

## Standard of physical attractiveness

*Betina Kujawa, Jan Strzałko*

### *Abstract*

The research was conducted in order to corroborate the validity of the hypotheses that (1) there are certain common criteria of physical attractiveness of the face, and hence divergence of assessments between persons judging attractiveness is reduced, regardless of their sex or age; (2) assessment of the physical attractiveness of human faces is a property of the cognitive system; its criteria emerge early in the course of the individual development and do not change with age; (3); the most attractive faces will be characterised with trait variants close to the mean values for a given population. Computer averaged faces will be perceived as more attractive than actually existing faces, since they bear the greatest resemblance to the mental prototype of a face.

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### Attractiveness as a subject of study

DARWIN [1871] was the first scientist to introduce the thesis that the choice of a spouse is strongly determined by his/her appearance. He did that in his work on human sexual selection. Over a century later the development of sociobiology kindled interest in this topic and resulted in studies on the impact of physical attractiveness of man on the shape of social relationships. Sociobiologists, equipped with new methodological concepts, started to deliver frequently very surprising explanations to numerous social phenomena branded as “cultural universalialia” [MURDOCK 1967]. However, combining virtues, such as beauty and

goodness can be dated back to antiquity. The fact that this mental stereotype is still alive was confirmed in 1970s by social psychologists DION, BERSCHIED, WALSTER [1972]. From that time on it started to function almost as an advertising slogan: *What is beautiful is good*. Its authors indicate a considerable influence a person's appearance bears on the emergence of concrete expectations of the observer towards this person. Compared with less attractive individuals, attractive people are ascribed personalities that are socially more acceptable. They are also envisaged to have happier and more satisfactory lives. Such attitudes are formed even towards children and infants differentiated according to their “beauty” [STEPHAN, LANGLOIS 1984]. MCCABE'S [1984] and DION'S [1974] studies indicated that unattractive children are perceived as older than their attractive peers, which may result in “higher” expecta-

tions towards these children. RIESER-DANNER [1987] proved that mothers' behaviour towards their own children strongly correlates with their appearance. Pretty children attract more attention, evoke more positive emotions and provoke more frequent physical contacts (carrying, hugging). These attitudes towards other people's looks appear surprisingly early in the course of post-natal development. Some scientists maintain that even a few months' old infants show preference for attractive faces of adult people over less attractive ones (as judged by adults) [LANGLOIS, ROGGMAN, CASEY 1987; LANGLOIS, ROGGMAN, RIESER-DANNER 1990; LANGLOIS *ET AL.* 1991].

Similarly to our attitudes formed towards pretty and ugly children we channel our "expectations" towards adult people. Attractive people are considered to be better in almost every respect [CUNNINGHAM 1986; RITTER, LANGLOIS 1988].

A common assumption as a matter of fact, one consistent with every day experience, is that physical attractiveness of a person is determined primarily by the attractiveness of his/her face [BERSCHIED 1986]. According to the authors of one of the main trends in explaining the physical attractiveness of man, the face provides us with all the clues concerning its owner. They also suggest that our attitude towards another person is more positive if the face observed has "juvenile" or even child-like traits [CUNNINGHAM 1986, ALLEY 1992].

Features deciding about high attractiveness of a human figure exhibit a strong variance in judges' eyes – especially the judges with different ethnic background [JONES 1996].

HOETINK [1967] made interesting

contribution to the discussion on the criteria of attractiveness in ethnically differentiated populations. He proposed two notions: *somatic norm image* and *somatic distance* for the purpose of his studies. Somatic norm image refers to commonly accepted image of an ideal physical type, while somatic distance is a degree of deviation from the standard. Appraisal of attractiveness would consist in mental detection of differences between a perceived individual and his/her prototype – a standard representative of a given community. The more an appraised individual would differ from the prototype, the lower position he/she would take in the scale of attractiveness. A similar mechanism of the recognition and appraisal of physical attractiveness may occur when the observer meets representatives of his/ her own community.

In the past decade many of such in-born perceptive-cognitive mechanisms have been discussed as human adaptations to the processing and generation of acoustic, linguistic, visual or emotional signals. The cognitive specialisation related to face recognition is particularly interesting. According to GOREN *ET AL.* [1975], initial indications of this property of the human brain appear as early as in a few months' old infants. Neurological studies prove that the recognition of a face takes place in subsequent areas of the brain, starting from the recognition of the basic elements of its image in the visual region of occipital lobes, moving through the subsequent stages along the bottom edge of the temporal lobe where the face is finally associated with its name. There is a great deal of certainty that the entire process is located in the right cerebral hemisphere (being the part of the brain mainly engaged into the per-

ception of spatial relations between various objects), in the bottom part of the temporal lobe containing the so called facial neurones, sending impulses selectively when a human face appears within the field of vision of the observer. [KENDRICK, BALDWIN 1987; SERGENT, SIGNORET 1994]. The left hemisphere, in the area located in the vicinity of the hippocampus, becomes active only when a first name or surname is matched with a given face. It is interesting, that the neurone tract of facial recognition is reserved only for this single process; similar regions – yet located in the left hemisphere – become active when objects are being identified.

Numerous data were gathered based on the research on the people who had lost their ability to recognise faces but whose efficiency of other brain operations remained intact [BEHRMANN, WINOCUR, MOSCOVITCH 1992]. Such brain dysfunction known as prosopagnosia makes people unable to distinguish particular faces, since they have (in the eyes of the people suffering from this dysfunction) no characteristics that would make such distinguishing possible.

Studies by ATICK [1996] suggest, that face recognition boils down to comparing a perceived face with standard models (200 of them) already existing in the brain, i.e. – according to Atick – with so called “own heads” the combinations of which result in countless possible face variants. However, one may assume that among these two hundred models there is a single specific representation of the human face in our mind, being its prototype. According to a definition, a *prototype* includes these examples of a *category* (i.e. a class of existing objects), which represent its averaged members.

Prototype may also be defined as a *medial, central representation of a given category, characterised with averaged values of the attributes of this category* [ANGLIN 1977].

It is likely that also for the human face we form a mental prototype representing an average face in a local population, which is then used in the process of recognition of individual faces. The appearance of this property of the human brain could be a turning point in the initial stages of socialisation, facilitating individual identification and enhancing the sense of belonging to the group.

Francis Galton undertook a search for a prototype face, and specifically for a face of a model criminal, at the close of the past century. With the use of a stereoscope he overlaid a number of plates and drawings representing male faces obtained from the police files. The result of this operation must have astounded Galton very much. Instead of the expected face of a model criminal he obtained, as he himself put it, an image of “uniquely beautiful, almost ideal” male face [GALTON 1878 p. 99]. The results of his experiment Galton published in *Nature*, where he wrote that the composed image, having lost all disproportion, is much more attractive than any of the component images.

Two principal trends in explaining the nature of attractiveness have emerged in the earlier studies. One of them relates physical attractiveness of the face with traits occurring rarely in the population, situated at the extremes of the distribution of variability [BERRY, MCARTHUR 1986; CUNNINGHAM 1986; ALLEY, CUNNINGHAM 1991; ALLEY 1992; BENSON, PERRET 1992]. These are so called child-like traits, such as wide-set,

big eyes, little nose and narrow jaw, which when present in adult women were to signalise the presence of other traits desirable in potential partners for a "marital" relationship, such as youth, vitality, sound health and fertility. The latter option would point out to the high attractiveness of faces characterised with mean variants of traits. Such faces, in turn, are most typical and "familiar" to the observer, since they represent averaged members of their population [GALTON 1878; LIGHT 1981; FARKAS, MUNRO, KOLAR 1987a,b; LANGLOIS, ROGGMAN 1990].

### Purpose of the studies

Research on the attractiveness of the face may be a source of interesting observations helpful in the formulation of a model of the formation of the human aesthetic preferences with regard to the morphological standards occurring in our environment.

This paper was written based on the following assumptions: (1) physical attractiveness is a trait evoking emotions in the observer; (2) attractiveness understood in this way is determined primarily by certain physical parameters of the face being the most exposed carrier of information for other members of the community.

The studies conducted may either corroborate the advanced hypotheses or refute them in favour of alternative hypotheses:

(1) categorisation mechanisms are a universal feature of the human mind; one may assume the existence of certain common criteria of physical attractiveness of the face, and hence little divergence of assessments between persons

judging attractiveness, regardless of their sex or age;

*alternatively*, perception of attractiveness remains under the prevailing influence of individual taste of the judge, therefore one should not expect consistency in the assessments given by particular judges;

(2) assessment of the physical attractiveness of human faces is a property of the cognitive system. Its criteria, being a manifestation of inborn categorisation mechanisms, emerge early in the course of the individual development and do not change with age;

*alternatively*, assessment of attractiveness should be treated as a skill that can be acquired by learning, thus emerging in the later stages of ontogenetic development, improving with age;

(3) aesthetic preferences with regard to human faces remain under the influence of categorisation mechanisms (employed for the recognition of the most face-like standards). Therefore, the most attractive faces will be characterised with trait variants close to the mean values for a given population. Computer generated faces – especially these at the highest averaging levels – will be perceived as more attractive than actually existing faces, since they bear the greatest resemblance to the mental prototype of a female or male face;

*alternatively*, attractive faces are characterised with traits different than average, which would indicate the superior role of visual indicators of the "genetic quality" of an individual as a potential partner for marital relationship; computer aided "averaging" of faces bears no influence upon the estimation of their attractiveness.

Finding a model of an "average face"

is certainly the key issue while testing the last of the presented hypotheses. For this task we employed the technique of computer averaging of the dimensions, and hence the proportions of the images of actual faces. As a result, an image of ideally average – with regard to the selected set of proportions – face emerged which we adopted as a hypothetical model of attractiveness.

## Material and methods

The research material consisted of 9x12 cm black and white photographs of the faces of 128 men and 128 women aged 22–25 years. The subjects were photographed under standard conditions, *en face*, they were asked to comb their hair back in order to expose their foreheads, and to assume neutral expression of their faces. The resulting 256 photographs were scanned and input into the computer system.

Upon the preliminary standardisation of all the photographs for contrast and brightness (made with Adobe Photoshop 2.5), averaging of 128 component photographs for each sex was performed in stages with the use of a program developed specifically for the purpose of this study. The images were randomly combined in pairs. Then, each face was marked with approximately 260 points distributed along the curves describing the face. (Fig. 1).

A morphing program, treating each of the photographs as a set of a great number of points (pixels) of varying intensity of black (brightness), represented numerically, analysed the position of previously marked points in each of the processed pair of images and averaged the location and brightness of the two corre-

sponding pixels. As a result the third face was created with averaged, in comparison to the source traits, location of the metric traits. Thus, from 128 of faces (zero averaging level), 64 faces were obtained (first level of averaging) for each sex. By the same procedure out of these faces 32 further images were derived (second level of averaging). The subsequent third level resulted in 16 face images, fourth level – in 8 images, fifth level – 4 images, sixth level – in 2 face images. The last – seventh level of averaging – was represented by the ultimate male or female face, being the final result of the entire averaging process (Figs. 2 and 3).

The face images, both natural, and computer generated ones obtained at all averaging levels (in the form of black and white print outs), were assessed by 210 “judges” divided by age and sex into six 35-people groups. There were two adult groups – male group (1) and female group (2) aged 21–25 years (in majority students of Adam Mickiewicz University and the Academy of Physical Education in Poznań); two adolescent groups – boys (3) and girls (4), aged 16–18 years (pupils of High School No. VI in Poznań); and finally two children groups – boys (5) and girls (6), aged 10–12 years (pupils of Primary School No. 3 in Poznań).

The method of the quantitative assessment of attractiveness was proposed in the paper by STRZAŁKO, KASZYCKA [1992]. The judges were shown the set of male and female faces print outs. Each of the judges was instructed that his/her task is to assess the physical attractiveness of the photographed faces according to the 0–1 estimation scale (where 1 = attractive and 0 = unattractive). The expression “attractive face” was to mean “a face evoking positive emotions”. The



Fig. 1. Face image prepared for averaging procedure with marked (ca 260) points

time allowed for the assessment of a single photograph was limited to 3 seconds, since the appraisal was to concern the first impression only. As a result, each of the 255 female and 255 male faces was assigned 35 estimations by the members of each of the six groups of judges. Thus, each face was assigned a total of 210 estimations of attractiveness.

The following system of symbols was applied in the study:

$A_{ijk}$  – estimation of attractiveness (1 or 0) assigned to a given individual ( $i$ ) from the set of 255 photographs of male faces, and from the equal number of the photo-

graphs of female faces by one ( $j$ ) of 35 judges from one ( $k$ ) of six groups of judges.  $A_{ik}$  – overall estimation (expressed as a fraction of positive estimations) of a given individual ( $i$ ) by one ( $k$ ) group of judges.

$V_{ik}$  – variance of positive estimations assigned by one ( $k$ ) group of judges with regard to one ( $i$ ) individual, calculated as  $A_{ik}(1-A_{ik})$ .

$A_k$  – mean of the estimations of all individuals of a given sex assigned by one ( $k$ ) group of judges.

$V_k$  – variance of estimations assigned by one ( $k$ ) group of judges, calculated

as  $A_k(1-A_k)$

$v_k$  – averaged variances of individual estimations ( $V_{ik}$ ) assigned by one group of judges ( $k$ ), calculated as sums of  $V_{ik}$  divided by 255 (number of individuals).

$A$ ,  $V$ ,  $v$  – mean values and corresponding variances of estimations for all individuals of a given sex assigned by 210 judges (no division into groups)

The purpose of statistical testing (analysis of variance,  $t$ -Student test,  $F$ -Snedecor test) was to determine the effect of the averaging of facial parameters on the assessment of their attractiveness and the correlation between the assessment of the physical attractiveness of the face with the age and sex of judges.

## Results

The data compiled in Table 1 refer to the assessments of the attractiveness of male and female faces represented by the sets of photographs, containing both real and computer generated face images. Thus, the mean values of these estimations do not refer to any natural collection of face images. However, they enable us to state as follows.

The mean values of attractiveness

(total fraction of positive estimations assigned) shown in the bottom line of the table are 0.31 and 0.33 for male and female faces, respectively, which means that not large proportion of faces represented in the photographs were considered attractive by the judges. Let us note that positive estimations focused on certain faces. Variance of judges' estimations for particular faces ( $v$ ) is significantly lower ( $p < 0.01$ ) than the overall variance – the  $V/v$  ratio for male and female faces is 1.31 and 1.29, respectively. The degree of judges' unanimity in judging certain faces attractive may be expressed with the share of intra-individual variance  $v$  in a theoretical maximum variance  $V_{\max} = 0.25$ . On average, the value is 64% for male faces and 68% for female faces. The rest – over 30% – is an effect of the consistency of opinions of the judges on what face should be considered attractive.

The level of the above-mentioned consistency in estimations varies with regard to the age and – to a certain degree – to the sex of the judges. Generally speaking, the lowest consistency was noted among the judges from the youngest group, especially in their assessment of male faces, and among adult judges

**Table 1.** Estimations assigned by judges to the sets of male (M;  $N=255$ ) and female faces (F;  $N=255$ ) represented as:  $A_k$  – fraction of positive estimations per one face (from a 255-face set) assigned by a given group of judges;  $V_k$  – variance of estimations by a given group of judges;  $v_k$  – averaged variances of estimations of particular photographs in groups of judges.  $v_k/V_{\max}$  – percentage of maximum variance (0.25)  
In the bottom line – data for the entire body of material ( $A$ ,  $V$ ,  $v$ ,  $v/V_{\max}$ )

Group of judges		Male faces				Female faces			
$k$		$A_k$	$V_k$	$v_k$	$v_k/V_{\max}$	$A_k$	$V_k$	$v_k$	$v_k/V_{\max}$
1	adults M	.35	.23	.14	.56	.35	.23	.16	.64
2	adults F	.36	.23	.16	.64	.44	.25	.18	.72
3	adolescents M	.33	.22	.16	.64	.23	.18	.11	.44
4	adolescents F	.24	.18	.11	.44	.38	.24	.16	.64
5	children M	.32	.22	.18	.72	.31	.21	.16	.64
6	children F	.25	.19	.15	.60	.28	.20	.15	.60
Total		.31	.21	.16	.64	.33	.22	.17	.68



Fig. 2. Examples of female faces from the first level of averaging (above), fourth level (middle) and the last bottom)





Fig. 3. Examples of male faces (as on Fig. 2)

estimating female faces. There is a certain peculiarity in the estimations assigned by judges in the medium age group (adolescents). Male youths were exceptionally consistent in their estimation of the attractiveness of female faces. A similar phenomenon was observed among female youths judging male faces. Consistency of the views on attractiveness amounted to 50% in these combinations.

Table 2 contains the results on estimations made by all the judges (regardless of their age) with regard to both natural faces and computer generated ones resulting from the averaging of the images of pairs of

natural faces (level 1), and from the further averaging of the previously averaged faces (levels 2-7). The attractiveness of both male and female faces increases in judges' eyes along with the averaging level. Only several percent of real faces were described by the judges as attractive. The mean estimation of the real faces is only 0.15 and 0.19 for male and female faces, respectively. The values more or less doubled for the faces resulting from the averaging of the pairs of real faces. With subsequent averaging levels the mean estimation of attractiveness increases up to 0.79 (male faces) and 0.85 (female faces) for the two

Table 2. Mean estimations (*A*) made by all (210) judges and variances of these estimations (*V*) for the sets of male and female faces at subsequent averaging levels. The face images obtained at the 2 top averaging levels were merged

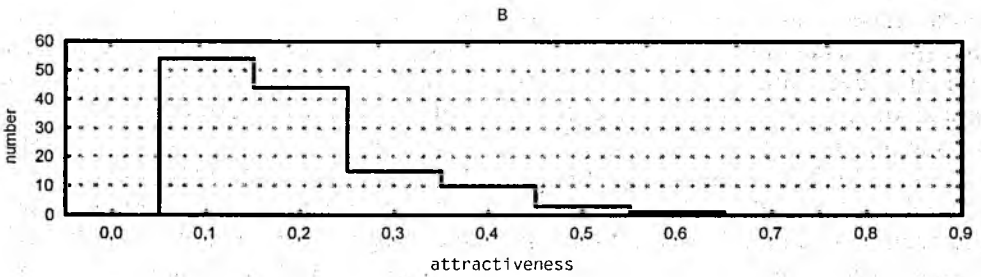
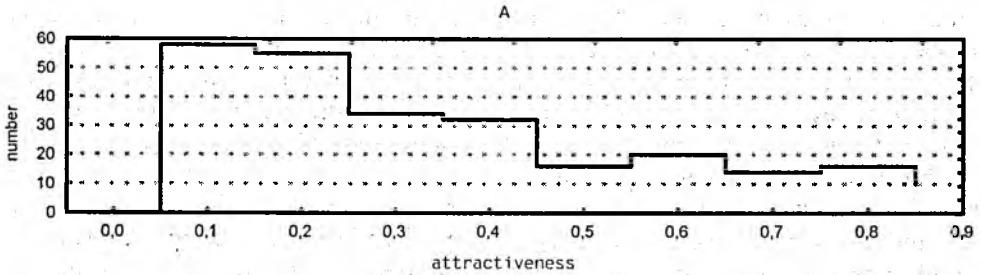
Averaging level	N	Male faces			Female faces		
		A	V	v	A	V	v
Real faces	128	.15	.13	.12	.19	.15	.14
1	64	.32	.22	.20	.31	.21	.19
2	32	.54	.25	.23	.53	.25	.23
3	16	.70	.21	.20	.71	.21	.20
4	8	.76	.18	.17	.80	.16	.16
5	4	.73	.18	.18	.85	.13	.13
6+7	3	.79	.16	.16	.85	.13	.13

Table 3. Mean estimations of attractiveness for male and female faces at subsequent averaging levels, given by judges from 3 age categories, and the significance of differences (*d*) between estimations of judges of different age

Level	Adults(1)			Adolescents (2)			Children (3)			Differences		
	A	V	v	A	V	v	A	V	v	d <sub>1-2</sub>	d <sub>1-3</sub>	d <sub>2-3</sub>
Male faces												
0 (N=128)	.17	.14	.12	.14	.12	.10	.15	.13	.12	*	*	*
1 (N=64)	.35	.23	.20	.26	.19	.17	.33	.22	.19	*	*	*
2 (N=32)	.65	.23	.21	.50	.25	.22	.46	.25	.23	*	*	*
3 (N=16)	.82	.15	.14	.70	.21	.17	.57	.25	.23	*	*	*
4 (N=8)	.86	.12	.12	.83	.14	.11	.58	.24	.23	*	*	*
5 (N=4)	.81	.15	.14	.84	.13	.12	.55	.25	.24	*	*	*
6+7 (N=3)	.88	.11	0,11	.88	.11	.11	.62	.24	.23	*	*	*
Female faces												
0 (N=128)	.26	.19	.16	.16	.13	.11	.16	.13	.12	*	*	*
1 (N=64)	.37	.23	.21	.28	.20	.17	.27	.20	.18	*	*	*
2 (N=32)	.59	.24	.23	.53	.25	.23	.48	.25	.23	*	*	*
3 (N=16)	.74	.19	.18	.72	.20	.19	.67	.22	.21	*	*	*
4 (N=8)	.83	.14	.14	.80	.16	.15	.77	.18	.17	*	*	*
5 (N=4)	.87	.11	.11	.88	.11	.10	.78	.17	.17	*	*	*
6+7 (N=3)	.87	.11	.11	.88	.11	.10	.80	.16	.16	*	*	*

\* Statistically significant differences ( $p = 0,05$ )

Males



Females

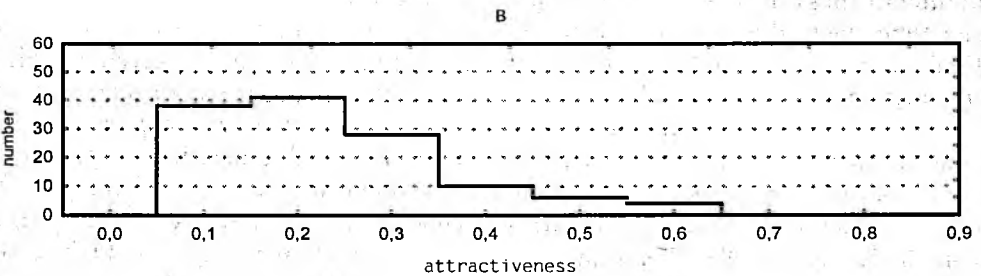
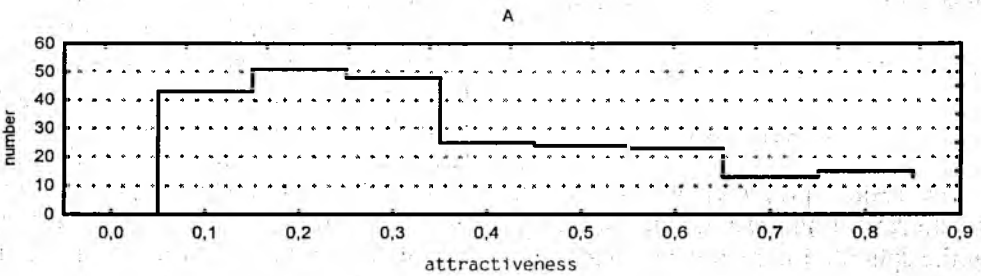


Fig. 4. Distribution of the estimation frequencies. A – set of photographs, containing both real and computer generated face images, B – real face images only

highest levels, resulting in the ultimate average face for each sex, and two component faces from which it was derived. It is noteworthy, that the estimations assigned to female faces are slightly higher than the estimations of male faces.

Table 3 shows the mean values of the estimations of the attractiveness of real faces and faces generated at subsequent averaging levels, taking into consideration the age of the judges. As far as the natural faces and faces from the first three (male faces) or two (female faces) averaging levels are concerned, the estimations of judges of different age differ, in principle, in a statistically significant way. The highest estimations are assigned by adult judges, lower ones by adolescents, while the lowest estimations of attractiveness are given by children. At higher averaging levels the difference is retained only between children and the other judges, being very distinct in the case of the estimation of male faces but less clear for female faces.

## Discussion

The results presented above provide us with several interesting clues concerning the sphere of human behaviour manifested here by the appraisal of the physical attractiveness of other people. At the same time, they allow us to assume an attitude towards the hypotheses advanced in the beginning of this paper.

If the presumption of the universality of categorisation processes is correct, one can expect the existence of some common criteria of face attractiveness reconcilable between the representatives of different age groups. The results regarding the consistency of judgements show that the judges' opinions on facial

attractiveness are consistent to a degree excluding a chance occurrence. This supports the first of the hypotheses advanced concerning the universality of physical attractiveness criteria within a population. However, it is worthwhile noting that certain, in fact fairly considerable, proportion of the overall variability of estimations can be ascribed to the differences in the perception of the same face by different judges. In general, the judges were critical about the attractiveness of the assessed faces (the mean estimations of attractiveness were low), with female faces estimated higher than the male ones (0.33 and 0.31, respectively). At the same time, higher consistency in opinions was observed among the judges with regard to male faces. Similarly low attractiveness indices were obtained in earlier studies. BERNSTAIN [1982] obtained the mean value of approximately 4.5 in a 7-grade scale (where 1 = the most attractive). Also in the case of his research, the results revealed a tendency to estimate female faces higher than the male ones, with higher consistency level in the appraisal of male faces. STRZAŁKO & KASZYCKA [1988, 1992] give the value of 0.19 as the average estimation in the assessment of the attractiveness of female faces (0-1 estimation scale).

An interesting tendency can be observed in the estimations given by judges when assessing persons of their own sex (Table 1) – they are higher than the marks assigned to the faces of persons of the opposite sex. As indicated by Tukey's test, female faces were judged most severely by young men, high school girls were most critical about male faces. Similar results, in favour of the representatives of the judges' own sex were observed

by HENSS [1991] and other researchers [CROSS, CROSS 1971, KORTHASE, TRENHOLME 1983].

Comparison of the results obtained in particular age groups indicates the differences in adult and child judges' views on attractiveness. Lower estimations, or to be precise a weaker tendency to appraise a face positively, was observed among the youngest judges. This means that a lower number of faces evoked a positive attitude in children than in adults. This could be explained by the paradigm of the „superiority” of categorisation processes with respect to the estimation system. As it has already been mentioned, the categorisation mechanism is shaped gradually with experience to which a human being is subjected with time. More frequent interpersonal relations make the category of attractive faces „richer”.

The estimations assigned by the selected groups of judges, especially in the lowest age category, corroborate also the second hypothesis. Children aged from 10 to 12 years show a fairly distinct preference for some of the faces subjected to appraisal. The frequency of positive estimations in the group of children differed significantly from adult and adolescent groups; nevertheless, a tendency to distinguish some of the faces was also clear among them. Such a sophisticated system of appraisal of physical attractiveness of faces among younger school children suggests that this ability emerges in the early stages of mental development. The research team from the University of Texas in Austin, led by Judith Langlois carried out several experiments with several months' old infants. The results showed that the subjects' reactions to attractive and to unat-

tractive faces of adults differed significantly [LANGLOIS, ROGGMAN, CASEY 1987; RITTER, LANGLOIS 1988; LANGLOIS, ROGGMAN, RIESER-DANNER 1990]. However, the boundaries of infant categories, and the new ones acquired year by year, vary from those commonly accepted by adults for many years [HAYES, TAPLIN 1992]. This has its grounds in the very nature of the categorisation mechanism, which requires a number of previously acquired experiences for the proper classification of a new phenomenon or object.

A universal model of conceptualisation, i.e. a principle governing the extension of category boundaries is still under discussion. So far, a high level of accord has been reached with respect to one issue. The ability of the human brain to average the features of objects in order to establish separate standards for various classes of objects develops at fairly an early stage of the ontogeny. It has been observed that both in the case of adults and children opinions on the „typicality” of specimens within a given category of objects are based on the appraisal of their perceptive resemblance (mainly of shape) to the typical representatives of that category [ANGLIN 1977]. The very mechanism of establishing the typical representatives would then follow either the specimen or averaging model. The former model is based on the assumption that typical representatives are characterised with variants of traits most frequent among the objects of their category. According to the averaging model, typical member represents the mean values of the traits of objects within their category [STRAUSS 1979]. In literature, this division can be encountered also under the label of the specimen and probabilistic

approaches to the conceptual structure [BARSALAU 1985]. At the late 1970s a series of experiments were carried out to settle the above dilemma. The surprising outcome of the research was that infants as young as 10 to 15 months, that is too young to have language skills developed, have categorisation capabilities corresponding to those of adults [HOMA, CHAMBLISS 1975; HOMA 1978, STRAUSS 1979].

In the interpretation of the study results the researchers point out to the fact that both children and adults are able to mentally abstracting and subsequently average traits, which leads to the formation of a mental prototype of the face. Such a face, or a face similar to it, appearing in the subject's environment would entail a „familiarity” effect and possibly even evoke positive emotions as a safe „face-like” stimulus. Observations made by NACHMAN [1986] support the idea that familiar and typical visual stimuli facilitate the memorisation process. This, in turn, would suggest the in-born character of preferences for typical signals appearing in the environment. Our research indicates that preferences of the judges in all the age groups were clearly channelled. The faces whose parameters are the closest to the population average were rated as the most attractive ones (Tables 2 and 3). The judges' statements suggest that they were unaware of their channelled reaction. Of course, they had not been informed about this aspect of the experiment, neither did any of them „discover” the purpose of the experiment before it came to an end. Many judges claimed to have original views on human attractiveness and then appraised the faces similarly to the majority. Furthermore, starting from the fourth level

of averaging, inter-individual ( $V$ ) and intra-individual variances ( $v$ ) of estimations of attractiveness, especially those assigned by adult judges become almost identical. These results allow us to accept also the third hypothesis concerning the correlation between typicality and attractiveness. What is more, they are in line with the trend in research, which assumes a strong impact of typicality of facial parameters upon the estimation of attractiveness. The face generation method employed resulted at top averaging levels in a subset of faces very rare among the real ones, totally „average” with respect to all the physiognomic traits. The influence of this subset upon the overall estimation of attractiveness is evident from the estimation frequency distributions shown in Fig. 4. LANGLOIS & ROGGMAN [1991] obtained similar results. The researchers used the combination of Galton's method of overlaid photographs, described in the introduction to this paper, and computer processing. However, they interpreted the results as if this method actually involved averaging of faces, which provoked heated discussions among scientists [ALLEY, CUNNINGHAM 1991, PITTENGER 1991, LANGLOIS *ET AL.* 1991]. Not only the method but also to the results aroused opposition. And the results were explicit: the greater number of face images contributed to the final portrait, the higher it was appraised. STRZALKO & KASZYCKA [1992] obtained similar results. In their research the values of facial traits in a group of attractive women oscillated in the medial part of their distributions.

However, also other conclusions were drawn from the attractiveness studies. Some authors suggested that the faces with the values from the extreme variabi-

lity ranges are preferred [CUNNINGHAM 1986]. What is more, these observations were easily explainable with the arguments in favour of the evolution in females of numerous species of an inclination towards males with outstanding epigamic traits indicating their genetic „quality”. The experiments conducted by MCARTHUR & BERRY [1983], FAUSS [1988] and RIEDL [1990] with the use of transformed drawings of female faces proved that the faces with decreased vertical dimensions of their lower part and with bigger eyes were considered more attractive. Interestingly enough, when applied to male faces this method did not give similar results. In this case, unmodified faces turned out to be the most attractive ones [JONES 1996].

In their research on the remembrance of faces, LIGHT, HOLLANDER & KAYRA-STUART [1981] pointed out to a difficulty in capturing a significant differentiation of traits of faces viewed as attractive. He found out that these faces are simultaneously described as „typical” and are the most difficult to recognise after some time.

The results presented in this paper support the view that a tendency of humans to consider particular faces as attractive derives from their preference for the typicality of appearance. In general, a tendency to choose averaged versions of male and female faces was noted in each of the groups of judges. This indicates it was not affected by „sexual” bias in the course of appraisal. Thus, the judges looked for the most attractive representative of the category of faces presented rather than for a potential partner for a „marital” relationship.

Let us emphasise that unreal faces with „idealised” features proved to be the

most attractive ones and that the number of positive estimations of attractiveness declined distinctly with the decreasing level of averaging. This could mean that the standard of attractiveness is formed within a given population and that it is contingent upon the distributions of the perceived traits of its members. Consistency of opinions among the judges assessing attractiveness occurred only in approximately half of the variances of estimations. Hence, the remaining half results from individual, culturally determined tastes.

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## Streszczenie

Badania nad atrakcyjnością twarzy mogą dostarczyć ciekawych spostrzeżeń, pomocnych w formułowaniu modelu kształtowania się ludzkich preferencji estetycznych wobec morfologicznych wzorców pojawiających się w naszym otoczeniu.

Przedstawiana praca została zrealizowana w oparciu o założenia, że: (1) atrakcyjność fizyczna jest cechą, która wzbudza pozytywne emocje u obserwatora; (2) o tak określanej atrakcyjności decydują przede wszystkim pewne fizyczne parametry twarzy – gdyż jest ona najbardziej wyeksponowanym nośnikiem informacji dla innych członków społeczności.

W pracy starano się rozstrzygnąć, czy (1) kryteria atrakcyjności fizycznej twarzy są wspólne dla osób oceniającymi tę atrakcyjność, niezależnie od ich płci i wieku, czy spostrzeganie atrakcyjności pozostaje pod decydującym wpływem indywidualnych upodobań oceniającego; (2) czy kryteria te, jako przejaw wrodzonych mechanizmów kategoryzacyjnych, pojawiają się wcześniej w rozwoju osobniczym i nie ulegają zmianom z wiekiem, czy pojawiają się w późniejszych etapach rozwoju ontogenetycznego i doskonaląc się z wiekiem; (3) czy preferencje estetyczne co do twarzy ludzkich pozostają pod wpływem funkcjonowania mechanizmów kategoryzacyjnych (służących rozpoznawaniu najbardziej twarzopodobnych wzorców), zatem najatrakcyjniejsze twarze będą charakteryzowały się wariantami cech bliskimi średnim wartości dla populacji, czy atrakcyjne twarze charakteryzują się cechami odbiegającymi od przeciętnych.

Kluczowym zagadnieniem przy testowaniu ostatniej z przedstawionych hipotez jest oczywiście znalezienie modelu „przeciętnej twarzy”. W pracy zastosowano technikę komputerowego uśredniania rozmiarów, a tym samym proporcji wizerunków twarzy rzeczywistych. W wyniku powstał obraz idealnie średniej – ze względu na wybrany zestaw proporcji – twarzy, uznany przez nas za hipotetyczny wzorzec atrakcyjności.

Materiał badawczy stanowiły czarno-białe fotografie twarzy 128 mężczyzn i 128 kobiet w wieku 22–25 lat. Wykorzystując specjalnie opracowany na potrzeby tej pracy program komputerowy, dokonano w kolejnych etapach „uśredniania” zdjęć składowych. W obrębie każdej płci, ze 128 twarzy (zerowy poziom uśredniania), powstawały 64 twarze (pierwszy poziom uśredniania), z których, tą samą metodą, uzyskano 32 obrazy (drugi poziom uśredniania); kolejny poziom, trzeci, zawierał 16 twarzy, czwarty – 8, piąty – 4, szósty – 2 twarze. Ostatni – siódmy – reprezentowany jest przez jedną, tę ostateczną twarz męską lub żeńską, będącą końcowym rezultatem całego procesu uśrednień (rys. 3).

Twarze, zarówno rzeczywiste, jak i wygenerowane komputerowo, pochodzące ze wszystkich etapów uśrednień (w postaci czarno-białych wydruków), zostały ocenione przez 210 „sędziów” podzielonych na 6, zróżnicowanych ze względu na wiek i płeć, 35-osobowych grup: dwie grupy osób dorosłych – (1) mężczyzn i (2) kobiet, w wieku 21–25 lat; dwie grupy młodzieży – (3) chłopców i (4) dziewcząt, w wieku 16–18; dwie grupy dzieci – (5) chłopców i (6) dziewczynek, w wieku 10–12 lat. Sposób dokonywania ilościowej oceny atrakcyjności został zaproponowany w pracy STRZĄLKO, KASZYCKA [1992]. Sędziom przedstawiano komplet wydruków twarzy męskich i kobiecych. Każdy z sędziów został poinstruowany, że ocenia atrakcyjność fizyczną sfotografowanych twarzy w skali 0–1 (1 – atrakcyjna lub 0 – nieatrakcyjna).

Średnie wartości ocen (tab.1) nie odnoszą się do żadnego naturalnego zbioru twarzy, oceniany zbiór zawierał twarze rzeczywiste i wyniki uśrednień) wynoszą 0,31 dla twarzy męskich i 0,33 dla kobiecych, co oznacza, że tylko niewielka część przedstawianych na zdjęciach twarzy uznawana była przez sędziów za atrakcyjne. Stopień jedności sędziów w uznawaniu pewnych twarzy za atrakcyjne oszacowano na ponad 30%. Poziom wspomnianej wyżej

zgodności ocen jest zróżnicowany ze względu na wiek i – w pewnej mierze – płeć sędziów. Najogólniej, jest on najniższy u sędziów z grupy najmłodszej, szczególnie wtedy, gdy oceniają oni twarze męskie, oraz u sędziów dorosłych oceniających twarze kobiece.

Atrakcyjność twarzy, zarówno męskich jak i kobiecych, w oczach sędziów rośnie wraz z poziomem uśrednienia. Twarze rzeczywiste zaledwie w kilkunastu procentach określane są przez sędziów jako atrakcyjne. Średnia ocena rzeczywistych twarzy męskich wynosi zaledwie 0,15, kobiecych – 0,19. Wartości te ulegają mniej więcej podwojeniu dla twarzy powstałych z uśrednienia par twarzy rzeczywistych. Dla kolejnych poziomów uśredniania ocena wzrasta, aż do 0,79 (twarze męskie) i 0,85 (twarze kobiece) dla dwu ostatnich poziomów, obejmujących ostateczną, średnią twarz dla każdej płci i dwie twarze, z uśrednienia których powstała.

Wyniki dotyczące zgodności ocen sędziowskich wskazują, że opinie sędziów co do atrakcyjności fizycznej twarzy są zgodne, i to w stopniu wykluczającym przypadkową zbieżność. Ciekawą tendencję można zaobserwować w ocenach wystawianych przez sędziów w obrębie swojej płci (tab. 1) – są one wyższe w porównaniu z ocenami przydzielanymi twarzom płci przeciwnej. Porównania wyników w grupach wiekowych sugerują różnice w spostrzeganiu atrakcyjności przez sędziów dorosłych i dziecięcych. Niższe oceny atrakcyjności, a dokładniej mówiąc, mniejsza skłonność przyznawania ocen pozytywnych obserwowanym twarzom charakteryzuje sędziów najmłodszych. Preferencje sędziów ze wszystkich grup wiekowych wykazały wyraźne ukierunkowanie. Najbardziej atrakcyjne wydają się twarze, które swymi parametrami zbliżają się do średniej populacyjnej (tab. 2 i 3), co pozwala przyjąć hipotezę o związku przeciętności z atrakcyjnością. Najatrakcyjniejsze okazały się twarze nierzeczywiste, o cechach „wyidealizowanych”, a ocena atrakcyjności wyraźnie spadała wraz z obniżeniem poziomu uśrednienia. Może to oznaczać, że wzorzec atrakcyjności kształtuje się w obrębie konkretnej populacji i zależy od rozkładów dostrzeganych cech jej członków. Zgodność opinii wśród oceniających atrakcyjność wyczerpuje nie więcej niż około połowy wariancji ocen. Pozostała połowa wynika więc z indywidualnych, kształtowanych kulturowo upodobań.