible contamination. While liking ratings for both sexes again increased following exposure, Rhodes et al found no main effect of exposure on attractiveness ratings, with only individual female faces showing an increase in attractiveness after exposure.

Rhodes et al and others (Langlois et al 1990, 1994) have also suggested that general familiarity may help explain why average faces are considered more attractive. The idea here is that average faces are rated as more attractive than other faces because they are perceived as generally familiar, since they resemble other faces in memory. The concept of general familiarity was developed by researchers attempting to explain why attractive faces are more poorly discriminated on recognition tests than other faces (Light et al 1981; Vokey and Read 1992). For example, Vokey and Read (1992) have posited the existence of two distinct components that influence typicality, the first of which they term general or structurally induced familiarity, and the second of which they term 'memorability'. Structurally induced familiarity refers to the extent to which a face resembles other faces in memory. A more typical face, for example, will resemble many faces already encountered during the lifetime of the observer and is consequently high in structurally induced familiarity. However, since a more typical face resembles many other faces, it will be low on memorability, whereas a more atypical face will be low on structurally induced familiarity but high on memorability.

Vokey and Read argue that it is structurally induced familiarity, rather than typicality that is responsible for the finding that attractive faces are more poorly discriminated on tests of recognition. An attractive face appears more typical and generally familiar than other faces, which makes it confusable with other familiar faces and therefore harder to recognise. This ties in with Langlois and Roggman's (1990) suggestion that attractive faces are considered more typical than other faces because they are closer to the average, or the mean of a population of faces.

Although the literature tells us that both episodic familiarity and structurally induced familiarity (or typicality) can affect attractiveness, what is not clear is how these two factors interact. Here, we examined how typicality and familiarity separately shape our perceptions of attractiveness, with the aim of discovering whether typical and distinctive faces respond differently to exposure. Faces that are rated as typical, or average, are judged as more attractive than faces that are rated as more atypical or distinctive. In addition, episodic familiarity, or repeated exposure to a stimulus, has been shown to increase positive affective responses to that stimulus. We investigated whether increasing episodic familiarity by manipulating exposure has the same effect on the attractiveness of more typical and less typical (ie distinctive) faces. In other words, can increasing the familiarity of distinctive faces make them as attractive as

typical faces? This question has important implications for how we conceptualise attractiveness. Current theory suggests that typical or average faces are preferred because they appear more generally familiar than other faces. If familiarising participants with distinctive or non-average faces fails to make these faces as attractive as average or typical faces, then more typical faces cannot be preferred simply because they appear more familiar. Alternatively, episodic familiarity may be a factor influencing facial attractiveness which is independent of general structurally induced familiarity or typicality. In this case, exposure should have the same effect on the attractiveness ratings of typical and distinctive faces.

To test whether this is the case or not, in our first experiment we asked participants to rate a series of faces for attractiveness, distinctiveness, and familiarity. In addition to hoping to replicate earlier studies which showed a negative correlation between attractiveness and distinctiveness, and a positive correlation between attractiveness and familiarity (Light et al 1981; Rhodes and Tremewan 1996; Vokey and Read 1992), we needed to create a stimulus set of faces rated as typical or more distinctive for the subsequent experiment. In experiment 2 we investigated whether exposure would have the same effect on attractiveness ratings for typical faces as for distinctive faces, or whether distinctive faces would benefit more from increased exposure.

2 Experiment 1

Several studies have demonstrated that attractiveness is negatively correlated with distinctiveness and positively correlated with familiarity (Light et al 1981; Rhodes and Tremewan 1996; Vokey and Read 1992). In this experiment, we had two aims: to replicate these findings, and to construct a stimulus set with baseline ratings for use in the next experiment. Three separate groups of participants rated the same set of 84 face stimuli for attractiveness, distinctiveness, and familiarity. We expected to find a negative correlation between attractiveness and distinctiveness, and a positive correlation between attractiveness and familiarity. We also expected to find a negative correlation between distinctiveness and familiarity.

2.1 *Method*

2.1.1 *Participants.* Three different groups participated in the attractiveness-rating, distinctiveness-rating, and familiarity-rating studies of this experiment. For the attractiveness-rating study, ten female and twenty-one male participants from Trinity College, Dublin and Media Lab Europe, Dublin took part in the experiment without payment. The ages of the participants ranged from 21 to 43 years (mean = 27.4 years). In the distinctiveness-rating study, twenty-five female and twelve male students from the Trinity Access Program participated without payment during an Open Day at Trinity College, Dublin. Their ages ranged from 15 to 25 years (mean = 17.6 years). Finally, in the familiarity study, thirty undergraduate students from the Department of Psychology, Trinity College, Dublin took part in the experiment without payment. Participants ranged in age from 17 to 37 years (mean = 20.7 years). Twenty-one of the participants were female and nine were male. None of the participants was involved in more than one of these rating studies.

2.1.2 *Materials.* The stimulus set consisted of 84 monochrome photographs of unfamiliar female faces taken from US high-school yearbooks. Each photograph was scanned into a Macintosh G3 computer at 150 dots per inch. Faces were photographed from a full-face perspective. All of the faces were Caucasian, were without glasses, and displayed smiling expressions. The images measured approximately 1063×1175 pixels. Lighting conditions were standardised throughout. These 84 faces were edited with Adobe Photoshop 5.5 to remove hair, background information, and jewellery. Each image was cropped approximately 0.5 cm below the bottom of the chin, and the remaining hair and background information was masked (ie blacked out). The images were resized

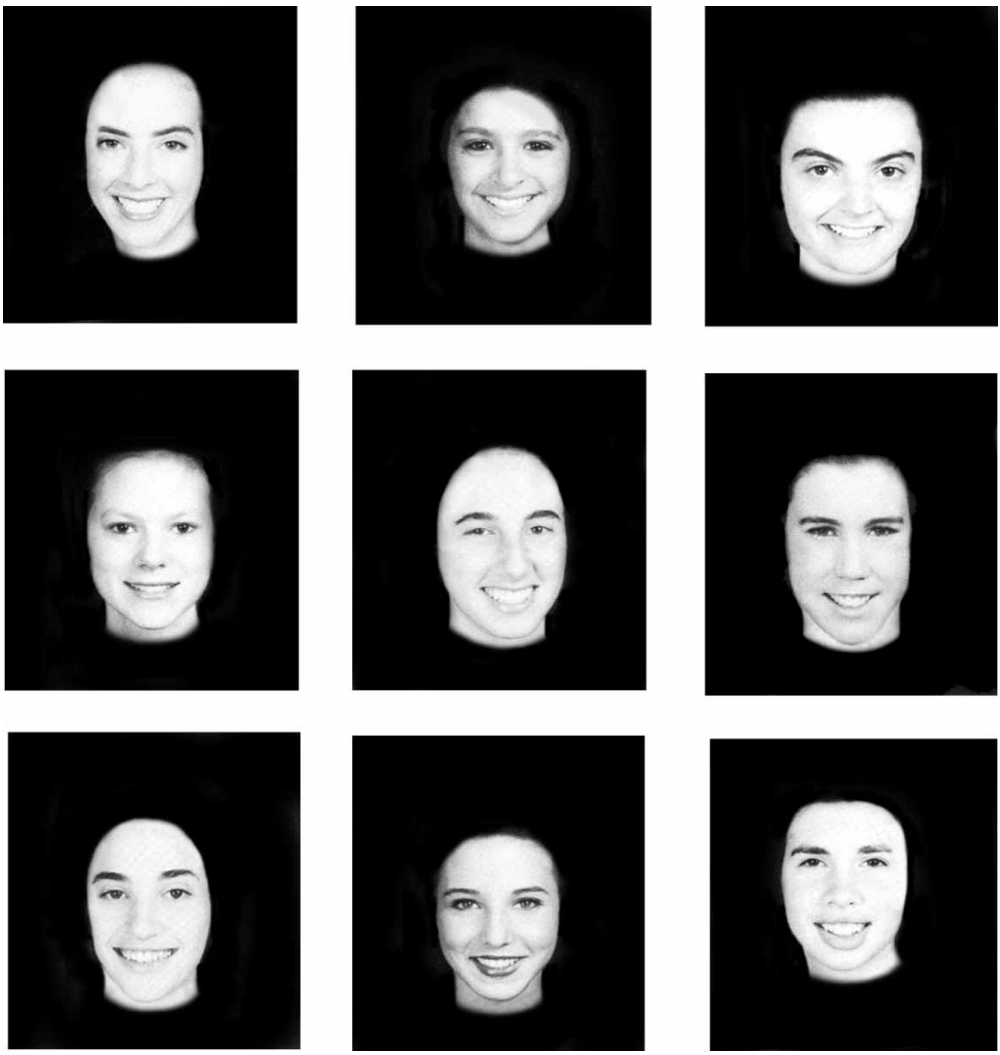

Figure 1. Examples of the face stimuli used in experiment 1.

to measure approximately 1250×1350 pixels. Examples of some of the faces used in this experiment are shown in figure 1.

2.1.3 *Apparatus.* The face images were projected onto a video screen with an NEC GT1150 computer video projector connected to a Macintosh PowerBook G3 computer. Microsoft PowerPoint was used to present the images, in a large lecture theatre.

2.1.4 *Design and procedure.* Participants were tested in separate groups in a large lecture theatre with a capacity of approximately 200. Participants were instructed to record their responses on printed rating sheets and to do the task silently without comments or conferring. They were encouraged to use the whole scale in making their decisions. Each face was shown for 8 s, with a delay of 500 ms between faces. A study lasted approximately 10 min. The presentation order of the face stimuli was randomised across studies.

The participant groups received different instructions on how to rate the faces, depending on the study to which they were assigned. The specific instructions for each of the rating studies are listed below:

(a) *Attractiveness-rating study.* Participants were asked to rate each face on a 1 – 7 scale for how attractive they thought it was, where a rating of 1 constituted a very unattractive face and a rating of 7 constituted a very attractive face.
(b) *Distinctiveness-rating study.* In the distinctiveness-rating study, participants were given the following instructions:

> "You are going to be shown pictures of female faces. Imagine you had to go to a railway station to meet each of these women. Rate the pictures for how easy you think it would be to spot each face in a crowd, using facial characteristics alone. For example, if you think a face is very distinctive (or unusual) and so would be relatively easy to pick out in a crowd, give the face a rating score of 7; if you think it is a very typical face and so would be very hard to spot in a crowd give the face a rating score of 1."

(c) *Familiarity-rating study.* Participants were asked to rate each face on a 1 – 7 scale for how familiar looking they thought it was, where a rating score of 1 was a very unfamiliar face, and a score of 7 was a very familiar face. In order to set up a plausible cover story, participants were told the following:

> "These faces are of some of the students who are currently attending Trinity College, so we expect that you have seen some, but probably not all, of these people around college. However, the photographs are not current; rather they were taken 10 years ago, when the students were in school."

A familiar face, then, was defined to participants as one they may have seen before, and an unfamiliar face was defined as one they had never seen before (Vokey and Read 1992).

2.2 *Results and discussion*

The mean attractiveness rating, distinctiveness rating, and familiarity rating of each face across participants was calculated. The mean attractiveness rating was 3.6 (SD = 1.5); the mean distinctiveness rating was 4.3 (SD = 1.7); and the mean familiarity rating was 3.6 (SD = 1.9). We calculated inter-rater reliability using Kendall's coefficient of concordance. We found a high degree of inter-rater reliability between participants in the attractiveness study ($W = 0.14$, $\chi^2_{30} = 354.45$, $p < 0.001$); the distinctiveness study ($W = 0.09$, $\chi^2_{36} = 246.37$, $p < 0.001$); and in the familiarity study ($W = 0.08$, $\chi^2_{29} = 202.85$, $p < 0.001$).

We conducted Pearson correlations between male and female participants in each of the studies. The ratings from male participants correlated highly with the ratings from female participants in the attractiveness study ($r = 0.92$, $p < 0.001$); the distinctiveness study ($r = 0.75$, $p < 0.001$); and the familiarity study ($r = 0.50$, $p < 0.001$). We collapsed the ratings across all participants and conducted correlations between the rating scores across the studies. We found a negative correlation between attractiveness scores and distinctiveness scores ($r = -0.24$, $p < 0.05$). We found a positive correlation between attractiveness scores and familiarity scores ($r = 0.47$, $p < 0.001$). There was no correlation between distinctiveness ratings and familiarity ratings ($r = 0.01$, ns).

Like previous studies, we also found that attractiveness and distinctiveness were negatively correlated (Langlois and Roggman 1990; Light et al 1981). We also replicated the finding that attractiveness correlates positively with familiarity (O'Toole et al 1994; Vokey and Read 1992).

Most studies on facial attractiveness have used faces with neutral expressions (eg Langlois and Roggman 1990; Langlois et al 1994; Perrett et al 1994; Rhodes et al 1999), although here we used face stimuli with smiling expressions. Otta et al (1996) reported enhanced attractiveness ratings to smiling faces versus the same faces with neutral expressions. Although the effects of smiling on attractiveness ratings are beyond the scope of this study, it is worth noting that our ratings may have been affected by the smiling expressions. For example, some participants mentioned that they found the

faces quite 'American' looking. This may have influenced their judgments. Even so, any effect from the smiling faces would have been a constant factor since all faces were smiling and is unlikely to have contributed to the overall correlations between the factors.

3 Experiment 2

Many studies from cognitive and developmental psychology have shown that the average or prototype of any group of objects is viewed as familiar, even though it has never before been seen (Bomba and Siqueland 1983; Quinn and Eimas 1986; Rosch 1978). Furthermore, other research has suggested that one of the reasons average or typical faces are considered more attractive may be because they are perceived as more generally familiar than distinctive faces (Zajonc 1968). Indeed, in our ratings study (experiment 1), we found a positive correlation between attractiveness and general familiarity. However, episodic familiarity, or exposure, has also been shown to have an effect on attractiveness (Rhodes et al 2001).

In experiment 2 we sought to tease apart the relationship between the effects of typicality as determined by general familiarity and episodic familiarity, to discover whether they are indeed related, and determine which makes a greater contribution to attractiveness. More specifically, we examined whether increasing exposure, or episodic familiarity, would increase attractiveness ratings overall. Furthermore, we also wanted to investigate whether exposure would have the same effect on attractiveness ratings for typical faces as distinctive faces, or whether distinctive faces would benefit more from increased exposure because they may be lower in general familiarity. We proposed that, if increasing episodic familiarity increases general familiarity, and through that attractiveness, then distinctive faces may increase in attractiveness more than typical faces. If, on the other hand, episodic familiarity is independent of general or structurally induced familiarity, then an increase in exposure should have the same effect on the attractiveness of typical and distinctive faces. The experiment consisted of two phases: an initial exposure phase in which participants viewed faces six times, and a judgment phase in which participants rated these and control faces for attractiveness.

3.1 *Method*

3.1.1 *Participants.* Thirty-two participants volunteered to take part in the experiment. Most of the participants were undergraduate and postgraduate students or staff of Trinity College, Dublin. There were sixteen female and sixteen male participants. The ages of the participants ranged from 22 to 37 years (mean = 25.4 years).

3.1.2 *Materials and apparatus.* The experiment was run on Macintosh G3 computers with PsyScope 1.23 stimulus presentation software. Participants used the numbers 1 – 7 on the keyboard to give their ratings. Face stimuli were a subset of stimuli used in experiment 1. Figure 1 shows some of the face stimuli used.

3.1.3 *Design.* Two groups of 24 faces were selected by choosing the 24 most typical and the 24 most distinctive of the 84 faces in experiment 1. These faces were chosen as those faces with a rating above and below the mean distinctiveness rating of 4.3. The mean distinctiveness rating for the 24 typical-faces group was 3.6 (SD = 1.5) and the mean rating for the 24 distinctive-faces group was 4.9 (SD = 1.6).[(1)] From each group of 24, there were 16 faces randomly selected for use in the exposure phase of the experiment. The 8 remaining faces from each group served as a control, and were shown once during the judgment phase only. The 16 typical and 16 distinctive faces were shown six times, for a total of 192 trials. In the judgment phase of the experiment,

[(1)] Since typicality correlates with attractiveness, our face groups also differed in attractiveness ratings: the mean attractiveness rating was 4.2 (SD = 1.2) for the typical faces and 2.7 (SD = 1.2) for the distinctive faces.

each of the repeatedly exposed 32 faces, along with the 16 control faces, was rated for attractiveness. Trials were presented in a random order across participants. There was a total of 48 trials in the judgment phase. All participants were shown the same faces six times.

The experiment was based on a two-way, within-subjects design, with face type (typical or distinctive) and exposure duration (once or six times) as factors. Rating scores were used as a measure of the influence of exposure on attractiveness.

3.1.4 *Procedure.* Participants were tested individually. There were two parts to the experiment: an exposure phase followed by a judgment phase. In the exposure phase of the experiment participants were instructed as follows:

> "You are going to be shown a series of female faces. Please study them carefully, because in the next part of the experiment you will be asked some questions about them. Each face will be shown for 2 seconds."

The face stimuli were presented in six different randomised orders. In each trial, each face stimulus was preceded by a central fixation cross for 500 ms with a 500 ms delay between trials. Following the exposure phase, participants read the instructions for the judgment phase, which were the same as those used for the attractiveness ratings in experiment 1. Participants proceeded to the judgment phase once they had read the instructions. Each face stimulus was shown for 8 s and was preceded by a central fixation cross for 500 ms. There was an inter-trial interval of 500 ms. Participants responded to each face stimulus by typing in their ratings using the keyboard. The experiment lasted approximately 30 min for each participant.

3.2 *Results*

Inter-rater reliability was calculated by using Kendall's coefficient of concordance. We found a high degree of inter-rater reliability between participants ($W = 0.170$, $\chi^2_{31} = 247.88$, $p < 0.001$). We then conducted Pearson correlations on the attractiveness ratings between the male and female participants. We found that the attractiveness ratings from male participants correlated highly with the ratings from female participants ($r = 0.93$, $p < 0.001$). We collapsed the ratings across male and female participants in all subsequent analyses.

To determine the effects of exposure on attractiveness ratings we compared the attractiveness ratings for the typical and distinctive faces shown six times across participants in the present experiment, with the attractiveness ratings for the same faces shown once across participants in experiment 1. The mean attractiveness ratings for the 16 typical and 16 distinctive faces shown once to the participants in experiment 1 and six times to the participants in this experiment are shown in figure 2.

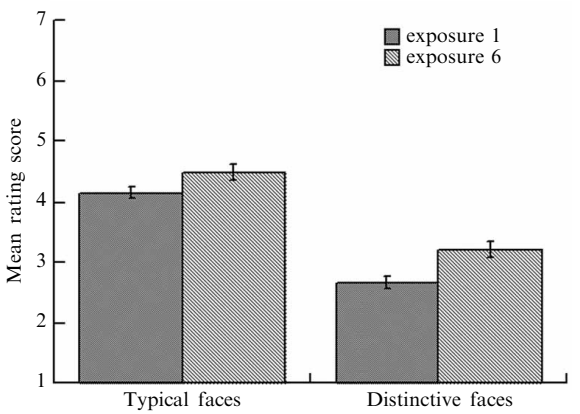

Figure 2. Plot showing the effects of exposure on the mean attractiveness ratings to the same set of typical and distinctive faces shown once (in experiment 1) and six times (in experiment 2). The legend highlights the number of times the faces were seen which was either once only (exposure 1) or six times (exposure 6).

For the distinctive faces, the mean attractiveness ratings increased by 0.5 when presented six times repeatedly. Similarly, for the typical faces, the mean attractiveness rating increased by 0.3 when presented six times. We conducted a mixed-design ANOVA on the mean ratings with participant group as a between-subjects factor (one or six repeats of the face stimuli) and face type as the within-subjects factor (distinctive or typical). We found a significant main effect of exposure on the basis of analysis of the subject ($F_{1,61} = 10.94$, $p < 0.001$) and on analysis of an item ($F_{1,30} = 5.45$, $p < 0.05$), showing that exposure increased attractiveness ratings. There was a main effect of face type for subjects ($F_{1,61} = 218.49$, $p < 0.001$) and items ($F_{1,30} = 121.41$, $p < 0.001$) with typical faces rated as more attractive than distinctive faces. Importantly, there was no interaction between factors ($F_{1,61} = 1.39$ for subjects and $F < 1$ for items). Thus, although exposure increased attractiveness ratings overall, there was no relative difference of exposure on the typical and distinctive faces.

It was important to establish that our effects were due to increased exposure per se and not to any spurious factor such as judgment bias or experimental conditions. Hence, we compared the ratings of faces seen only once in this experiment (control faces) with ratings of the same faces seen once by participants in experiment 1. We performed a one-way between-subjects analysis of variance (ANOVA) on attractiveness ratings of the 16 faces in the control (ie one exposure) condition, against ratings of the same faces from the participants in experiment 1. There was no significant difference between the participant groups ($F_{1,61} = 2.73$, ns), showing that it is unlikely our results were due to spurious differences between the experiments.

3.3 *Discussion*

Our results show that increasing the familiarity of faces by increasing exposure can increase their attractiveness, compared with a control group of faces seen only once. The fact that Rhodes et al (2001) found more consistent evidence for an increase in liking ratings rather than attractiveness ratings could have been due to several factors. First, during the judgment phase of Rhodes et al's second experiment each face remained on screen until participants responded; therefore they did not control the length of time each face remained on screen. Given that exposure effects are based on time differences in the region of seconds, any variation in the length of time each face was presented to the observer could have unintended consequences which may have had an indirect effect on attractiveness ratings. For example, temporal variation in the presentation of a face may have increased variation in attractiveness ratings because a single prolonged presentation of a face might increase attractiveness relative to a short presentation. The consequent effect of varying presentation times may have obscured any intended effects of repeated exposure on attractiveness ratings. Second, in the study by Rhodes et al, each face was exposed four times, whereas we exposed each face six times. While some researchers have argued that low levels of exposure are better at generating a positive affect, as higher levels are liable to produce boredom or other negative attitudes (Bornstein 1989), Rhodes et al speculate that the ideal exposure level could differ for different classes of stimuli, and that faces might require more exposure than other types of stimuli. In addition to differing for different stimulus classes, perhaps the ideal exposure level also differs for different measures of affect. In a meta-analysis of mere exposure effects, Bornstein (1989) found that greater increases are usually reported for liking ratings than other measures of affect. Perhaps to facilitate increases in attractiveness, or affective responses that require a greater degree of social bonding, higher levels of exposure are necessary. Our results are consistent with this line of reasoning.

Although the average attractiveness rating of typical faces and distinctive faces increased following exposure, there was no differential effect of exposure on typical

and distinctive faces. Typical faces were still significantly more attractive than distinctive faces. This finding suggests that where a face lies on the typicality/distinctiveness continuum may influence how attractive it is more than where it lies on the familiarity/unfamiliarity continuum. However, we did not test this directly.

The fact that the attractiveness of faces in the single-exposure condition did not change compared with their attractiveness ratings given by participants in experiment 2 reveals that our results were due to exposure per se, rather than to any inherent differences between participant groups.

4 General discussion

The first experiment we reported was concerned mainly with establishing factors affecting the attractiveness of unfamiliar faces. In experiment 1, we found a negative correlation between attractiveness and distinctiveness, as was reported in other studies (Langlois and Roggman 1990; Light et al 1981). We also found a positive correlation between attractiveness and familiarity ratings.

Our results in experiment 2 reveal that increasing the familiarity of faces by increasing exposure increases their attractiveness, compared with the same faces viewed once only. The fact that distinctive faces did not increase in attractiveness to any greater degree than typical faces following exposure suggests that episodic familiarity has the same effect, irrespective of general familiarity, in judgments of attractiveness. Vokey and Read's explanation of the relationship between episodic and context-free, general familiarity suggests that manipulating exposure, or episodic familiarity, has a direct effect on context-free familiarity. They state that "the familiarity arising from some specific prior exposure is *not* intrinsically separable from the structurally induced familiarity that arises from a lifetime of experience with similar exemplars ... [s]pecific familiarity when added to existing levels of familiarity can be assumed on the average to exceed some background level of general familiarity" (page 300). In other words, Vokey and Read assert that increasing episodic familiarity should lead to a corresponding increase in general, context-free familiarity. Whether our effect on attractiveness ratings occurred because episodic familiarity directly affects general familiarity, as Vokey and Read assert, is not clear from our study since we did not directly investigate this question. It might be, for example, that episodic familiarity increases attractiveness ratings of all faces directly, without having any effect on general familiarity. Specifically, the issue here is whether episodic familiarity has an effect on the perceived resemblance of faces in memory (ie general familiarity). One way this might be investigated further in the future would be to obtain typicality and general-familiarity ratings for faces before and after exposure. This would allow researchers to measure whether exposure to a particular face does actually produce an increase in its context-free familiarity rating or typicality rating.

Our findings suggest implications for models of face representation. The most widely accepted model of facial processing is the face-space framework developed by Valentine (1991a, 1991b). A recent study of the effect of exposure on the structure of face space provides a helpful framework for attempting to situate our findings within the broader face-space model. Using a large database of faces, Leopold et al (2001) measured adaptation effects on the recognition of faces by creating an average face and a series of anti-faces. Interestingly for our study, Leopold et al found that, when confronted with the average face after exposure to an anti-face, participants identified it as the original face in over three quarters of trials. The results of this study suggest that the location of the prototype or average face within face space is not fixed, but rather that it shifts when participants are exposed to a particular face. Exposure shifts the location of the prototype or average face towards the adapting face stimulus, thus temporarily altering the layout of face space.

Our results also suggest that exposure might alter the layout of face space by shifting the location of the average face towards the particular face to which participants are exposed. Thus in the same way exposure has an effect on identity, we suggest that there is a shift in the location of the average face towards the adapting face stimulus, such that attractiveness may also be affected. If average faces are considered more attractive, and exposure to a particular face X shifts the average face towards face X, then exposure may essentially serve to decrease the distance between face X and the average, and thus increase the attractiveness of face X.[(2)] This is interesting because it implies that there may be something about being considered average or prototypical that is essentially attractive, as suggested by other studies (Halberstadt and Rhodes 2000, 2003; Langlois and Roggman 1990). Moreover, it suggests that changing people's perception of what is average may change their perception of what is attractive. Recent research with aftereffects generated by adaptation to distorted faces has confirmed that shifting participants perception of what appears average also shifts their perception of what appears most attractive (Rhodes et al 2002b). Rhodes et al adapted participants to faces that had been either compressed or expanded using a computer morphing technique, and then had those participants rate the attractiveness and normality (averageness) of a series of faces on a continuum of compressed to expanded. They found that adaptation to a distorted face shifted participants' views of what appears most attractive, in addition to what appears normal, in the direction of the adapting stimulus.

Although increasing familiarity of distinctive faces does lead to an increase in attractiveness ratings, typical faces were still considered significantly more attractive than distinctive faces. The possibility that exposure distorts the layout of face space by pulling the average face closer to the exposed face stimulus would explain why typical faces were still rated as more attractive than their distinctive counterparts. If typical faces lie closer to the average face to begin with, then a shift in the location of the average face towards a typical exposed face stimulus means that typical faces would still be closer to the average face than distinctive faces after exposure. Further investigation into the similarities between aftereffects and exposure might provide greater insight into how these two effects are related. One such study might involve, for example, an investigation of the effects of exposure to veridical faces versus anti-faces on the subsequent attractiveness rating of the (previously unseen) average face. Here we might expect that exposure to anti-faces would cause the average face to shift more towards these faces and consequently away from the veridical faces. The effect would be that attractiveness ratings of previously unseen veridical faces would be lower after exposure to the anti-faces than before exposure. Such a finding would strongly suggest that 'averageness' is the key to attractiveness.

In conclusion, we examined how typicality and familiarity influence our perceptions of attractiveness, with the aim of discovering whether increasing episodic familiarity has the same effect on attractiveness ratings for typical and distinctive faces. We revealed that increasing exposure to a face increases its attractiveness rating, and that there is no differential effect of exposure on typical and distinctive faces. We also demonstrated that typical faces were found to be more attractive than distinctive faces although both face types were subjected to similar increases in familiarity. Our findings suggest that exposure to a face stimulus may serve to distort face space, possibly by shifting the location of the average, or prototype towards the exposed face stimulus.

[(2)] We suppose that the same effect could occur with one or a group of faces. With a group, the overall average face may be pulled more towards the central tendency of the exposed group of faces.

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