RESEARCH ARTICLE

CAMOUFLAGE - EXPLORING THE AI-GENERATED BEAUTY IDEAL*

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This study complies with research and publication ethics.

Abstract

The retouching and altering of portrait photographs used to require extreme professionalism from the artists, thus it was a privilege for photographers. However, thanks to modern image editing techniques, the process has become completely automated, to the point where it is no longer uncommon to find artificial intelligence-based software to perform portrait editing. The present research uses a self-report questionnaire to investigate the functioning of an image editing software that uses artificial intelligence to anatomically transform portrait photos beautiful at one push of a button. Participants are asked to give their opinions on pairs of photographs, one of which is an original, unedited picture, meanwhile the other is its idealised version created by the artificial intelligence-based software. The results of the research showed that the viewer's perception of automatic image retouching was not influenced by the gender or age of the model, nor by the age of the recipients. However, the participants' first judgement of the models' beauty influenced their attitude towards both the model and the photograph. In most cases, the photo version that participants considered more beautiful was the one they would have preferred to see both in their own social media news feed and on the cover of a magazine, furthermore, more people would have preferred to meet the model based on the photo they thought to be beautiful. The research also reveals that viewers tend to associate negative emotions with image manipulation. Although the enhancement of photographs is a phenomenon that media users regularly encounter, not much research have been conducted on the ideal of beauty in relation to AI-technology. The current study aims to contribute to filling the aforementioned research gap.

Keywords: beauty ideal, artificial intelligence, portrait photos, image manipulation, retouch.

* Extended and revised version of the study which was presented in Üsküdar University 9th International Communication Days, İstanbul.

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ARAŞTIRMA MAKALESİ

KAMUFLAJ - YAPAY ZEKÂ TARAFINDAN ÜRETİLEN GÜZELLİK İDEALİNİ KEŞFETMEK*

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Bu çalışma araştırma ve yayın etiğine uygun olarak gerçekleştirilmiştir.

Öz

Önceki dönemlerde portre fotoğraflarının rötuşlanması ve değiştirilmesi, sanatçılar açısından aşırı profesyonellik gerektirdiğinden bu durum fotoğrafçıların bir ayrıcalığıydı. Ancak modern görüntü düzenleme teknikleri sayesinde bu süreç tamamen otomatikleşmiş ve portre düzenlemesi yapmak için yapay zekâ tabanlı yazılımlar yaygın hale gelmiştir. Bu araştırma, tek bir düğmeye basarak portre fotoğraflarını anatomik olarak güzelleştirmek için yapay zekâ kullanan bir görüntü düzenleme yazılımının işleyişini araştırmak için bir öz bildirim anketi kullanmaktadır. Katılımcılardan, biri orijinal; düzenlenmemiş bir resim, diğeri ise yapay zekâ tabanlı yazılım tarafından oluşturulan idealize edilmiş fotoğraf çiftleri hakkında görüşlerini bildirmeleri istenmiştir. Araştırmanın sonuçları, izleyicinin otomatik görüntü rötuşuna ilişkin algısının, modelin cinsiyetinden, yaşından veya alıcıların yaşından etkilenmediğini göstermiştir. Ancak, katılımcıların modellerin güzelliğine ilişkin ilk yargıları, hem modele hem de fotoğrafa yönelik tutumlarını etkilemiştir. Çoğu durumda, katılımcıların daha güzel olduğunu düşündükleri fotoğraf, hem kendi sosyal medya haber akışlarında hem de bir derginin kapağında görmeyi tercih edecekleri fotoğraf olmuştur. Buna ek olarak, katılımcıların çoğu, güzel olduğunu düşündükleri fotoğraftaki modelle tanışmayı tercih etmiştir. Araştırma ayrıca izleyicilerin olumsuz duyguları görüntü manipülasyonu ile ilişkilendirme eğiliminde olduğunu ortaya koymaktadır. Fotoğrafların iyileştirilmesi medya kullanıcılarının düzenli olarak karşılaştığı bir olgu olmasına rağmen, yapay zekâ teknolojisiyle ilişkili güzellik ideali üzerine yapılan araştırmalar sınırlı sayıdadır. Bu çalışma, literatürdeki boşluğunun doldurulmasına katkıda bulunmayı amaçlamaktadır.

Anahtar Kelimeler: güzellik ideali, yapay zekâ, portre fotoğrafları, görüntü manipülasyonu, rötuş.

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Introduction

Before the popularity of modern digital image editing software, the retouching and manipulation of portrait photographs required extreme professionalism from the artists and was therefore the privilege of professional photographers and retouchers. In the era of analogue photography, retouching was still done by scraping the film negative and masking certain areas. The extremely time-consuming and precise manipulation processes were later greatly facilitated by the development of digital technology, but the first image editing programs to appear on the market were not yet available to the lay user, as they could only be used on complex, space-intensive graphics computers. The personal computers in ordinary homes were not capable of running this software due to their limited power. However, thanks to today's modern image editing techniques, the once complex process has become completely automated, to the point where it is not uncommon to see artificial intelligence (AI) software performing image retouching in a fully automated manner, at the touch of a button, without any major user intervention.

However, these learning systems are often criticised for reflecting the worldview and values of their developers and for continuing to operate in this way, which may be offensive to certain social groups or – by presenting an unattainable level of perfection – may have a negative impact on the self-image of the average user.

The present research uses an online questionnaire to investigate the functioning of a commercially available image editing software (*Portrait Professional*), which uses artificial intelligence to transform user-uploaded portrait photos according to geometric beauty and contemporary beauty ideals with the click of a few buttons.

Does the social ideal of beauty shape the various technological solutions or, on the contrary, does technology determine the perception of beauty that members of society have themselves? Are there any differences in the expectations of beauty between male and female observers? How do different age and gender groups relate to image retouching?

The research aims to find answers to these questions, among others, through a questionnaire-based survey focusing on portraits of subjects from different age and gender groups: participants are asked to give their opinions on pairs of photographs, one of which is always a raw, unedited photograph, while the other an idealised version of the original portrait image automatically retouched by the artificial intelligence software.

The Importance of Visuality in Human Communication

"We live in the era of visuality" – this is one of the key statements of the *Handbook of Visual Communication,* a volume on current issues, trends and meth-

odological approaches in visual communication research, published in 2020 (Josephson et al, 2020: 18). However, the dominance of visual communication over verbality was already evident in the 1990s, that Barry (1997: 1-2) explains by the rise of visual and audiovisual media. According to Worth (2016: 1), visual products play a crucial role in the construction, transmission and decoding of meaning, making visuality an integral part of human communication. The processing of visual information cannot be separated physiologically or logically from the process of thinking: our vision does not serve but triggers our thoughts. This is demonstrated by the fact that, from an evolutionary point of view, the development of the human brain is also motivated by the need to process visual stimuli (Sless, 2019: 16).

However, despite the importance of visuality in human existence, both socially and evolutionarily, communication and media research has not paid enough attention to the study of visual stimuli, according to Cava A. Finnegan (2020). As the author describes this phenomenon, communication theory suffers from iconophobia: traditional communication research considers verbal information exchange as the purest form of communication, while the reception of images is mostly treated as an unconscious process, where pictures are framed as dangerous and misleading contents (Finnegan, 2020: 62). The underlying reason Finnegan gives for this problem is that the understanding of the meaning of images is relatively subjective, as it is largely determined by the way how the recipient interprets a certain visual stimulus. This subjectivity makes visual content difficult to investigate.

According to the reception theorists' approach, however, the primary question of communication research should not be *what* images mean, but *how* those meanings are created. Indeed, the process of constructing meaning highly depends on the receiver, as well as on the creator and the relationship between the image and the receiver. It is the combination of these that creates the context of the visual stimuli that enables the process of meaning-making (Barbatsis, 2004: 43).

Defining visual communication is also a challenge for communication and media researchers, as visual products can take many different forms, and all of them are capable of conveying information in different ways (Josephson et al, 2020: 17). It is widely accepted that the visual revolution has not been encouraged by classical art forms such as painting or printmaking, but by the emergence of photography in the 19th century (Kolta and Tőry, 2007: 54; Rab, 2015: 13; Josephson et al, 2020: 17). Photographs not only enabled a more realistic representation of reality, but also the reproduction of visual content, which was unprecedented in the arts that time (Szarka and Fejér, 1999: 24).

The Communicative Role of Photographs

Whereas in the 1800s the primary social expectation of photography was to

capture reality authentically, in the era of digital photography, where almost all our portable devices have their own cameras, photographs have become much more like tools of self-expression for the users (Dijck, 2008: 57). For a long time, the identity-forming and communicative functions of photographs were overshadowed by their role in preserving memories (Sontag, 1973 as cited in Dijck, 2008: 58), but the widespread availability of technology has also brought major changes in the scientific understanding of photography (Villi, 2007: 49).

Van House (2011: 125) defines photography as a highly complex technological achievement that has a major social and communicative role, as it is a tool for memory preservation, communication, self-representation, and self-expression. Bock (2017: 1) sees the communicative role of photographs primarily in their impact on information transmission and retention, as visual products capture the attention of the recipient more effectively than simple verbal content, and the messages they convey are easier and faster to recall. Photographs can be a persistent and highly relevant means of delivering messages to a target audience (Das and Chakrabarti, 2022: 619), as the average user can take photos anywhere, anytime and publish them instantly online (Winston, 2011: 1-2).

However, the impact of photography on its users begins at the moment of capture, because photography as a practice shapes the photographer's behaviour and mindset, while also influencing, how the world being represented by the photographs is interpreted by the recipients (Winston, 2011: 2). As Susan Sontag (1977: 8) notes, photography is not merely a mediator between a real-life event and the photographer: photography is an event in itself that not only captures reality but also shapes it.

The genre of portrait photography

When looking at the social and communicative aspects of photography, it is essential to mention portrait photography as a genre of human representation. Traditional documentary genres, such as press photography, often depict people in their images, too, but an important criterion here is that the photographer must not interfere with the subject scene and must present the subject as authentically and accurately as possible, without any alteration. In contrast, portrait photography creates a special situation between the photographer and the subject – in this case the model of the photograph –, because the photographer has to show in the picture both his own artistic vision, and the personality and characteristics of the subject, while keeping in mind the message he wants to convey to the viewer (Rand and Meyer, 2014: 6-8).

The genre of portrait photography can be captured through the photographer-subject relationship, but there is also a much simpler, technology-oriented photographic definition of portraiture: portraits are visual artworks that

are intended to show the appearance of a person, in other words, they depict an individual (Hurter, 2008: 11).

Based on the literature about portrait photography, it appears that studies from the early 2000s tend to examine traditional portraiture from a photohistorical approach, mostly focusing on the process of lighting, setting up models or in the case of analogue photography, the process of exposure and photo development (Bank, 2001: 43-76; Wue, 2005: 257-280; Ertem, 2006). A breakthrough in the academic study of portrait photography has been caused by the popularity of social media platforms that are formed to present visual content. In addition to traditional portraits, recent research has also looked at modern portrait photography such as self-portraits of users, called selfies, which are considered as important ways of self-expression on social media (Qiu et al, 2015: 443-449; Senft and Baym, 2015: 1588-1606; Pusztai, 2021: 136-145). Also, as a result of increased social media use and user-generated content production, the digital modification of photographs (image manipulation) has become a field of study in visual communication research (Nightingale et al, 2017: 1-21).

Digital Image Manipulation

"The camera never lies!" – it is an often-heard old cliché which – in the world of modern digital photo editing programs – can easily be disproved, as even the average mobile phones have pre-installed applications that are able to make photos more beautiful and interesting with a few simple settings. Thus, photography will no longer necessarily be an authentic representation of reality, but will create a completely new reality for the recipient. However, questioning the truth value of photographs is not a phenomenon of the last decade. As Susan Sontag wrote in the 1970s, the photographer's task is not simply to record the past, but to invent it. Therefore, photographs can even be used to support false claims as a kind of visual evidence (Hofer and Swan, 2005: 290).

Concepts and types of image manipulation

Rossner and Yamada (2004: 11) define image manipulation as the alteration of the original image information, which – besides the removal or addition of various image elements – also includes basic photographic modifications of the pictures, such as corrections for brightness, colour, sharpness or perspective distortion.

In Thakur and Rohilla's (2020: 2) definition of image manipulation, the above-mentioned photo correction settings are less emphasised: according to the authors, manipulated images are those where a given photograph becomes capable of influencing public opinion by distorting reality in relation to a particular event, person, company or even political decision.

Brugioni (1999: 17-24) puts manipulation techniques into four groups, to which he attributes different objectives. The first technique is the concealment of certain details of the image, also known as retouching, which aims to remove various problems of the face, such as wrinkles or other unwanted elements. The next technique is the insertion of details, which involves more serious modifications, like changing the features of the face (for example, adding facial hair to the image), changing the skin tone, or in the case of landscapes, adding fictional elements to the image. The last two elements of Brugioni's grouping of image manipulations are somewhat different from the previous ones, as they are not post-editing techniques within the photographs. The author also considers the technique of photomontage as manipulation, whereby the artist creates an entirely new image by assembling different pictorial elements from other photographs. Finally, the last technique of image manipulation is false captioning. It is true that captioning is a verbal type of information, but it is also an integral part of the photographs, therefore, it can be used to change the original meaning of the image by placing it into a different context.

Recognising image manipulation

Based on the above, there is a simple aesthetic function of image manipulation, where the purpose of the modifications is the artistic expression or enhancement of the viewers' experience. Post-alteration of photographs becomes problematic when the manipulation is intended to deliberately deceive or influence viewers. This is because manipulated images are extremely difficult to identify, as the authenticity of the information coming through the visual channel is less likely to be questioned by the viewers (Newman et al, 2012: 970), and traces of precise manipulation are extremely difficult to detect, even with software.

This was confirmed by the empirical research of Hany Farid and Mary J. Bravo (2010: 1-10), in which participants were asked to recognize inconsistent light-shadow effects on three-dimensional geometric shapes represented by computer graphics. The study found that subjects were only able to identify the manipulated lights by chance. Similar research findings were reported by Sophie J. Nightingale, Kimberley A. Wade and Derrick G. Watson in 2017 (Nightingale et al, 2017: 1-21). The research aimed to answer the question of whether lay media users could determine if a real-life original photograph had been manipulated, and if so, to localize the manipulation. The results showed that participants performed only slightly better than chance at detecting the manipulation and were able to correctly identify the location of the manipulation only a few times.

However, there is no consensus in the scientific community whether the human eye is really that deceptive when it comes to detecting image manipulation. In the early 2000s, Olshausen and Field (2000: 238-245) and Friston

(2005: 815-836) also concluded that humans have an innate ability to – usually unconsciously – recognise when a photograph is not original but a manipulated one.

The existence of image recognition ability (*IMRA*) is also demonstrated by a large sample (N=10,380) research of Ànges Veszelszki, Evelin Horváth and Gábor Kovács published in 2022 (Veszelszki et al, 2022: 171-209). In the study, participants had to decide whether any digital manipulation had been done on the faces of the subjects in 9 portrait photographs. The results of the study show that lay users are clearly more successful in detecting manipulation than random guessers but have difficulties in identifying and localising the exact modifications.

Examining Beauty

One of the most common criticisms of digital manipulation of portraits is that the over-idealized appearance of the subject conveys an unattainable ideal of beauty to other users. According to some approaches, the perception of beauty is subjective, making it impossible to create a single universal definition across disciplines (Wong et al, 2021: 2177). However, there are general laws, such as the rule of the golden ratio, that make beauty measurable (Prokopakis et al, 2013: 18). There are also theories that scientifically identify the process of perceiving subjective beauty with attraction: what is commonly referred to as beauty is in fact attractiveness (Pallett et al, 2010: 149). The current chapter of this paper will focus on the conceptual definition and the research history of beauty.

Conceptual framework of beauty

From a philosophical point of view, the perception of beauty is a process that involves all human senses: it can be seen, heard, and felt, and this experience is highly subjective, precisely because of its complexity; it mostly evokes a feeling of pleasure and satisfaction in the recipients (Wong et al, 2021: 2178). By contrast, if we take an objectivist view of beauty as an aesthetic perception, the phenomenon becomes immediately measurable; beauty can be described in terms of different proportions and degrees of symmetry (Wong et al, 2021: 2178). In establishing a conceptual framework for beauty, we must distinguish between subjective and objective beauty.

The perception of subjective beauty is based on an individual's own emotional response to a particular stimulus (Di Dio et al, 2007: 2). From a philosophical point of view, beauty as a qualitative attribute cannot be possessed by anyone: it exists only in the mind of the recipients, and hence, what is considered beautiful varies from individual to individual (Hume, 1757: 136). Similarly, Kant (1790) describes beauty as a subjective experience that is primarily

related to the individual's own taste: beauty is a phenomenon that gives pleasure and joy to the recipient. The perception of beauty is the individual's own privilege.

Sartwell (2022: 2) disputes this approach, as there are many examples of beauty generating controversy. If the judgement of beauty is entirely subjective, it would be meaningless to state beauty as a fact, to question it or even to criticise it. Yet, we do this regularly in relation to an artwork, an object, a landscape or even our own fellow human beings. Consequently, there must be some basic, measurable criteria that make something beautiful, and the subjective factor enters the process through the perception and interpretation of these criteria, when one interprets the measurable aspects of beauty differently from others.

Borelli and Berneburg (2010: 326) associate beauty with attraction, as far as human beauty is concerned. When the receiver perceives another person as beautiful, he or she actually finds him or her attractive. Attraction, in addition, leads to a positive perception of the inner qualities and personality traits of the person, in line with his or her positive physical attributes; someone whom the individual perceives as beautiful is also thought to be nicer, more trustworthy, more interesting than another, less attractive person.

Objective beauty can be observed in proportions, in symmetry, it can be quantified and measured. However, even in the presence of regularities found in nature and art, it cannot be said that beauty, taken as objective, is perceived as equally attractive by all recipients (Baker and Woods, 2001: 110). An objective description of beauty can be aided by the rule of the golden ratio, which is present in various artistic disciplines (fine arts, music), in nature (snail shells, plant structure), in history (the boom in cultural and economic development) and in the human body (the proportionality of facial features and body parts). According to the mathematical definition of the golden ratio, two parts (a and b, where a>b) are proportional to each other according to the golden ratio if the whole (a+b) is proportional to the larger part (a) exactly in the same way as the larger part (a) is proportional to the smaller part (b). The golden ratio creates balance between symmetry and asymmetry (Dunlap, 1997: 2).

The rule of golden ratio for the human face creates an apparent – but not complete – symmetry and balance between the facial elements: it can be used to describe the ideal length and distance between the eyes, mouth and nose (Prokopakis et al, 2013: 19). Both in portrait photography and cosmetic surgery, the use of the golden ratio can be observed in the design of an attractive face (Veres, 2010: 72).

Based on the research history, there is no clear evidence that face and body proportions that perfectly match the golden ratio rules are more attractive to people than the average appearance (Prokopakis et al, 2013: 19). This is the conclusion reached by Pallett, Link and Lee (2010). Digitally distorted

facial images, according to the rules of the golden ratio, evoked an unpleasant sensation in the recipients, who instead saw morphologically average faces as more beautiful (Pallett et al, 2010: 149).

Borelli and Berneburg's (2010: 327) research also show that the majority of people find faces with average proportions more beautiful. The participants in the study considered average nose, mouth and eye size, average face shape, average overall facial character within their own nation to be beautiful. The attraction to the average has an evolutionary explanation: people with facial features close to the average have a low number of genetic mutations and therefore, from an evolutionary point of view, they have higher survival rates, which means that it is worth choosing them as partners (Rhodes, 2006: 202).

The role of human faces in the perception of beauty

Much of the research on human beauty and attraction focuses on the human face. The reason for this is that the face is considered a prominent visual stimulus. The ability to recognise faces is already established in the first six months after birth and develops along with the nervous system (Kovács-Bálint, 2013: 15). Face recognition is a specific process that differs from other mechanisms of shape and object recognition (Zimmer, 2013), and the face also plays a central role in the perception of beauty and attractiveness (Zaidel and Deblieck, 2007: 423).

According to Schmid, Marx and Samal (2008: 2717), facial symmetry has less influence on attractiveness, but the size and the proportion of facial elements in relation to each other are important for the assessment of beauty: for female faces, a narrower face, a smaller nose, a relatively larger distance between the eyes and a less wide mouth were found to be the most attractive. For male faces, thicker eyebrows, wide jaws, thin mouths, and smaller eyes are the most attractive (Liu et al, 2006: 16636). According to a study written by Godinho et al. (2020: 99), the mouth is one of the most important factors in judging beauty, especially when the subject is smiling. Similarly, eyes, teeth and facial skin also influence beauty.

The ideal of beauty

The ideal of beauty is a summary of the norms – primarily related to appearance and physical attributes – by which most of the society judges a person to be beautiful (Vandenbosch and Eggermont, 2012: 870). Social norms of beauty are not stable over time and cannot be considered universal; the ideal of beauty varies significantly within and across cultures (Zhan et al, 2021: 2243). The standard of beauty as mediated by (social) media also has a strong influence on the current ideal of beauty (Britt, 2015: 86). There is a two-way relationship between the standards of beauty conveyed by (social) media and

the own individual beauty ideals of members of society; the beauty presented in (social) media is seen by members of society as a model to be followed, but at the same time, media content is actually produced according to social demands, therefore, the recipients – although, mostly unconsciously – shape the media's beauty ideal themselves, through their own expectations.

Social media platforms are often criticised for presenting unrealistically beautiful, edited images, thereby setting too high and unattainable expectations for members of society (Henriques and Patnaik, 2020: 2). Due to the built-in features of mobile phones, digital image editing programs and phone applications, skin imperfections can be easily erased, teeth can be whitened with a brush stroke, and waists can be made thinner within a few moments (Farid, 2009: 44). Moreover, modern software requires minimal user intervention to idealise images. The latest version of *Adobe Photoshop* **–** the professional image editing software that has been a market leader for years – has an artificial intelligence-based toolkit that recognises the elements of the human face and the body's boundaries, and all the user has to do is adjust the face shape, eye, nose and mouth size, or even the desired body weight on a scale (Clark, 2020). The *Portrait Professional* image editor has the same features, but it is designed specifically for digitally correcting human faces and, in addition to the above-mentioned settings, can be used to automatically change the hair or eye colour of a model, apply make-up on them or adjust the lighting of a portrait image. As a special feature of the software, users can choose between a general portrait and a magazine-quality portrait option for both male and female subjects, which automatically adjusts the proportions of the model's face to the ideal beauty proportions using artificial intelligence, while removing skin imperfections and making basic photographic corrections as well (Anstee, 2021).

Objective of the Research

The present research uses digitally manipulated portrait photographs, which were created using *Portrait Professional*, the artificial intelligence-based image editing software briefly described in the previous chapter (*The ideal of beauty*), to investigate the opinions of lay recipients about the retouched faces, with a special focus on gender and age differences. The study of viewer attitudes towards portrait photographs retouched by artificial intelligence will help to understand viewers' expectations of beauty and will also provide insights into how viewers perceive photo retouching and what image manipulation software and practices they use.

The target group of the research

The primary target group of the research is the group of young adults (21-30 years old) who are familiar with social media use and manipulated image

contents and have user-level knowledge of image retouching applications and/ or image editing software. The research also included participant[1] with professional visual experience (e.g., photographer, retoucher, graphic designer, etc.).

Hypotheses of the research

At the start of the research, four hypotheses have been set up about the beauty of faces automatically retouched by artificial intelligence.

Research suggests that women's physical appearance and physical attributes attract much more attention than men's (Gill, 2007: 149). These social expectations mean that women are more likely to retouch their photos with photo-editing apps that make them look more flawless in line with current beauty ideals. Consequently, the average viewer is more used to seeing automatically retouched photos of female subjects, while for male models, such retouching can create an unusual feeling in the recipients, making them less likely to see retouched portrait photos of men as beautiful.

H1 = In the case of female photo models, more participants consider the automatically retouched image to be more beautiful than in the case of male photo models.

The second hypothesis of the research is based on the attraction to the opposite sex and the assumption that female recipients may feel uncomfortable with an over-edited female portrait photograph.

H2 = In the case of female photo models, male participants are more likely to consider the automatically retouched image to be more beautiful than the original one.

The third hypothesis, like the first one, is based on the use of image editing applications. The use of automated portrait retouching is more typical of the younger generation, who are technologically competent and motivated enough to manipulate their images to meet the ideal of beauty. This practice is less common in the older generation, so in the case of older photo models, retouched images may cause an unusual feeling and participants tend to perceive these versions as less beautiful than the original images.

H3 = In the case of older photo models (over 70 years), participants are more likely to consider the original image to be more beautiful than in the case of younger photo models.

Due to their familiarity with photo editing applications, the younger generation is expected to react more positively to automatically retouched photos, therefore, the fourth hypothesis of the research is that they will more often choose retouched portrait photos as more beautiful.

[1] The ethic approval has been obtained from Corvinus University of Budapest on 21/09/2022.

H4 = Members of the younger generation are more likely to think that automatically retouched images are more beautiful than the original images.

Methods

The research has been conducted through an online questionnaire, collecting quantitative and qualitative data as well. The former has been analysed using *SPSS* research software, while the text responses have been analysed using *SAS JMP Pro Text Explorer*.

The central part of the questionnaire was a gallery of 8 picture pairs (4 female and 4 male models), in which the first one of each pair was a raw, completely unedited portrait photo, while the second one was an automatically retouched version of the given portrait by artificial intelligence (*Figure 1.*). The age of the models in the images varied; both male and female portraits included young (21-30 years old), middle-aged (50 years old) and older (70 years old and above) models.

Figure 1: The image pairs of the questionnaire - from pair 1 to pair 8, from left to right, top to bottom (source: own editing)

After viewing each picture pair, respondents have been asked to answer four attitude measurement questions and to indicate which facial features had been taken into account when judging beauty.

- In which picture do you find the model more beautiful?
- Based on which picture would you prefer to meet the model?
- Which picture would you prefer to see in the news feed of your social media site?
- Which picture would you prefer to see on the cover of a magazine?
- Which elements of the face have been taken into account when determining beauty?

The questionnaire also included questions about the subjects' own photo retouching habits, questions about their opinions on photo retouching, and questions collecting demographic data.

Data collection

Data collection for the survey took place in Hungary, April 2022, in two phases. The first phase of data collection was carried out by personal questionnaire completion at Corvinus University of Budapest. The participants of the survey were 19-25 years old Communication and Media Studies BA students who voluntarily and anonymously participated in the research. In the first phase, participants were selected by convenience sampling.

In the second phase of data collection, the questionnaire was made available online for two weeks. Dissemination was achieved through public sharing and posting in target-specific closed social media groups.

The sample of the study

A total of 180 respondents completed the questionnaire (*N* = 180). All responses were validated during the data cleaning process, so there was no reason to remove any respondent from the sample. In terms of gender distribution, 62% of the respondents were female, 37% male and 1% were non-binary. In terms of age, the primary target group (21-30 years) accounted for more than half of the sample (55%), the proportions of participants aged 31-40 years (13%) and 41-50 years (14%) was approximately the same. The proportion of respondents aged 50 years and over (7%) and under 20 years (9%) was slightly lower.

The majority of participants (58%) reported to have hobby-level experience in some visual field, 21% of them said they had no professional experience in visual work, while slightly fewer (20%) said they had professional experience in some kind of a visual field.

Due to the nature of the data collection, a significant proportion of the primary target group is currently studying at undergraduate level, so the largest proportion of the sample (58%) is those with a secondary school degree at the time of the survey.

Results

Testing hypotheses

Based on the results, the first hypothesis (H1 = In the case of female photo models, more participants consider the automatically retouched image to be more beautiful than in the case of male photo models.) was disproved. At half (2 out of 4) of the picture pairs of female models the automatically retouched

version was perceived as more beautiful, while in the case of male models the retouched version was chosen at 3 images out of 4. All in all, more respondents chose the automatically retouched image as more beautiful for male models than for female models.

The second hypothesis of the research (H2 = In the case of female photo models, male participants are more likely to consider the automatically retouched image to be more beautiful than the original one.) was also disproved: for all 4 picture pairs of female models, proportionally fewer male respondents chose the automatically retouched version than female or non-binary respondents.

Similarly, the third hypothesis have not been confirmed (H3 = In the case of older photo models (over 70 years), participants are more likely to consider the original image to be more beautiful than in the case of younger photo models.) For both subjects over 70, the automatically retouched version has been found more beautiful. In contrast, for younger and middle-aged photo models, on average, the original image and the retouched version has been perceived as beautiful approximately similar times.

Finally, the fourth hypothesis of the research (H4 = Participants from the younger generations are more likely to consider the automatically retouched images to be more beautiful than the original images.) was also disproved. Two age groups (under 20s and 21-30s) were classified as the younger generation. In only 3 of the 8 image pairs (*image pair 1*; *2*; *8*) was it observed that a higher number of members of the young generation considered the automatically retouched image version to be more beautiful. There was no clear correlation between the age of the models and the age of the respondents in the perception of beauty.

The attitude measurement questions

After each pair of pictures, the participants had to answer four questions:

- In which picture do you find the model more beautiful? Based on which picture would you prefer to meet the model?
- Which picture would you prefer to see in the news feed of your social media site?
- Which picture would you prefer to see on the cover of a magazine?
- Which elements of the face have been taken into account when determining beauty?

In the case of beauty, out of all the picture pairs (8), the automatically retouched image was considered more beautiful by the participants in 5 cases (*image pair 1*; *2*; *3*; *5*; *8*) and the original image in 3 cases (*4*; *6*; *7*). In contrast to beauty, in only 2 out of 8 picture pairs (*2* and *8*) did the respondents consider that they would prefer to meet the model in person based on the automatically retouched photo. For the other 6 picture pairs (*1*; *3*; *4*; *5*, *6* and *7*), they

would prefer to meet the model based on the original photo. For half of these (*image pair 4*; *6* and *7*), the original photo was considered to be more beautiful at the first question.

In their own social media feed, respondents preferred to see the retouched photo in 3 out of 8 cases (*image pair 1*; *2* and *8*), while in the other 5 picture pairs (*3*; *4*; *5*; *6* and *7*), more respondents preferred the original photo. However, for the magazine cover, the majority of respondents preferred the automatically retouched image: for a total of 5 picture pairs (*image pair 1*; *2*; *3*; *5* and *8*), they would prefer to see the automatically retouched photo as a magazine cover, and for only 3 (*image pair 4*; *6* and *7*), they would prefer to see the original photo.

A correlation can be found between which image version the respondents thought was more beautiful and which they would prefer to see on the cover of a magazine: the image pairs where the respondents would prefer to see the automatically retouched image version were the image pairs where they thought it was more beautiful (*image pair 1*; *2*; *3*; *5*; *8*). The perception of beauty had a similar effect on the desire to meet the model: in 5 out of all image pairs (8), respondents would prefer to meet the photographer based on the image version that more people thought was more beautiful. While overall more people would prefer to see the original photos in their own newsfeed, in 6 out of 8 cases, the version of the photo that more people found more beautiful was the one that people would prefer to see on their social media page.

Therefore, the perception of beauty also had an impact on the other three attitudinal measures: in most cases, the version of the photo that more people thought was more beautiful was the one that they would prefer to see in their own news feed or on the cover of a magazine, and more people would prefer to meet the model based on the picture they thought to be more beautiful. The results are in line with previous research that has shown that beauty has a positive effect on the overall image of a person and the attitude towards that person (Borelli and Berneburg, 2010: 326).

Other results

After every picture pair, respondents had also been asked to report which facial features they felt influenced when choosing the more beautiful photo version. According to the text analysis study, the most commonly observed facial elements were facial skin, eyes and face shape, followed by mouth, nose and hair (occasionally teeth if they were visible). Of these, the importance of mouth and teeth, eyes and facial skin was also previously highlighted in Godinho et al.'s study (2020: 99).

The questionnaire also included an association task: subjects had to write down the first three words that came to their mind when they think of beauty. Among these, *naturalness* and *subjectivity* were the most frequent answers. A

possible explanation for the former is that, due to the topic of the study and the nature of the questionnaire, the participants were already attuned to the phenomenon of natural beauty and manipulated beauty, which might be considered unnatural. The latter suggests that the respondents' knowledge of beauty includes the claim also mentioned by some literature sources, that the perception of beauty is subjective from a certain point of view and cannot be considered universal (Hume, 1757: 136; Kant, 1790: Di Dio et al, 2007: 2; Wong et al, 2021: 2178).

The responses to the questionnaire also show that a significant proportion of respondents (78%) believe that retouching requires creative expertise. Women users in general are considered to retouch their own photos (69%), while only 8% of the participants things the same about men users. Half of the respondents (50%) agree that retouching their own pictures increases self-confidence, while slightly more (56%) believe that other people's retouched photos create negative feelings in the individual. However, the claim that retouching has a negative effect on people's body image was agreed upon by 74% of respondents. The least divisive viewpoint was that retouching also has a negative impact on the social ideal of beauty (81%), and that respondents were more likely to consider it acceptable for professional photo models than for civilian photo subjects (76%).

Just over half of respondents said that retouching tends to evoke negative feelings in viewers, but in a follow-up question, far fewer (15% of respondents on average) said they had a negative emotional reaction to retouched photos. The majority (55%) admitted to having a neutral reaction to retouched portraits.

Overall, slightly less than half (47%) of the respondents reported that they usually retouch their own photos. In terms of gender, 51% of female respondents retouch their photos, while this proportion is slightly lower for men (42%).

Limitations

The research was conducted on a relatively small (N = 180), non-representative Hungarian sample, so the results cannot be considered valid for society. Moreover, the perception of beauty and the perception of image manipulation also depend on the cultural background and socialisation of the recipients, so the conclusions drawn in the research are indicative but not universal. Furthermore, the results may have been influenced by the software used to create the images being used in the research, as each image editing program works with different visual solutions. Another potential limitation of the research is that the questionnaire was self-reported, so it is possible that respondents made decisions in preference for the appearance of naturalness.

Application of the Results and Further Research Opportunities

The research is embedded in the discourse of the perception of visual manipulations, complemented with the possibilities offered by artificial intelligence (AI). The relationship between visual manipulation and AI is mostly examined in the context of deepfake (automated video manipulation) in communication and media studies, with less emphasis on static images. This is particularly true for the study of manipulated facial images, even though the human face is a prominent visual stimulus in media content.

Therefore, the study points to new possible research directions in the field of automatic retouching and the beauty ideal generated by artificial intelligence. A further research topic could be the digital manipulation of the body shape beyond the human face, which can also have a strong impact on the recipients' own body ideals.

Conclusion

The visual revolution in the field of communication and media was triggered by the emergence of photography. Thanks to technological advances, in the last decade, modern media research has focused attention on the true value of images; visual stimuli have played a major role in the speed of information transmission and retention, and their authenticity is less questioned by the recipient. Consequently, the post-editing and manipulation of photographs raise several questions and potential ethical issues. Portrait photographs form a special category within manipulated photographs since the human face is a specific visual stimulus that plays a very important role in the perception of beauty.

The present research examined portrait photographs using an online questionnaire that was automatically retouched and beautified by an artificial intelligence-based image editing program. The central part of the questionnaire consisted of a gallery of 8 picture pairs (4 female models and 4 male models), in which the first one of each pair was a raw, completely unedited portrait photo, while the second one was an automatically retouched version of the original portrait. The results of the research showed that the viewer's perception of the automatic image retouching was not influenced by the gender or age of the model, nor by the age of the recipients. However, the participants' first judgement of the models' beauty influenced their attitude towards both the model and the photograph. In most cases, the photo version that participants considered more beautiful was the one they would have preferred to see both in their own social media news feed and on the cover of a magazine, furthermore, more people would have preferred to meet the model based on the photo they thought to be beautiful. These findings are consistent with both studies on the subjectivity of beauty (Wong et al, 2021: 2177) and previous research that suggests that perceptions of beauty influence the overall image of an individual (Borelli and Berneburg, 2010: 326).

The research also reveals that viewers tend to associate negative emotions with image manipulation, as it is considered to have a negative impact on people's self-image and on society's ideal of beauty in general. According to the answers, image manipulation is more acceptable in the case of professional photography where the subject is not a civilian but a professional photographic model.

The study points to new possible research directions in the field of automatic retouching and AI-generated beauty ideal, opening the way for future areas of investigation such as digital manipulation of the body shape, which can also have an impact on the recipients' own body ideal.

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